DOCUMENT RESUME

ED 088 506 IR 000 340

AUTHOR Wagner, Harold; Butler, Patrick J.
TITLE Computer Simulation as an Aid to Managers of Training.
INSTITUTION Human Resources Research Organization, Alexandria, Va.
SPONS AGENCY Army Research Inst. for the Behavioral and Social Sciences, Arlington, Va.
REPORT NO HumRRO-TR-73-34
PUB DATE Dec 73
NOTE 110p.

EDRS PRICE MF-$0.75 HC-$5.40
DESCRIPTORS Autoinstructional Programs; Computer Oriented Programs; *Computer Programs; *Educational Programs; Educational Research; Individualized Instruction; Individualized Programs; *Management Systems; Military Training; Models; Pacing; Program Length; Program Planning; *Scheduling; *Simulation; Time Factors (Learning)
IDENTIFIERS General Purpose Simulation System; GPSS

ABSTRACT

Research investigated computer simulations of a hypothetical self-paced training program to determine the utility of this technique as a planning aid for Army training program managers. The General Purpose Simulation System (GPSS) was selected as the programing language and the study was divided into three stages. In Stage I, the daily number of entering and graduating students was computed and displayed in a printout. In Stage II, statistics were added to deal with attrition rates, advanced training schedule comparisons, training load, and completion times. In the last phase, the final simulation program made possible the determination of the most efficient follow-on course location of each student, the medium of instruction assigned to each student, the session attended by the student, the absentee rate, and additional summary data on student flow through the course. It was concluded that the simulations were useful planning tools, for they allowed training managers to offer advanced courses on a schedule consistent with student flow through basic courses, thus reducing the student's waiting time between courses. The use of the simulations was recommended in planning training programs. (Author/PB)

SCOPE OF INTEREST NOTICE
The ERIC Facility has assigned this document for processing to: IR CE
In our judgement, this document is also of interest to the clearinghouses noted to the right. Indexing should reflect their special points of view.

ED 088506

[redacted]

[redacted]

[redacted]

ERIC

HumRRO
Technical
Report
73-34

ED 088506

Computer Simulation as an Aid to Managers of Training

Harold Wagner and Patrick J. Butler

HumRRO Division No. 1 (System Operations)
Alexandria, Virginia 22314

HUMAN RESOURCES RESEARCH ORGANIZATION

Work Unit STOCK/PRISM

December 1973

Approved for
public release;
distribution
unlimited.

Prepared for

U.S. Army Research Institute for the
Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, Virginia 22209

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRO
DUCED EXACTLY AS RECEIVED FROM
THE PERSON OR ORGANIZATION ORIGIN
ATING IT. POINTS OF VIEW OR OPINIONS
STATED DO NOT NECESSARILY REPRE
SENT OFFICIAL NATIONAL INSTITUTE OF
EDUCATION POSITION OR POLICY

ERIC

The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation. HumRRO's mission in work performed under Contract DAHC 19-73-C-0004 with the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

Published
December 1973
by
HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street
Alexandria, Virginia 22314

Distributed under the authority of the
U.S. Army Research Institute for the
Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, Virginia 22209

FOREWORD

The purpose of the research performed as part of HumRRO Work Unit STOCK was to develop practical techniques for the management of entry-MOS training programs, in order that these programs may more effectively use individualized instruction for students of all aptitude levels. The training management techniques develcped under Work Unit STOCK were evaluated and refined as part of Work Unit PRISM.

This document reports on the design, development, and refinement of a computer simulation program, using the General Purpose Simulation System (GPSS), to assist training managers in planning for the implementation of self-paced training programs. A report in press, "Individualized Course Completion Time Predictions: Development of Instruments and Techniques," describes an approach developed in Work Units STOCK and PRISM to predict "time to learn" in a student self-paced training program. These predictions are necessary to solve management problems brought about by the conflict of self-paced training and personnel assignment procedures. In addition to such "external" management problems are numerous internal administrative and scheduling problems caused by programs in which individual trainees progress at their own speed. These are the problems which the computer simulations described in this report were designed to alleviate. An earlier report based on Work Unit STOCK is *Self-Paced Individual Training (AIT) and Duty Assignment Procedures*, Technical Report 73-14, June 1973.

Research performed under Work Units STOCK and PRISM was conducted by HumRRO Division No. 1, Alexandria, Virginia, Dr. J. Daniel Lyons, Division Director. The Work Unit Leader for the research was Dr. C. Dennis Fink; Dr. Harold Wagner was the Work Sub-Unit Leader and was directly responsible for conduct of the research. Mr. Patrick J. Butler designed and developed the GPSS simulation programs described in this report.

HumRRO research for the Department of the Army under Work Units STOCK and PRISM was conducted under Contract DAHC 19-73-C-0004. Army Training Research is performed under Army Project 2Q062107A745.

Meredith P. Crawford
President
Human Resources Research Organization

INTRODUCTION

The purpose of this research, performed as part of the Work Unit STOCK, was to develop techniques for managing individualized training programs. The training management techniques developed under Work Unit STOCK were evaluated and refined as part of Work Unit PRISM.

PROBLEM

The U.S. Army Quartermaster School (QMS) selected for individua ization the Stock Control and Accounting Specialist (MOS 76P20) course, which "feeds" advanced, follow-on training programs. In an individualized 76P20 course students would progress at their own speed. This would create the problem of how to efficiently schedule the advanced training. That is, what is the minimum number of follow-on classes, distributed in what manner, that would minimize student *wait time* (idle time waiting for a class to begin), and still meet course output quotas?

In addition, the training manager is faced with the problem of how to efficiently use available facilities, personnel, and other training resources to accommodate trainees progressing at their own speed *within* the course. To solve these problems, the training manager needs information of student flow through such a self-paced training program (i.e., how many students will be at given points in the course at certain times). However, for this information to be useful, it should be provided *prior* to program implementation so that the training manager can use it for *planning* purposes.

The basic problem, then, is to provide data of student flow through a self-paced course in time for training managers to plan implementation of such a course, and to efficiently schedule advanced training. It was believed that computer simulations would be required to produce such information in a timely and practical manner.

OBJECTIVES

The overall objective of this research was to develop and study computer simulations of a hypothetical self-paced training program in order to determine the utility of this technique as a planning aid for training managers faced with implementing a self-paced course. General Purpose Simulation System (GPSS) was the programming language used to develop these simulations. The study was divided into three stages, each with its own goal, as well as subobjectives (specific problems to be solved by the results of the simulations). The goals of the three stages were as follows:

- Stage I - To demonstrate the feasibility of developing and performing a GPSS simulation of self-paced training.
- Stage II - To develop GPSS simulations of a hypothetical self-paced 76P20 course in order to demonstrate the utility of computer simulation.
- Stage III - To modify and refine the GPSS simulation program to serve as a detailed model of the self-paced 76P20 course.

APPROACH

GPSS programs were prepared in each stage of the study to solve different specific problems. For this reason, a different set of variables was used in each GPSS simulation model. The results of the simulation in each stage were presented to QMS training managers for their comments and suggestions, which were then incorporated into the simulation model developed in the next stage of the study.

Completion time data from the self-paced sections of the 76P20 course were used to develop hypothetical course completion time distributions for the GPSS simulations. In Stage I, the same completion time distribution was assigned to each simulated entering class. In Stages II and III, more than 60 distributions were available, from which one was randomly selected (according to predefined probabilities) for each entering group of students.

In Stage I, the number of students entering and graduating on each day was computed and displayed in the simulation printout. In Stage II, the model contained, in addition to the Stage I computations, provisions for statistics on attrition rate, follow-on training scheduling comparisons, training load, and completion time.

In Stage III, the final simulation program contained, in addition to the capabilities of the previous models, provisions for determining: (a) the most efficient follow-on course scheduling policy for *each* advanced MOS; (b) the internal course location of each student by major section (annex) of the course; (c) the medium of instruction—audio-visual (AV) or programmed (PI-text)—assigned to each student; (d) the session (day or night) attended by the student; (e) the daily absentee rate; and (f) additional summary statistics of student flow through the course.

In Stage I, the simulation was applied to a "fiscal year's worth" of classes. That is, the QMS class schedule for that year was used to determine the size of the 76P20 input. In Stages II and III, follow-on course scheduling policies were compared and evaluated. This required applying the policies to several "years" of simulated self-paced training.

FINDINGS

In Stage I, the simulation showed that, in a variable-length course with a stable weekly input, and the same course completion distribution applied to each class, the *daily output* of graduates was relatively stable. Advanced-MOS courses could be scheduled on a daily basis to accommodate such a stable daily output with a minimum of student wait time. This Stage effort demonstrated the feasibility of using GPSS to simulate self-paced training.

A detailed simulation of the 76P20 course was developed and performed in Stage II. It was shown that when completion time distributions varied from class to class, in terms of their ranges and shapes, a highly variable, unstable daily output resulted. The simulation data indicated, however, that even when the daily output was unstable, scheduling follow-on classes more frequently or more evenly throughout the week reduced student *wait* time. The results of these simulations were presented to QMS training managers. The utility of such simulations to their planning needs was demonstrated. The parameters used in this simulation were then modified by data gathered in the 76P20 course, and by suggestions from QMS personnel. This information formed the basis for the Stage III model.

In Stage III, various follow-on course scheduling policies were evaluated and modified in order to identify a policy that would most efficiently meet the specific quotas for each of the advanced-MOS training programs. Such a policy was designed, and its development is described in detail in the report.

The overall goals of this study were met by the simulation developed and performed in Stage III. It provided a realistic model of student flow within and through the self-paced 76P20 course, by means of a detailed *daily* accounting of (a) the number of students who were assigned to an AV or PI-text instructional medium; (b) the number of students who were in a night or day session; (c) the number of students who were in each one of the four course annexes; (d) the number of students who were absent; (e) the number of students who were lost by attrition and (f) the number of students who graduated from the course.

IMPLICATIONS

The results of this study illustrate the successful use of computer simulation for training management planning purposes. Information obtained from the simulations was displayed in printouts in a way that would be useful to training managers. It appears that the follow-on course scheduling policy identified in Stage III would be suitable for use and validation by QMS in implementing the individualized 76P20 course.

The policy identified in Stage III as meeting the goals of the simulation had the following specific characteristics:

(1) A follow-on class did not contain less than 35 or more than 45 students.
(2) The sequence of follow-on classes was the same as that specified in the FY 1973 QMS schedule.
(3) If more than 106 follow-on classes were required, they started in alphabetical order.
(4) Follow-on classes were started Monday through Thursday.
(5) The FY 1973 follow-on course quotas were met.
(6) All 76P20 graduates in excess of the total follow-on course quotas were assigned directly to the field.
(7) Priority was given to the follow-on courses before assigning 76P20 graduates to the field.
(8) Assignments to the field were made during July and August 1972 (the first months of the fiscal year in which the policy was implemented).
(9) No assignments to the field were made during June, July, and August 1973 until the follow-on course quotas were met.
(10) Assignments to the field were made on Thursday and Friday until the follow-on course quotas were met, after which they were assigned Monday through Friday.
(11) The rate of assignment to the field was uniform.

The GPSS program provided in this report has implications for use as a model for planning the establishment of other self-paced programs, as it can be modified rapidly to take into consideration changes in many of the parameter values. If computer and programming capabilities are available, the simulations can be employed as planning aids to training managers who are faced with implementing self-paced courses.

CONTENTS

		Page
Introduction		3
	The Problem	3
	Objectives of the Research	3
Stage I--Demonstration of GPSS Simulation Feasibility		4
	Objectives	4
	Program Development	4
	Assumptions and Input	4
	Description of Output	4
	Results of Simulation	6
	Conclusions and Implications	6
Stage II--Development of GPSS Simulation Program		6
	Objectives	6
	Program Development	7
	Assumptions and Input	7
	Description of Output	8
	Results of Simulation	10
	Conclusions and Implications	13
Stage III--Modification and Refinement of GPSS Simulation Program		14
	Objectives	14
	Program Development	14
	Assumptions and Input	14
	Description of Output	19
	Results of Simulation	22
	Conclusions and Implications	26
Summation		28
Appendices		
A	Computer Simulation Flow Diagrams	29
B	Final GPSS Program	49
C	GPSS Simulation Printout--Stage III	79
Figures		
1	Example of Summary Statistics of Student Flow Within 76P20 Course	21
2	Sample Printout Showing Follow-On Course Input Quotas and Number of 76P20 Graduates Assigned to Field	22
C-1	Follow-On Class Schedule Developed Under Policy 1D'	92
C-2	Follow-On Class Schedule Developed Under Policy 1F'	94
C-3	Sample Printout of Course Completion Time Statistics for AV Students	96
C-4	Sample Printout of Course Completion Time Statistics for PI Students	97

Figures *(Cont.)* Page

C-5 Sample Printout of Daily Absentee Statistics 98
C-6 Wait-Time Data for Policies 1D ' and 1F ' 98

Tables

1 Computer Printout From Stage I GPSS Program 5
2 Computer Printout From Stage II GPSS Program 9
3 Follow-On Course Scheduling Policies—Stage II 10
4 Comparison of Follow-On Course Scheduling Policies—Stage II Simulation Results. 12
5 Follow-On Course Scheduling Policies—Stage III 16
6 Comparison of Scheduling Policies 1, 2, and 3—Stage III 23
7 Comparison of Scheduling Policy Modifications—Stage III 25
8 Comparison of Scheduling Policies 1D ' and 1F ' Over a Simulated Period of Six Fiscal Years 27

Computer Simulation as an Aid to Managers of Training

INTRODUCTION

THE PROBLEM

As more Army training programs become individualized,[1] training managers will face administrative problems much more complex than those that occur under a traditional lock-step, fixed-length training program. The variable daily output (number of graduates) of a self-paced training program can generate several types of problems. First, there is the question of how to efficiently utilize "early" graduates at the local training base, or how to ensure the timely arrival of assignment instructions so that students may depart their training bases immediately upon graduation. A related problem, applicable to courses that "feed" advanced, follow-on training programs, is how to efficiently schedule the advanced training. This is one of the scheduling problems addressed in this report.

The course selected for individualization by the U.S. Army Quartermaster School (QMS) was Stock Control and Accounting Specialist, Military Occupational Specialty (MOS) 76P20, a "feeder" course whose graduates enter several follow-on training programs (MOS 76Q, 76R, 76S, 76T, and 76U).

In addition to the "external" management problem of efficiently scheduling advanced training, there are numerous *internal-to-course* planning and scheduling difficulties. As individual trainees progress at their own speed, there is a need to know how many will be at given points in the course at certain times. This is extremely important information to managers faced with the problem of determining how to efficiently use available facilities, personnel, and other training resources.

OBJECTIVES OF THE RESEARCH

Computer simulation was considered as a potential aid to training managers in solving some of their planning and scheduling problems. General Purpose Simulation System (GPSS)[2] is a computer language designed specifically for programming simulations that are used to solve "waiting line" or queuing-type problems. The scheduling problems that have been described are a form of such queuing problems. It was believed that simulations of student flow through hypothetical self-paced courses would be useful to training managers.

The objectives of this study can be divided into three stages:

- Stage I - To demonstrate the feasibility of developing and performing a GPSS simulation of self-paced training.
- Stage II - To develop GPSS simulations of a hypothetical self-paced 76P20 course in order to demonstrate the utility of computer simulation.
- Stage III - To modify and refine the GPSS simulation program to serve as a detailed model of the self-paced (MOS 76P20) course.[3]

[1] Under the label "individualized training," the characteristic of student self-pacing can be subsumed.

[2] *IBM General Purpose Simulation System (GPSS) V User's Manual*, First Edition, November, 1970.

[3] GPSS simulations in Stages I and II were performed on an IBM 360/40 computer. The Stage III GPSS-V simulations were performed on an IBM 370/145 computer. (Identification of products is for research documentation only, and does not constitute an official endorsement by HumRRO or the Army.)

In each of these stages there were other objectives, relating to specific scheduling problems that can arise in a self-paced 76P20 course. The simulations performed in each stage were developed to produce information that could aid in solving these scheduling problems.

STAGE I—DEMONSTRATION OF GPSS SIMULATION FEASIBILITY

OBJECTIVES

The major goal in this stage, which occurred in FY 1971, was to demonstrate the feasibility of using computer simulation as an aid to training managers of self-paced courses. A GPSS program was written to demonstrate how its output could provide well-structured information to training managers for decision-making purposes.

The specific scheduling problems addressed were (a) what the *daily* output would be like from a variable-length training program completed by individual students at their own pace and (b) whether this output would lend itself to a follow-on course schedule that could minimize student idle time (to be referred to in this report as *wait time*). Such idle time would cut into the savings in training time obtained by the implementation of self-pacing.

PROGRAM DEVELOPMENT

Assumptions and Input

At the time Stage I began, the conventional, fixed-length 76P20 course was six and one-half weeks long. In a survey of self-paced training, HumRRO researchers found that average training time could be reduced approximately 30% by the conversion of a course to self-pacing. Using this finding as a basis, a course completion time distribution was created that was normal in shape, had a mean completion time of 33 days, a Standard Deviation of 7 days, and a range of 16-50 days (including Saturdays and Sundays, but not holidays).

The FY 1971 76P20 class schedule was used to obtain the number of students entering each class. There were either 41 or 42 students in each class. Four classes began each Monday. As class distinctions would be eliminated in a self-paced training program, the four classes were combined so that between 164 and 168 students entered the 76P20 course every Monday. The same completion time distribution was applied to each entering group of students.

Description of Output

Based on the assumptions and input just described, a GPSS program was prepared to produce a computer printout (shown in Table 1) that contained the following information:

Column 1 - The numerical (Julian calendar) date.

Column 2 - The number of students reporting for training on that particular date (*input*). (All students began training on Monday. The number 5 was inserted to indicate only that this day was Friday.)

Column 3 - The number of 76P20 students graduating on that date (*output*).

The legal holidays observed by the QMS were taken into consideration in the simulation program. On these dates there were no classes starting or graduates emerging from the training program.

Table 1

Computer Printout From Stage I GPSS Program

76P20 Input and Output, 12 October 1970 to 20 November 1970, Matrix Halfword Savevalue 2

Row \ Column	1	2	3
1	285	164	31
2	286	0	34
3	287	0	48
4	288	0	39
5	289	5[a]	28
6	290	0	0
7	291	0	0
8	292	164	38
9	293	0	27
10	294	0	37
11	295	0	28
12	296	5[a]	44
13	297	0	0
14	298	0	0
15	299	164	28
16	300	0	36
17	301	0	25
18	302	0	37
19	303	5[a]	36
20	304	0	0
21	305	0	0
22	306	164	26
23	307	0	33
24	308	0	36
25	309	0	28
26	310	5[a]	32
27	311	0	0
28	312	0	0
29	313	0	36
30	314	0	31
31	315	0	0
32	316	0	32
33	317	5[a]	37
34	318	0	0
35	319	0	0
36	320	164	40
37	321	0	28
38	322	0	29
39	323	0	37
40	324	5[a]	37

[a]Indicates this day was Friday.

RESULTS OF SIMULATION

After an initial start-up period (several weeks of class starts), there was a gradual build-up of graduates on a daily basis, until approximately 25 to 45 students were graduating daily. This stable daily output of students continued throughout most of the weeks in the year. Occasionally, it would be interrupted when holidays intervened. However, the simulation showed that in a variable-length course, with a fixed number of students entering each week, the daily output of graduates was relatively stable. This stable output occurred when the *same* completion time distribution was applied to each input group. Advanced-MOS courses could be scheduled on a daily basis to accommodate the output generated in this simulation. Such a *daily* follow-on course schedule would minimize student *wait time.*

CONCLUSIONS AND IMPLICATIONS

The Stage I GPSS simulation was produced for demonstration purposes. The printouts were presented to training managers of the QMS to inform them of the availability of GPSS, and of the feasibility of using computer simulations to answer their questions on planning self-paced training. Plans were then made to extend the GPSS program for a more complete and detailed simulation of a hypothetical self-paced 76P20 course. The Stage I effort indicated the feasibility of using computer simulation to assist training managers in implementing a self-paced program.

With the assistance of QMS personnel, more realistic information was obtained to change the underlying assumptions upon which the first GPSS simulation program was based. The program was written so that such modifications could be easily made. For example, provisions were made in the program for the use of more than one course completion time distribution even though that was not used in the Stage I simulation. Thus, in Stage I it was concluded that GPSS may be a useful planning tool to assist the individualization efforts at QMS, and a "full-blown" simulation of a self-paced 76P20 course was planned for Stage II.

STAGE II—DEVELOPMENT OF GPSS SIMULATION PROGRAM

OBJECTIVES

The initial GPSS simulation in Stage I provided an example of what the daily output of graduates is like when produced by a variable-length course with a stable input and a single course completion time distribution. It was not surprising that the number of graduates from this course stabilized on a daily basis, since the weekly input was stable, with the same completion time distribution for each input group. It would be relatively simple for a training manager with this information to efficiently schedule follow-on courses on the basis of this stable output.

The purpose in Stage II was to produce a more realistic simulation of a self-paced 76P20 training program. When this work was performed (late in FY 1971), HumRRO researchers in Work Unit STOCK had obtained data on the time it took students to complete sections of the 76P20 course. With these data, and input from QMS training managers regarding parameters to be included in the simulation, a GPSS program was developed. The program was designed to simulate the 76P20 course and to determine (a) the most efficient scheduling policy for assigning the graduates of a self-paced

76P20 course into the follow-on training programs, and (b) whether the daily output of graduates from the self-paced 76P20 course would remain stable if completion time distributions were varied in their ranges and shapes.

PROGRAM DEVELOPMENT

Assumptions and Input

The simulations produced in Stage II were based on the following assumptions:

(1) The QMS FY 1971 class schedule for the 76P20 course was used as the basis for the simulated input. A total of 8,039 trainees entered the 76P20 course. The actual weekly input was employed for the first 39 weeks of the simulated fiscal year. It was further assumed that the quota of 8,039 would be met. Therefore, the final weeks of input were created in a manner that would meet the quota and be similar to the actual input of the previous 39 weeks.

(2) The overall (academic and administrative) attrition rate for the entire year was approximately 3.5%. An attrition probability of .001 on any given day in training was assigned to each trainee.

(3) Sixty-eight different completion time distributions were developed. Five general shapes were employed for these distributions—normal, positively skewed, negatively skewed, bimodal, and horizontal (flat). For each distribution shape there were several different ranges. Data obtained from the self-paced sections of the 76P20 course confirmed the findings of an approximate 30% reduction in average training time when a course undergoes self-pacing. The reference that was used in developing these distributions was an "ideal" completion time distribution that was approximately normal, had a mean of 33 days, a Standard Deviation of 7 days, and a range of 16-50 days. This was the same distribution used in the Stage I simulation. The distribution included Saturdays and Sundays, but not holidays. With that distribution as a referent, 68 distributions were created to serve as the population from which one was selected for each week's input. The overall range for the 68 distributions was 12-60 days. Each distribution had a stated probability of being selected, which was incorporated into an overall probability function. The probability of selecting each of these distributions was based upon an analysis of the completion time distributions obtained from the self-paced 76P20 course sections.

(4) Nine fiscal year simulations were performed to determine whether the findings obtained in one fiscal year would be replicated when different sets of completion time distributions were randomly selected and employed in other fiscal years.

(5) Instructions were added to the GPSS program to permit four follow-on class scheduling policies to be compared in each fiscal year simulation. The criterion for efficiency was the total amount of time students spent waiting prior to entering a follow-on class, which resulted if a given policy was implemented. The following constraints were imposed on the policies:

(a) At least one class began on Monday.
(b) There were no more than 200 follow-on classes a year.
(c) No more than four classes were scheduled to begin each week.[4]
(d) No classes began on Friday. This provision was based on the assumption that it was not effective from a training standpoint to begin a class the day before a weekend.[5]
(e) A follow-on class did not begin unless there were at least 25 students available to enter it. A class did not contain more than 45 students.

[4] In two policies, this constraint was changed to permit five classes each week.
[5] In one policy, the fifth class could begin on Friday.

For completion time distributions to be randomly assigned to each week's input, and for graduation dates to be randomly assigned to individual trainees in each completion time distribution, the GPSS program utilizes a random number generator. It produces strings of random numbers for use in probability functions such as the completion time distributions used in these simulations. One feature that is provided to a programmer using the GPSS computer language is the ability to control the absolute sequence of random numbers generated during a simulation. This is important in these simulations because of the desirability of obtaining a *uniquely sequenced* set of course completion time distributions for each fiscal year.

Description of Output

The GPSS program produces computer printouts containing matrix tables of data generated by the simulation. (A more detailed description of these matrix tables is presented in the next section of this report. Only a brief description of the computer output obtained in Stage II follows.)

The computer printout contained simulation matrices for nine fiscal years (each represented FY 1971). Each of the matrix tables in the printout had 18 columns. These columns, as shown in Table 2, contained the following entries:

Column 1 - The numerical (or Julian) date. Each *row* in the matrix contained information for a different calendar date. Holidays during the year were taken into consideration, and no classes were started or trainees graduated on these dates.

Column 2 - The number of students reporting for 76P20 training. (The *input* was always indicated on a Monday in the simulations.)

Column 3 - The number of students that were lost to attrition from the group entering training on that calendar date. This number was obtained by randomly applying the .001 attrition probability to each individual on each day of training.

Column 4 - The number of students from the group entering training on that calendar date who completed training (the sum of the entries in Columns 3 and 4 was equal to the entry in Column 2—students entering training.)

Column 5 - The identification number for the group entering training on that calendar date.

Column 6 - The identification number of the course completion time distribution selected for the group entering training on that calendar date.

Column 7 - The mean course completion time for the group entering training on that calendar date (included Saturdays and Sundays, but not holidays).

Column 8 - The total number of students (from all groups) lost to attrition on that calendar date.

Column 9 - The total number of students available for training on that calendar date (equivalent to the *training load*).

Column 10 - The total number of students completing training on that calendar date (the number of graduates of the 76P20 course—the *output*).

Columns 11-18 - These eight columns provided data on four follow-on class scheduling policies. Columns 11, 13, 15, and 17 show the size of each follow-on class beginning on that calendar date. Columns 12, 14, 16, and 18 show the wait time (in man-days) spent by students entering the follow-on class started on that day. In this way, four policies were compared and evaluated in the same simulation.

Table 2

Computer Printout From Stage II GPSS Program

76P20 Input and Output, 12 October 1970 to 20 November 1970, Matrix Halfword Savevalue 2

	Column																	
Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	285	173	0	173	15	48	22	1	894	22	45	125	45	123	156	765	45	125
2	286	0	0	0	0	0	0	0	871	23	26	12	0	0	0	0	0	0
3	287	0	0	0	0	0	0	0	848	21	0	0	0	0	0	0	45	38
4	288	0	0	0	0	0	0	1	927	27	44	23	69	82	0	0	25	4
5	289	5	0	0	0	0	0	0	799	18	0	0	0	0	0	0	0	0
6	290	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
7	291	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	292	166	5	161	16	43	29	1	946	16	45	117	45	117	111	448	45	117
9	293	0	0	0	0	0	0	0	929	11	0	0	0	0	0	0	0	0
10	294	0	0	0	0	0	0	2	918	46	27	16	0	0	0	0	27	16
11	295	0	0	0	0	0	0	0	870	38	45	0	73	43	0	0	45	0
12	296	5	0	0	0	0	0	0	832	40	0	0	0	0	0	0	0	0
13	297	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
14	298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	299	177	3	174	17	18	25	0	968	63	45	130	45	128	151	529	45	130
16	300	0	0	0	0	0	0	1	905	57	45	102	0	0	0	0	0	0
17	301	0	0	0	0	0	0	0	847	52	45	52	0	0	0	0	45	147
18	302	0	0	0	0	0	0	1	795	81	45	64	135	330	0	0	90	161
19	303	5	0	0	0	0	0	0	713	84	0	0	0	0	0	0	0	0
20	304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	305	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	306	180	4	176	18	34	32	0	809	84	45	206	45	223	180	895	45	206
23	307	0	0	0	0	0	0	0	725	61	45	680	0	0	0	0	0	0
24	308	0	0	0	0	0	0	1	664	44	45	230	0	0	0	0	45	725
25	309	0	0	0	0	0	0	0	619	17	45	246	135	946	0	0	90	521
26	310	5	0	0	0	0	0	0	602	7	0	0	0	0	0	0	0	0
27	311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	313	0	0	0	0	0	0	5	595	8	45	380	45	718	180	1,624	45	380
30	314	0	0	0	0	0	0	0	582	8	45	889	0	0	0	0	0	0
31	315	0	0	0	0	0	0	0	0	0	45	187	0	0	0	0	45	934
32	316	0	0	0	0	0	0	1	574	9	45	150	135	1,155	0	0	90	382
33	317	5	0	0	0	0	0	0	564	12	0	0	0	0	0	0	0	0
34	318	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
35	319	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	320	179	2	177	19	12	23	0	730	29	45	240	45	439	180	2,182	45	240
37	321	0	0	0	0	0	0	1	701	53	45	312	0	0	0	0	0	0
38	322	0	0	0	0	0	0	2	647	52	45	65	0	0	0	0	45	357
39	323	0	0	0	0	0	0	0	593	42	45	73	135	552	0	0	90	183
40	324	5	0	0	0	0	0	0	551	48	0	0	0	0	0	0	0	0

In addition to the matrices in the computer printout, the GPSS simulations produced many supplementary tables that contained course completion time statistics for each group entering the 76P20 course. It is therefore possible to examine in detail the actual completion time distribution for each of the weekly 76P20 input groups. The actual distributions varied slightly from the original functions because of the GPSS random number generator that was previously discussed.

RESULTS OF SIMULATION

In Stage I GPSS simulation, the 76P20 output was relatively stable. It was expected that training managers could look at this output and easily create a follow-on class schedule that would minimize student wait time. An efficient schedule appeared to be one that permitted a follow-on class to start every day, absorbing the stable daily 76P20 output. Inspection of Stage II simulation printouts indicated that when completion time distributions varied in terms of their ranges and shapes, a highly variable, unstable daily output resulted. It was important to determine the most efficient follow-on class scheduling policy under these conditions. Efficiency was examined in terms of student wait time (the number of days 76P20 course graduates would be idle, waiting to enter a follow-on course).

A total of 12 follow-on class scheduling policies were compared, as described in Table 3. Four policies were compared in each simulation. The comparison of follow-on scheduling policy efficiency, for each set of four policies, was made over two fiscal years. The FYs each policy was applied to are listed in Table 3.

The results of the comparisons of scheduling policy efficiency are shown in Table 4. Policies 1, 2, 3, and 4 were compared in the FY 1 and FY 2 simulations. The most efficient policy (that for which wait time was the least) was Policy 1. This policy was then compared with three others (5, 6, and 7) in FY 3 and FY 4 simulations. There was not much difference between Policies 1 and 7. They were both then included with two additional Policies (8 and 9) in FY 5 and FY 6 simulations. As indicated in Table 4, Policies 1, 7, and 9 were fairly close in efficiency. These three policies were, therefore, compared again in FY 7 and FY 8. Policy 10 was added in that comparison. The results showed that the two most efficient scheduling policies were 1 and 9. These two policies were then compared in a final simulation (FY 9) with two new scheduling policies (11 and 12) that were not restricted by the previous constraints.

Table 3

Follow-On Course Scheduling Policies—Stage II

Policy Number	Description	Fiscal Year Applied to
1	• A follow-on class did not contain less than 25 nor more than 45 students. • There were no more than 200 follow-on classes a year. • No more than four follow-on classes were scheduled to begin each week. • No follow-on classes could begin on Friday. • Only one follow-on class could begin on Monday, one on Tuesday, one on Wednesday, and one on Thursday.	1-9

(Continued)

Table 3 *(Continued)*

Follow-On Course Scheduling Policies—Stage II

Policy Number	Description	Fiscal Year Applied to
2	Same as Policy 1 except: • Only one follow-on class could begin on Monday and three on Thursday.	1, 2
3	Same as Policy 1 except: • All four follow-on classes could begin on Monday.	1, 2
4	Same as Policy 1 except: • Only one follow-on class could begin on Monday, one on Wednesday, and two on Thursday.	1, 2
5	Same as Policy 1 except: • Only two follow-on classes could begin on Monday and two on Thursday.	3, 4
6	Same as Policy 1 except: • Only one follow-on class could begin on Monday, two on Tuesday, and one on Thursday.	3, 4
7	Same as Policy 1 except: • Only two follow-on classes could begin on Monday, one on Wednesday, and one on Thursday.	3-8
8	Same as Policy 1 except: • Only two follow-on classes could begin on Monday, one on Tuesday, and one on Thursday.	5, 6
9	Same as Policy 1 except: • Only one follow-on class could begin on Monday, one on Tuesday, and two on Thursday.	5-9
10	Same as Policy 1 except: • Only one follow-on class could begin on Monday, two on Wednesday, and one on Thursday.	7, 8
11	Same as Policy 1 except: • No more than five follow-on classes were scheduled to begin each week. • A follow-on class could begin on Friday. • Only one follow-on class could begin on Monday, one on Tuesday, one on Wednesday, one on Thursday, and one on Friday.	9
12	Same as Policy 1 except: • No more than five follow-on classes were scheduled to begin each week. • Only two follow-on classes could begin on Monday, one on Tuesday, one on Wednesday, and one on Thursday.	9

Table 4

Comparison of Follow-On Course Scheduling Policies—Stage II Simulation Results

Policy Number	Number of Classes Starting Each Day					Wait Time[a] (Man-Days)								
	Monday	Tuesday	Wednesday	Thursday	Friday	FY 1	FY 2	FY 3	FY 4	FY 5	FY 6	FY 7	FY 8	FY 9
1	1	1	1	1	0	30,709	23,190	34,690	30,932	26,817	32,697	26,765	19,555	19,269
2	1	0	0	3	0	33,282	27,320							
3	4	0	0	0	0	48,456	44,943							
4	1	0	1	2	0	31,690	27,184							
5	2	0	0	2	0			36,302	32,558					
6	1	2	0	1	0			37,251	34,435					
7	2	0	1	1	0			34,849	30,862	30,941	33,032	30,003	22,864	
8	2	1	0	1	0					31,557	35,923			
9	1	1	0	2	0					28,342	33,307	28,064	20,575	19,819
10	1	0	2	1	0							28,278	21,971	
11	1	1	1	1	1									5,973
12	2	1	1	1	0									11,691

[a]Time spent by 76P20 graduates waiting to enter follow-on classes.

Policy 11 had one class beginning every day including Friday. Policy 12 also permitted five classes each week, but had two on Monday and none on Friday. The data indicated that Policy 11 was clearly the most efficient follow-on course scheduling policy with regard to student wait time. Policy 12 also proved to be much more efficient than Policies 1 and 9, which permitted no more than four classes per week. These data also are shown in Table 4.

CONCLUSIONS AND IMPLICATIONS

In comparing the scheduling policies, it was concluded that, by scheduling follow-on classes more frequently, the total student wait time can be reduced even when the daily output from a variable-length training program is unstable. Also, distributing follow-on classes more evenly throughout the week can reduce the wait time, even with an unstable daily output. Thus, some type of balance needs to be considered with regard to the underlying efficiency criteria. With fewer classes there was more efficiency with regard to training resources. With fewer man-days of student wait time there was more efficiency with regard to time in training. These findings suggest that an optimum scheduling policy could be arrived at in future simulations by some combination of these policies.

The objectives of Stage II were met. An extensive and detailed simulation of the 76P20 program was developed and performed. Simulated data were obtained to determine the most efficient scheduling policy to employ when faced with completion time distributions varying in range and in shape. Scheduling follow-on classes frequently, and distributing them evenly throughout the week, was found to be an efficient policy whether the daily output distributions were stable (Stage I) or unstable (Stage II).

The GPSS simulations produced in Stage II and the comparison of follow-on class scheduling policies were shown to training managers at QMS. Comments received from them indicated how realistic they thought the simulations were. All the parameters and policies were examined (i.e., required quotas for follow-on advanced-MOS training, attrition rates, etc.). Data that were gathered while the Stage II simulations were being performed indicated that the completion time distributions used in the simulations were much more heterogeneous than was actually the case.

The QMS training managers saw the usefulness of computer simulation as a planning aid for their self-paced courses, although they spotted certain weaknesses in the Stage II model and made suggestions to improve it. Many internal-to-course problem areas were not dealt with in the Stage II simulation program. These are problems that concern training managers while the students are within the self-paced course. For example, information is needed to determine how to efficiently use training personnel, facilities, and testing areas to accommodate self-pacing.

It appeared desirable to develop a more realistic and detailed model of a self-paced 76P20 course, and perform simulations. A more restrictive set of completion time distributions should be employed. The multi-media aspect of the 76P20 course should be simulated. In addition, each of the follow-on courses has its *own* quota, which should be met. In the Stage II simulation, follow-on courses were grouped together. This did not provide a class start date for each specific follow-on course by MOS. This, too, has implications for the next simulation. Finally, the internal course location of each student should be identified, at least by course section (annex). There were four annexes in the 76P20 course. QMS requested that the training loads in each one be broken out by class session (day/night).

STAGE III–MODIFICATION AND REFINEMENT OF GPSS SIMULATION PROGRAM

OBJECTIVES

If simulations are realistic, decisions based on them should yield valid and effective problem solutions. As simulations increase in their reflection of reality, the probability of effective simulation-based decisions increases. This rationale formed the basis of the approach taken in Stage III. The Stage II results were shown to training managers at QMS, who suggested some modifications that could be included in the Stage III refinement of the model to make it more realistic. Simulations were performed to satisfy the following objectives:

(1) To provide a realistic model of a self-paced 76P20 course that includes detailed internal-to-course student flow data. This model would include such information as the number of students who on any given day were in audio-visual (AV) or programmed (PI-text) instruction, in a night- or day-session class, and in Annex A, B, C, or D.

(2) To provide a detailed accounting of the number of students who were absent, lost by attrition, or who graduated from the course on any given day.

(3) To provide information for the development of an *optimum* follow-on course scheduling policy. Such a policy should efficiently meet the individual quotas of the advanced-MOS training programs.

PROGRAM DEVELOPMENT

Assumptions and Input

To meet the objectives set for the Stage III simulation model, the GPSS program was modified as follows:

(1) The student input, class schedule, and quotas for the 76P20, 76Q20, 76R20, 76S20, 76T20, and 76U20 courses were based upon the QMS schedule of classes for F.Y 1973. One minor change to the QMS schedule was made. The final class, which was scheduled for 14 August 1973, was changed to become the first class (13 August 1972). This change was made to accommodate the shorter course completion times expected from self-pacing the 76P20 course. The length of the conventional 76P20 course at the time of Stage III (FY 1973) was eight weeks—40 training days.

(2) Students attending the 76P20 course were assigned on an equal probability basis to one of two different media of instruction—AV and PI-text. The QMS planned to have an AV capability large enough to accommodate one-half of the 76P20 training load. In this simulation students were identified as to which instructional medium they were assigned.

(3) Classes for the 76P20 course were conducted at night as well as during the day. Students were identified as to whether they were assigned to a day or night class. In this way, the training load during the day and night could be separately calculated and displayed to training managers.

(4) The 76P20 course consisted of four annexes of approximately equal academic difficulty but containing unequal portions of total course content. Annexes A, B, and D each contained approximately 28% of the total course content and Annex C approximately 15%. The predicted time required for students to complete a given annex was based, in the simulation program, on that portion of total course content that it contained.

A mathematically derived completion time for each annex was assigned to each student as he began study in that annex. This was based on a randomly selected course completion time derived from the distribution assigned to each group of entering students. Each student was identified as to the annex in which he was currently studying, in addition to his instructional medium and day/night class assignment.

(5) The time required for students to complete the 76P20 course differed as a function of their assigned medium of instruction. Thirty-three different course completion time distributions were developed for each instructional medium. Each set of 33 contained 15 positively skewed, six negatively skewed, seven normal, three bimodal, and two horizontal (flat) shaped distributions. Each of the 33 completion time distributions had an equal probability of being selected. The distributions were based upon actual completion time data that were gathered in the self-paced sections of the 76P20 course. Each set of distributions was based upon an approximately normal, but slightly positively skewed reference completion time distribution. The reference distribution for the AV medium had a mean of 25 days, Standard Deviation of 5 days, and range of 15-39 days. The reference distribution for the PI-text medium had a mean of 28 days, Standard Deviation of 5 days, and range of 16-40 days. Each day represented a *day of training* and excluded Saturdays and Sundays as well as holidays.

(6) A *single* attrition rate, to reflect student losses due to academic, disciplinary, and administrative causes was used. The annual attrition rate was approximately 7.5%, reflecting the most recent information obtained from QMS personnel. A probability of .002 of being lost to attrition on any given day of training was assigned to each trainee. The only exception to this was on the student's final day in each of the first three annexes. A student completing his last day of training in any one of the first three annexes of the course was assigned a probability of .004 of being lost to attrition on that day. This, too, reflected the information obtained at QMS.

(7) This simulation also contained an absentee rate parameter. It was included in Stage III to provide more realistic internal-to-course data. The daily absentee rate varied between 3% and 6%, with an average annual rate of approximately 4%. On training days following a holiday, absenteeism was nearly twice as great as that normally observed.

(8) The number of 76P20 graduates assigned to the field in this simulation was the difference between the total number of 76P20 course graduates during FY 1973, less the total of the FY 1973 input quotas for the five follow-on courses.

(9) Scheduling policies were changed. In Stage II, the relative effectiveness of various follow-on class scheduling policies in filling a single input quota for all follow-on courses was studied. In Stage III, the scope of the scheduling policies was expanded to include the assignment of 76P20 graduates to the field. In addition, the scheduling policies were directed toward filling a specific input quota for *each* of the follow-on courses. These changes to the scope of the scheduling policies, in conjunction with the results of the Stage II study, provided the basis for the scheduling policies examined here.

Three basic or primary scheduling policies were evaluated. Selected rules of these primary policies were altered to create additional policies. The policies that were evaluated in this simulation are described in Table 5. The first two policies (1 and 2) were modified in several iterative simulations to create an *optimum* scheduling policy. The application of these policies in successive FY simulations will be discussed in the section describing the results of the simulations. The FYs to which each policy was applied are listed in Table 5.

The set of assumptions underlying the policies described in Table 5 formed the basis of the GPSS program that was developed in Stage III. Flow diagrams of this simulation model are presented in Appendix A. These diagrams depict and describe the major actions and decisions required in the system that was simulated.

Table 5

Follow-On Course Scheduling Policies– Stage III

Policy Number	Description	Fiscal Year Applied to
1	• A follow-on class did not contain less than 35 nor more than 45 students. • The sequence of follow-on course classes was the same as that specified in the FY 1973 QMS class schedule. A total of 106 follow-on classes were scheduled. • If more than 106 follow-on classes were required to meet the input quotas, all subsequent classes (107, 108, . . .) were assigned to the follow-on courses in alphabetical order (i.e., Q, R, S, T, U). • Follow-on classes were started Monday through Thursday. • The FY 1973 quota for each follow-on course was met. • All 76P20 graduates in excess of the total follow-on course quota were assigned directly to the field with the 76P MOS. • Priority was given to the follow-on courses before assigning 76P20 graduates to the field. • No assignments to the field were made during July and August 1972. • No assignments to the field were made during June, July, and August 1973, until the follow-on course quotas were met. • Assignments to the field were made Monday through Friday.	1, 2, 3, 4,
2	Same as Policy 1 except: • Follow-on class size was the same as that specified in the FY 1973 QMS class schedule.	1, 2, 3, 4
3	Same as Policy 1 except: • Follow-on class size was the same as that specified in the FY 1973 QMS class schedule. If it could not be met, a class was started if at least 20 students were available. • The follow-on class start dates were the same as those specified in the FY 1973 QMS class schedule. • Graduates would be assigned to the field only if such action would not result in failure to meet the requirements of the next scheduled follow-on class. • If follow-on course quotas had not been met when the final FY 1973 class started, the following rules applied: •• Follow-on course classes were started in alphabetical order. •• Class size constraints were ignored. •• Classes were started Monday through Thursday. •• No more than four follow-on classes were started on the same day.	1, 2
1A	Same as Policy 1 except: • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then they were assigned Monday through Friday.	4

(Continued)

Table 5 *(Continued)*

Follow-On Course Scheduling Policies—Stage III

Policy Number	Description	Fiscal Year Applied to
2A	Same as Policy 1 except: • Follow-on class size was the same as that specified in the FY 1973 QMS class schedule. • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then they were assigned Monday through Friday.	4
1B	Same as Policy 1 except: • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then they were assigned Monday through Friday. • Assignments to the field were made during July and August 1972.	4
2B	Same as Policy 1 except: • Follow-on class size was the same as that specified in the FY 1973 QMS class schedule. • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then they were assigned Monday through Friday. • Assignments to the field were made during July and August 1972.	4
1C	Same as Policy 1 except: • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then they were assigned Monday through Friday. • A uniform rate of assignment to the field was required.	4
2C	Same as Policy 1 except: • Follow-on class size was the same as that specified in the FY 1973 QMS class schedule. • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then they were assigned Monday through Friday. • A uniform rate of assignment to the field was required.	4
1D	Same as Policy 1 except: • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then they were assigned Monday through Friday. • Assignments to the field were made during July and August 1972. • A uniform rate of assignment to the field was required.	4

(Continued)

Table 5 *(Continued)*

Follow-On Course Scheduling Policies—Stage III

Policy Number	Description	Fiscal Year Applied to
2D	Same as Policy 1 except: • Follow-on class size was the same as that specified in the FY 1973 QMS class schedule. • 76P20 graduates were assigned to the field on Friday only, until the follow-on course quotas were met. Then, they were assigned Monday through Friday. • Assignments to the field were made during July and August 1972. • A uniform rate of assignment to the field was required.	4
1E	Same as Policy 1 except: • Assignments to the field were made Monday through Friday. • A uniform rate of assignment to the field was required.	4
1F	Same as Policy 1 except: • Assignments to the field were made Monday through Friday. • Assignments to the field were made during July and August 1972. • A uniform rate of assignment to the field was required.	4, 5, 6, 7 8, 9, 10
1D'	Same as Policy 1 except: • 76P20 graduates were assigned to the field on Thursday and Friday, until the follow-on course quotas were met. Then, they were assigned Monday through Friday. • Assignments to the field were made during July and August 1972. • A uniform rate of assignment to the field was required.	4, 5, 6, 7, 8, 9, 10
1F'	Same as Policy 1 except: • Assignments to the field were made Monday through Friday. • Assignments to the field were made during July and August 1972. • The formula controlling uniformity of assignment to the field was modified.	4

Flow Diagrams 1, 2, and 3, collectively, depict the entire model. Flow Diagrams 1 and 2 represent the 76P20 training program. Flow Diagram 1 shows the principal administrative and control functions, whereas Flow Diagram 2 presents the flow of students through the various segments of the course. Flow Diagram 3 represents the application and evaluation of various policies for assignment of graduates from the 76P20 course to one of the follow-on courses or to the field. The student graduation (output) data generated in the execution of the actions shown in Flow Diagrams 1 and 2 became the primary data input to the activities represented in Flow Diagram 3. The computer concurrently performed the actions/decisions in Flow Diagrams 1 and 2. Upon completion

of these parts of the model, the computer then executed the assignment policies shown in Flow Diagram 3.

In an effort to keep the flow diagrams of the model as simple as possible, separate supplementary diagrams were prepared to depict certain sets of actions/decisions that were required repeatedly in the basic model. These sets of actions/decisions, labeled as subroutines, are represented in the flow diagrams by single blocks that refer to specific supplementary diagrams for details. They represent fixed sequences of actions/decisions that may require execution at three or four different points in the flow diagrams. There are a few instances in which certain subroutines are utilized in one or more other subroutines. Consequently, some supplementary diagrams provide details on flow diagram blocks, as well as on subroutines appearing in other supplementary diagrams. Supplementary Diagrams 4-14 follow the flow diagrams in Appendix A. Appendix B contains a computer printout of the complete final GPSS simulation program.

Description of Output

Appendix C contains an extract from the computer printout produced by the Stage III GPSS program. Most of the data are presented in a matrix format. A copy of one of these matrices (representing 99 days) is shown in this extract. The input and output data for the 76P20 course for a full year required five such matrices. The columns in each matrix contained the following entries:

Columns 1, 11, 21, 31, and 41 - The numerical or Julian calendar date beginning with 10 July and ending with 7 October 1973.

Column 2 - The number of students reporting for 76P20 training (*Input*).

Column 3 - The mean course completion time of the distribution selected for the class entering training on the date shown in Column 1.

Column 4 - The number of students lost to attrition on that calendar date.

Column 5 - The number of students absent from training on the date shown in Column 1.

Column 6 - The total number of students present and available for training (the total *Training Load*).

Columns 7-10 - The number of students present and available for training in Annexes A, B, C, and D, respectively. (The Training Load in each major section of the course.)

Column 12 - The number of students completing the 76P20 course on the date shown in Column 1 (*Output*).

Columns 13-20, 22-29 - These entries provided a detailed accounting of the numbers of students present and available for training as a function of:

(1) The *annex* in which they were studying
(2) Their class membership (*day* or *night*)
(3) Their assigned medium of instruction (*AV* or *PI-text*).

Column 30 - On rows corresponding to the start of a 76P20 class, this column contains the identification number of the distribution that was used to assign course completion times. The first two digits of this four-digit entry (*XX*00) identify the completion time distribution used for *AV* students. The final two digits (00*XX*) identify the completion time distribution used for *PI-text* students. These entries are the reference numbers assigned to the completion time functions (as shown on the program listing in Appendix B). This information was recorded in the matrix to provide a means of checking the *sequence* of course completion time distributions selected in the simulation.

A numerical value of 5 is a *single* entry in this column to indicate legal holidays observed by the QMS.

Columns 32-36 - These *five* columns contain the number of graduates assigned to the 76Q20, 76R20, 76S20, 76T20, and 76U20 follow-on courses, respectively, under the *first* scheduling policy under evaluation. (Note: The "first" scheduling policy refers to the order of evaluation, not policy number.)

Column 37 - The number of 76P20 course graduates who were assigned directly to the field upon graduation under the *first* assignment policy.

Columns 38-40, 42-44 - These columns contain the same information as in Columns 32-37, for the *second* policy under evaluation.

Columns 45-50 - These columns contain the same information as in Columns 32-37, for the *third* policy under evaluation.

The computer printout also contains the definitions of the scheduling policies under evaluation. The extract in Appendix C (p. 92) contains the definitions for Policies 1D', 1F', and 3.

An important feature of the GPSS output involves the summary statistics of student flow *within* the 76P20 course calculated during the simulated time period. A sample of these statistics is shown in Figure 1. The total number of students undergoing each instructional medium was presented. The *peak* training loads, by medium, day/night session, and course annex, were calculated and listed in this printout. In addition, the absentee and attrition rates for that specific fiscal year's simulation were presented. Finally, the average completion times for the AV and PI-text groups were computed and displayed.

The input quotas that were met for the follow-on courses, and the number of 76P20s assigned to the field were also printed. A sample page of this information is presented in Figure 2.

In Appendix C, information is provided in Figures C-1 and C-2 on the follow-on course class schedule developed under the different policies that were evaluated. The schedule identifies start dates and class sizes. The matrix cell entries are four-digit numbers; the first digit ($X000$) identifies the number of classes started, and the last three ($0XXX$) denote the total number of students comprising those classes. The matrix columns contain the following entries:

Column 1 - The numerical (or Julian calendar) date.

Column 2 - The number of classes and students assigned to the 76Q20 course.

Column 3 - The number of classes and students assigned to the 76R20 course.

Column 4 - The number of classes and students assigned to the 76S20 course.

Column 5 - The number of classes and students assigned to the 76T20 course.

Column 6 - The number of classes and students assigned to the 76U20 course.

The last two rows in Figures C-1 and C-2 (Rows 124 and 125) identify the total number of students and the total number of classes assigned to each course.

Another type of output obtained in the simulation is statistical information. Figure C-3 in Appendix C displays statistical data on the course completion times for the AV students. Figure C-4 serves the same function for the PI-text students. Figure C-5 presents the daily rate of absenteeism, by means of a tabulation of the percentage of students absent each day; the daily absenteeism rate in this specific simulation ranged from 0-11%, with a mean value of slightly over 3%.

Figure C-6 displays the *wait time* data compiled for each scheduling policy that was evaluated. *Wait time* is defined as idle man-days spent by 76P20 graduates waiting to be assigned to one of the follow-on courses or to the field. These wait time data were a significant aspect in the evaluation of scheduling policy efficiency.

Example of Summary Statistics of Student Flow Within 76P20 Course

76P20 COURSES STATISTICS FOR FY73

A TOTAL OF 2734 STUDENTS TRAINED UNDER AV MODE

THE PEAK NUMBER OF AV STUDENTS WAS 411
(PEAK NUMBER EQUALS MAXIMUM STUDENTS AVAILABLE FOR TRAINING ASSUMING ZERO ABSENTEEISM.)

THE PEAK NUMBER OF DAY AV STUDENTS WAS 315

THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX A WAS 111
THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX B WAS 127
THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX C WAS 101
THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX D WAS 148

THE PEAK NUMBER OF NIGHT AV STUDENTS WAS 146

THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX A WAS 56
THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX B WAS 63
THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX C WAS 51
THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX D WAS 67

A TOTAL OF 2686 STUDENTS TRAINED UNDER PI MODE

THE PEAK NUMBER OF PI STUDENTS WAS 431

THE PEAK NUMBER OF DAY PI STUDENTS WAS 326

THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX A WAS 145
THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX B WAS 130
THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX C WAS 102
THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX D WAS 147

THE PEAK NUMBER OF NIGHT PI STUDENTS WAS 155

THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX A WAS 61
THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX B WAS 59
THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX C WAS 44
THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX D WAS 63

OF THE 5892 STUDENTS WHO ENTERED THE COURSE
5420 GRADUATED FROM THE COURSE
472 WERE DROPPED FOR ACADEMIC, ADMINISTRATIVE, OR DISCIPLINARY REASONS

THE ATTRITION RATE WAS 8%

THE AVERAGE DAILY ABSENTEE RATE WAS 3.0%. THE RATE NEARLY DOUBLED ON DAYS FOLLOWING HOLIDAYS

THE AVERAGE NUMBER OF DAYS SPENT IN TRAINING BY STUDENTS UNDER THE AV MODE WAS 25.1 DAYS

THE AVERAGE NUMBER OF DAYS SPENT IN TRAINING BY STUDENTS UNDER THE PI MODE WAS 28.6 DAYS

Figure 1

Sample Printout Showing Follow-On Course Input Quotas and Number of 76P20 Graduates Assigned to Field

```
INPUT QUOTAS FOR USAQMS FOLLOW-ON COURSES IN FY 73

76Q20 COURSE QUOTA WAS 902
76R20 COURSE QUOTA WAS 360
76S20 COURSE QUOTA WAS 2105
76T20 COURSE QUOTA WAS 399
76U20 COURSE QUOTA WAS 895

759 76P20 COURSE GRADUATES DID NOT ATTEND  A FOLLOW-ON COURSE BUT WERE ASSIGNED TO THE FIELD
```

Figure 2

RESULTS OF SIMULATION

The output that resulted from performing the Stage III GPSS simulations fulfilled two of the Stage III objectives:

(1) It provided realistic simulations of student flow within the self-paced 76P20 course. It indicated, for any given day, the number of students who were in the AV or PI-text medium, in a night- or day-session class, and in one of the four course annexes.

(2) It provided a detailed accounting of the number of students who were absent, who were lost by attrition, or who graduated from the course on any given day.

The major scheduling problem to be solved in Stage III was how to optimally schedule follow-on courses and field assignments in a way that would efficiently meet the specific quotas for each one of the advanced-MOS training programs. Various scheduling policies were evaluated, modified, and re-evaluated to solve this scheduling problem.

The first step taken to determine an optimum scheduling policy was to evaluate the three basic policies described in Table 5. Policies 1, 2, and 3 were applied during a simulated period of two fiscal years, which meant that the operation of the 76P20 training program under the FY 1973 schedule was simulated twice. With each iteration, control parameters within the computer program were changed. These changes produced a different set and sequence of probability distributions used to assign course completion times to the students. A separate course completion time distribution was selected for each instructional medium group in each class. Each FY had a different pattern of student graduation from the 76P20 course, and consequently, different numbers of students available at different times for assignment to the follow-on courses and to the field. The simulations were numbered consecutively as they were performed (e.g., FY 1, FY 2, FY 3, etc.). The FYs to which the follow-on course scheduling policies were applied are listed in Table 5.

The first comparison was made of Policies 1, 2, and 3 on their relative efficiency (as measured in *wait time*). Policy 1 was found to require the least wait time, followed by Policy 2 then Policy 3, as shown in Table 6. The wait times under Policy 3 were more than three times greater than those found under Policies 1 and 2, and for this reason Policy 3 was dropped from any further evaluations.

The major difference between Policy 3 and Policies 1 and 2 was that under Policy 3 a major effort was made to start classes on the dates specified by the QMS schedule, as

Table 6

Comparison of Scheduling Policies 1, 2, and 3—Stage III

Policy Number	FY	Wait Time (Man-Days)
1	1	7,295
2	1	8,879
3	1	29,147
1	2	8,085
2	2	9,979
3	2	25,791
1	3	8,498
2	3	10,297
1	4	8,260
2	4	9,765

well as to meet the specified class sizes. The first priority was given to meeting the specified start dates, with secondary consideration given to the specified class sizes. If the specified class size could not be met, a class was started if at least 20 students were available. Over 90% of the scheduled class start dates were met under Policy 3. However, the detainment of 76P20 graduates to assure compliance with these start dates resulted in the large wait times found with this policy. It should also be pointed out that the QMS schedule called for the vast majority of follow-on classes to start on a Monday. This factor also contributed to the longer wait times with Policy 3.

After dropping Policy 3 from further consideration, Policies 1 and 2 were applied for two additional fiscal years (FY 3 and FY 4). Policy 1 continued to require less wait time than Policy 2. The principal difference between Policies 1 and 2 is the number of students required for each class. In Policy 1, class size varied between 35 and 45 students. Under Policy 2, the class size was equal to that specified in the QMS schedule for the follow-on courses, where class size varied between 35 and 47 students. Moreover, only nine of the 106 classes on the schedule contained less than 41 students.

The decision was then made to expand the scope of the evaluation to include, in addition to wait time, the following factors:

(1) The total number of follow-on classes required by the policy.
(2) The uniformity of class start dates for each follow-on course.
(3) The uniformity of the rate of assignment of 76P20 graduates to the field.

These factors, along with wait time, were perceived as not being of equal importance to training program managers. Therefore, a differential weighting scheme was developed, as follows:

(1) Wait time—a weight of three (3).
(2) Uniformity of follow-on course classes—a weight of two (2).
(3) Uniformity of assignments to the field—a weight of two (2).
(4) Number of classes—a weight of one (1).

To compute scores for uniformity, the input quota for each follow-on course and the number of 76P20 personnel assigned to the field were divided into 12 periods. The first period included part of July, and all of August and September 1972. The last period included August and September 1973. Other than for these two time periods, all other periods represented one month. Using these values as standards, the actual number of personnel assigned to a follow-on course, or to the field during the same time periods,

were compared in order to develop *difference* scores. A total difference score was computed for each follow-on course, and then for each policy on all follow-on courses. Similarly, a total difference score for each policy was computed on the assignment of 76P20 graduates to the field.

The next step in the evaluation procedure was to rank order the raw scores obtained on each of the four factors, for each policy being evaluated. The final score for each factor was obtained by multiplying the rank order score by the weight of the factor involved. These weighted factor scores were then added together to produce a total final weighted score that was used to determine the relative effectiveness of the policies under evaluation.

What followed was an attempt to develop a policy that efficiently scheduled follow-on course classes (in terms of number of classes and wait time), and uniformly assigned 76P20 course graduates to these classes and to the field. Successive modifications were made to the basic policies described and evaluated above. These modified policies (see Table 5) were applied in several simulations, with student course completion times maintained the same under FY 4. In this way, the rate of student graduation from the 76P20 program under FY 4 was held constant, and the various policies were evaluated. The results of these simulations are shown in Table 7.

An examination of the uniformity of assignments to the field under Policies 1 and 2 showed that under both policies the entire 76P20 quota was filled between 1 September 1972 and 30 November 1972. In an effort to improve the uniformity of assignment, Policies 1 and 2 were changed. These changes initially resulted in Policies 1A and 2A. Another change was made, creating Policies 1B and 2B.

Both Policies 1A and 2A produced greater uniformity in assignment of 76P20 graduates to the field, and less wait time, than their respective basic counterparts of Policies 1 and 2. However, the uniformity of assignment to the field was still unacceptable. Policies 1B and 2B did not improve this situation.

The next step was to institute a policy requirement that 76P20 personnel be assigned to the field in a uniform matter, which meant that the GPSS program was modified to produce uniform field assignments. These modifications are referred to as Policies 1C, 2C, 1D, and 2D.

The comparisons of Policy 1 modifications with those of Policy 2 indicated that Policy 1 would be more effective in terms of wait time. Thus, Policy 2 alternatives were dropped from further evaluation.

Policy 1D, relative to the above-mentioned policies, produced the highest evaluative score. In an attempt to improve these policies, the rules were slightly changed to create two new policies: 1E and 1F. Policy 1F is the same as Policy 1D except for the day of the week on which assignments can be made. Policies 1E and 1F were then compared with the other policies in FY 4 simulations.

Policy 1E produced an improvement only in the uniformity of follow-on course classes over that found for Policy 1C. Assigning 76P20 course graduates to the field Monday through Friday (Policy 1F), as compared to assignment on Fridays only (Policy 1D), produced a small improvement in the uniformity of such assignments, but a large improvement in the uniformity of class starts for the follow-on courses. On the factors of wait time and the number of follow-on courses, Policy 1D produced better scores than Policy 1F.

It was believed that training managers would take exception to the Policy 1D rule that 76P20 graduates be assigned to the field on Fridays only. Students would soon detect this phenomenon, and change their pace of study in order to graduate on a day other than Friday and therefore be considered for assignment to one of the follow-on courses. This observation suggested a compromise between Policy 1D and Policy 1F. Policy 1D was modified to permit assignment of graduates to the field on Thursdays as

Table 7

Comparison of Scheduling Policy Modifications—Stage III

Policy Number	FY	Wait Time (Man-Days) (Weight = 3)			Uniformity of Follow-On Classes Start Dates (Weight = 2)			Uniformity of Rate of 76P20 Personnel Assigned to Field (Weight = 2)			Number of Follow-On Classes Required (Weight = 1)			Total Score
		Raw Score	Rank Order	Final Score	Raw Score	Rank Order	Final Score	Raw Score	Rank Order	Final Score	Raw Score	Rank Order	Final Score	
1	4	8,260	12	36	2,244	1	2	1,136	1.5	3	112	3	3	44.0
2	4	9,765	9	27	2,136	4	8	1,136	1.5	3	106	12	12	50.0
1A	4	7,411	14	43	2,156	3	6	664	6	12	112	3	3	63.0
2A	4	9,168	11	33	2,126	6	12	884	4.5	9	106	12	12	66.0
1B	4	7,434	13	39	2,200	2	4	884	4.5	9	111	6.5	6.5	58.5
2B	4	9,820	8	24	2,106	7	14	1,110	3	6	106	12	12	56.0
1C	4	10,035	7	21	1,858	9	18	282	8	16	111	6.5	6.5	61.5
2C	4	12,314	1	3	1,926	8	16	256	9	18	106	12	12	49.0
1D	4	10,062	6	18	1,798	10.5	21	236	10.5	21	110	8.5	8.5	68.5
2D	4	11,869	2	6	2,128	5	10	222	12	24	106	12	12	52.0
1E	4	10,600	4	12	1,692	13	26	306	7	14	112	3	3	55.0
1F	4	10,486	5	15	1,637	14	28	219	13	26	112	3	3	72.0
1D'	4	9,661	10	30	1,798	10.5	21	236	10.5	21	110	8.5	8.5	80.5
1F'	4	10,717	3	9	1,748	12	24	178	14	28	112	3	3	64.0

well as Fridays. This policy modification was called Policy 1D'. Policy 1F was also modified slightly to produce Policy 1F'.

Policies 1D' and 1F' were compared in FY 4. Policy 1D' produced the results sought. Wait time was less under Policy 1D' than under 1D. Although Policy 1F' produced greater uniformity in the assignment of 76P20 graduates to the field than that found under Policy 1F, it also resulted in greater wait time and less uniformity of follow-on course classes.

Policies 1D' and 1F produced the two highest scores, with Policy 1D' producing the highest score. These two policies were selected for further comparisons.

In the next step, Policies 1D' and 1F were applied for six iterations of the FY 1973 QMS training schedule (see Table 8). Each iteration resulted in a different graduation rate of students from the 76P20 course. These simulations are referred to as FY 5—10. Although these two policies were extremely close on the evaluation criteria of number of classes and uniformity of follow-on class starts and field assignments, Policy 1D' was selected as the optimum follow-on course scheduling policy to employ with the individualized, self-paced 76P20 training program, because its wait time was consistently lower than the others.

CONCLUSIONS AND IMPLICATIONS

The simulations developed in Stage III met the objectives of this effort. Realistic simulation models of an individualized, self-paced 76P20 training program were prepared. Information useful to training managers for planning purposes was displayed in the printouts generated by these simulations. Detailed student flow statistics were generated by the simulation: the numbers of students in training on any given day (by mode of instruction, class section, etc.) were presented; the numbers of students absent, lost by attrition, or graduating from the course on any given day were also displayed.

The specific problem in Stage III was to determine the optimum scheduling policy for follow-on courses, so that the quotas of each of the advanced-MOS training programs would be met efficiently. Through an iterative procedure involving several fiscal year simulations, a scheduling policy was developed that should meet the needs of QMS training managers. It is recommended that this policy be used to implement the individualized 76P20 course, and then be validated when the course is operational. This follow-on course scheduling policy was Policy 1D', which had the following characteristics:

(1) A follow-on class did not contain less than 35 or more than 45 students.
(2) The sequence of follow-on classes was the same as that specified in the FY 1973 QMS schedule.
(3) If more than 106 follow-on classes were required, they started in alphabetical order.
(4) Follow-on classes were started Monday through Thursday.
(5) The FY 1973 follow-on course quotas were met.
(6) All 76P20 graduates in excess of the total follow-on course quotas were assigned directly to the field.
(7) Priority was given to the follow-on courses before assigning 76P20 graduates to the field.
(8) Assignments to the field were made during July and August 1972 (the first months of the fiscal year in which the policy was implemented).
(9) No assignments to the field were made during June, July, and August 1973 until the follow-on course quotas were met.

Table 8

Comparison of Scheduling Policies 1D' and 1F Over a Simulated Period of Six Fiscal Years

Policy Number	FY	Wait Time (Man-Days) (Weight = 3)			Uniformity of Follow-On Classes Start Dates (Weight = 2)			Uniformity of Rate of 76P20 Personnel Assigned to Field (Weight = 2)			Number of Follow-On Classes Required (Weight = 1)			Total Score
		Raw Score	Rank Order	Final Score	Raw Score	Rank Order	Final Score	Raw Score	Rank Order	Final Score	Raw Score	Rank Order	Final Score	
1D'	5	8,844	2	6	1,834	1	2	222	1	2	112	2	2	12
1F	5	9,929	1	3	1,797	2	4	220	2	4	113	1	1	12
1D'	6	9,104	2	6	1,667	2	4	228	1	2	111	1	1	13
1F	6	10,065	1	3	1,876	1	2	218	2	4	109	2	2	11
1D'	7	9,549	2	6	1,908	1	2	222	1	2	110	2	2	12
1F	7	10,721	1	3	1,865	2	4	220	2	4	111	1	1	12
1D'	8	9,167	2	6	1,787	1	2	222	2	4	111	2	2	14
1F	8	10,192	1	3	1,709	2	4	228	1	2	113	1	1	10
1D'	9	8,224	2	6	1,721	2	4	212	2	4	112	1	1	15
1F	9	10,346	1	3	1,942	1	2	216	1	2	111	2	2	9
1D'	10	9,719	2	6	1,800	1	2	210	2	4	110	2	2	14
1F	10	10,357	1	3	1,756	2	4	212	1	2	111	1	1	10
1D' Sum of Scores FY 5-10		54,607	2	6	10,717	2	4	1,316	1	2	666	2	2	14
1F Sum of Scores FY 5-10		61,610	1	3	10,945	1	2	1,314	2	4	668	1	1	10

(10) Assignments to the field were made on Thursday and Friday until the follow-on course quotas were met, after which they were assigned Monday through Friday.
(11) The rate of assignment to the field was *uniform*.

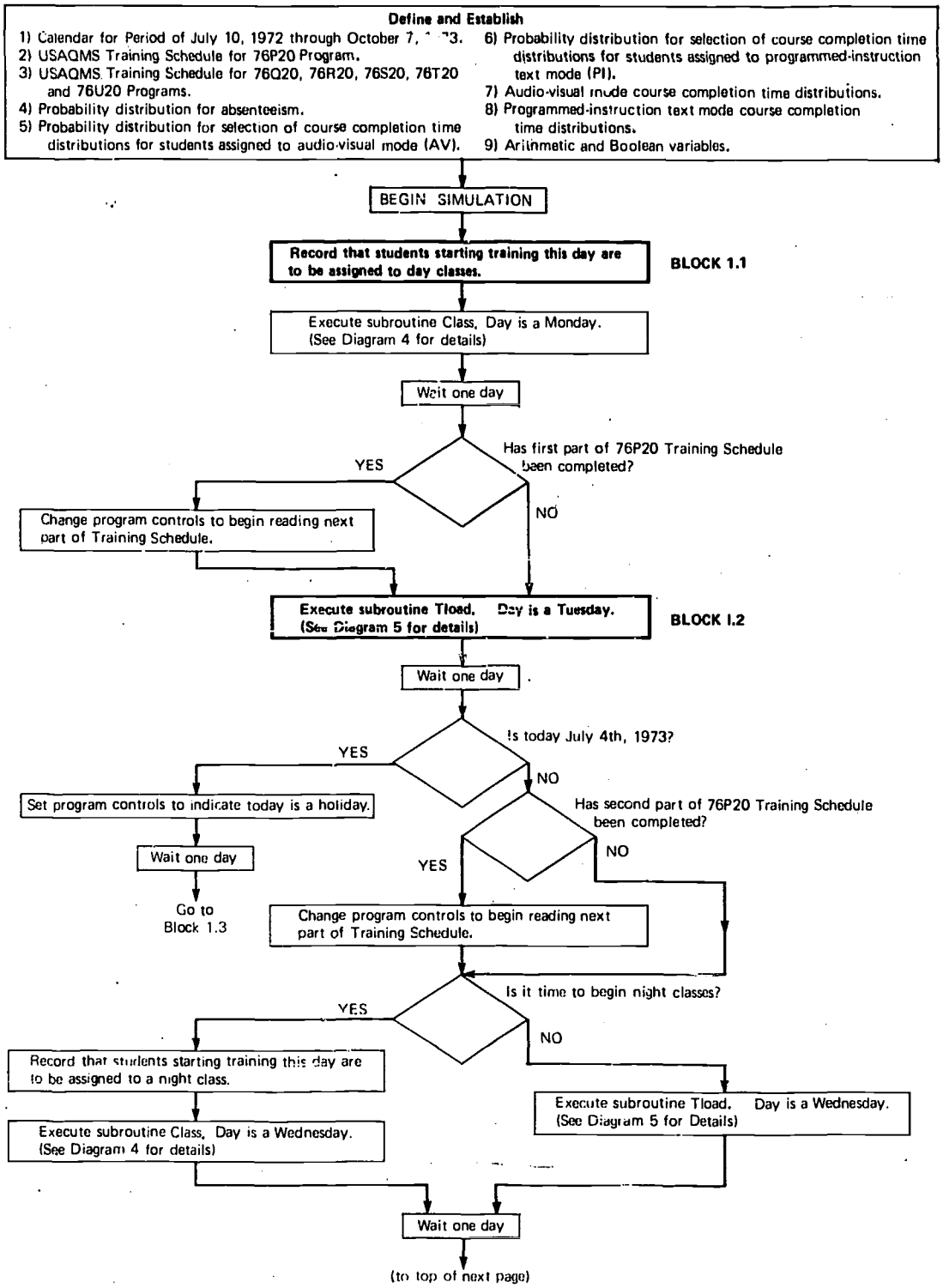
SUMMATION

The results of this study illustrate the successful use of computer simulation for training management planning purposes. A fiscal year's simulation required approximately 20 minutes of CPU time on an IBM 370/145 computer. Although many simulations were run and evaluated, the value of this information to training managers completely overshadows the initial cost. The resultant GPSS program (in Appendix B) can now be rapidly modified to take into consideration any changes in parameter values required in the model (e.g., attrition rates, holidays, official class schedules, quotas, etc.). It is felt that the usefulness of GPSS as a training management aid has been demonstrated by these simulations.

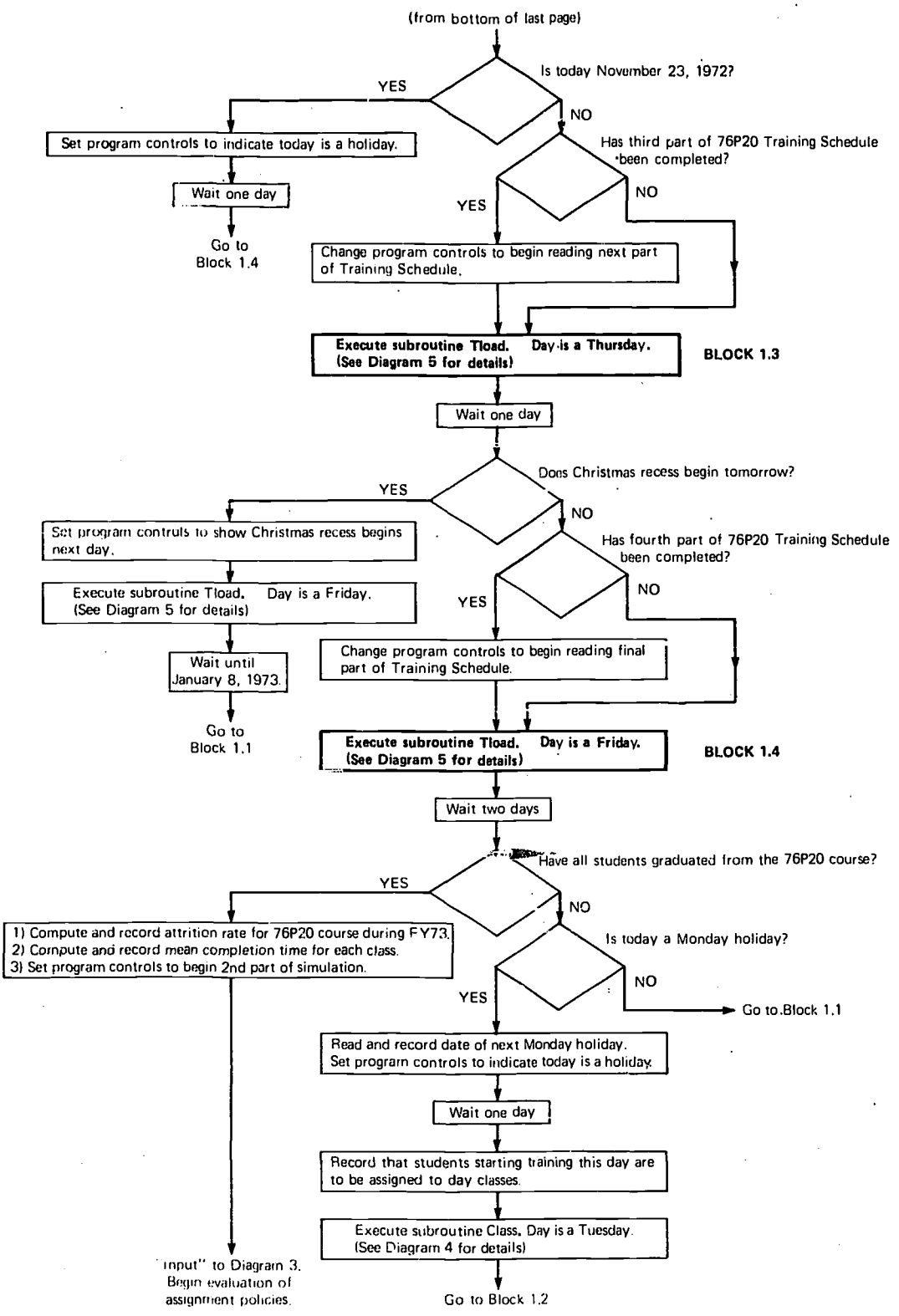
Appendix A

COMPUTER SIMULATION FLOW DIAGRAMS

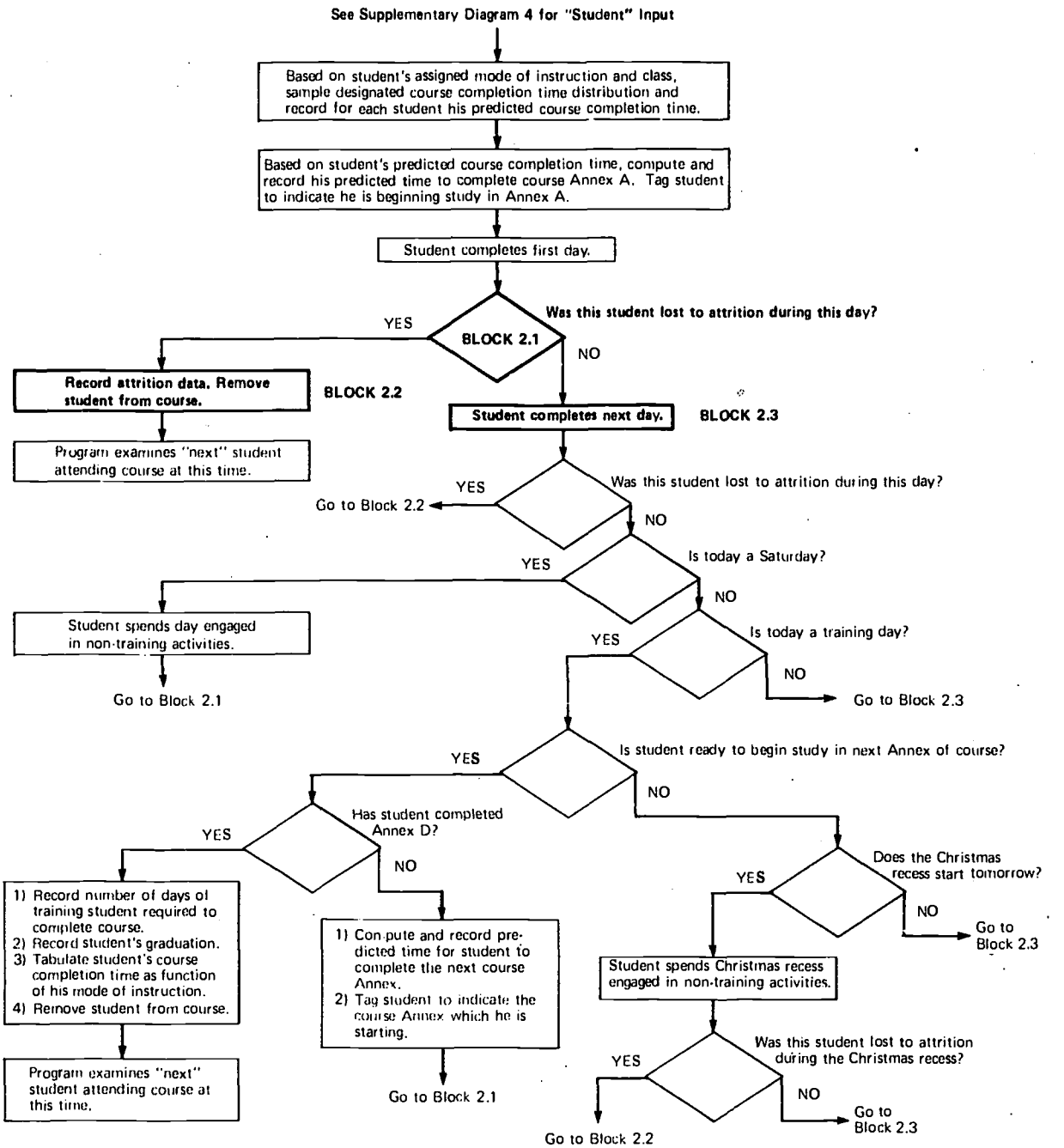
Flow Diagram 1 – Execution of the 76P20 Training Schedule
(Part 1)



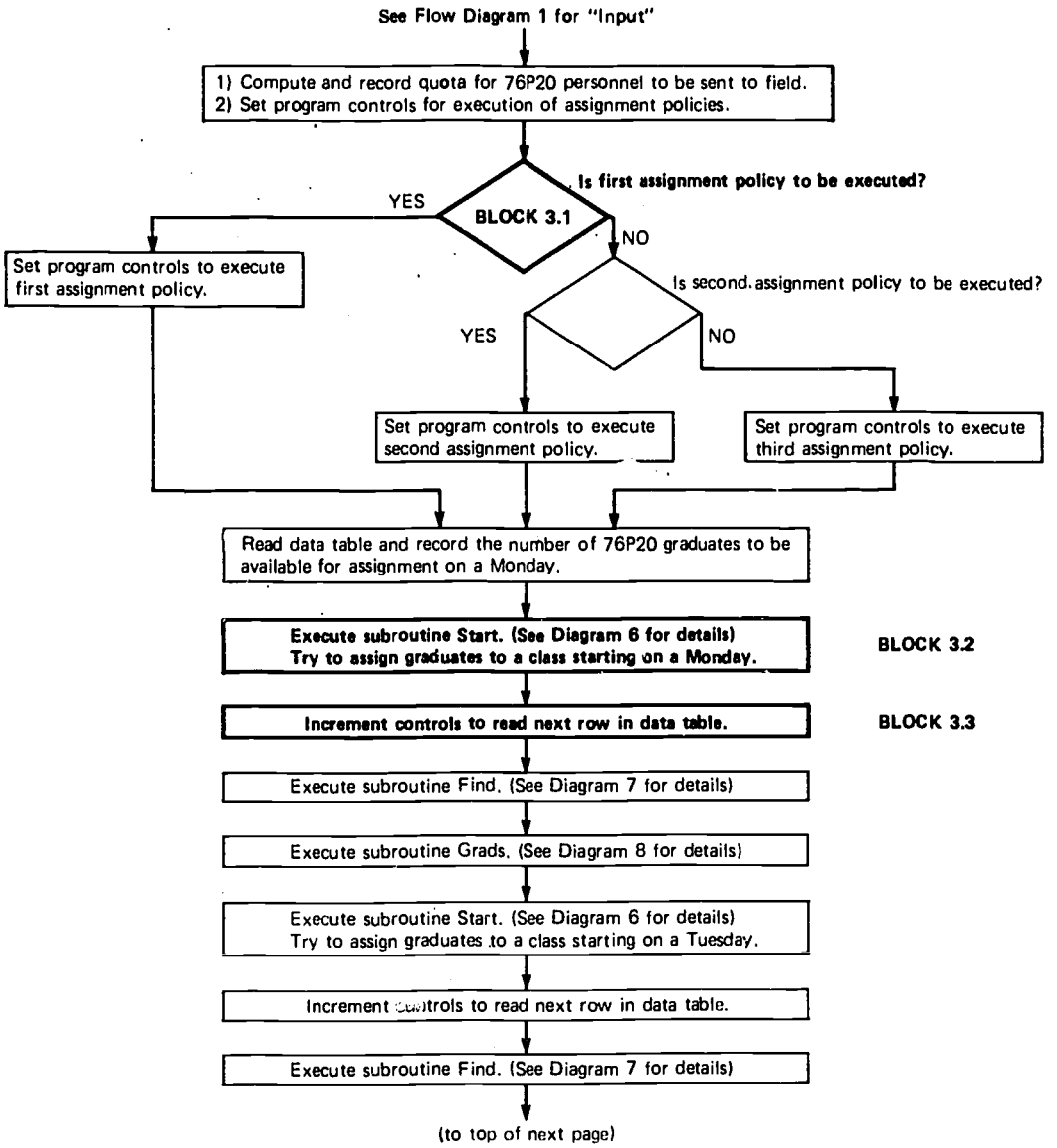
Flow Diagram 1 — Execution of the 76P20 Training Schedule (Part 2)



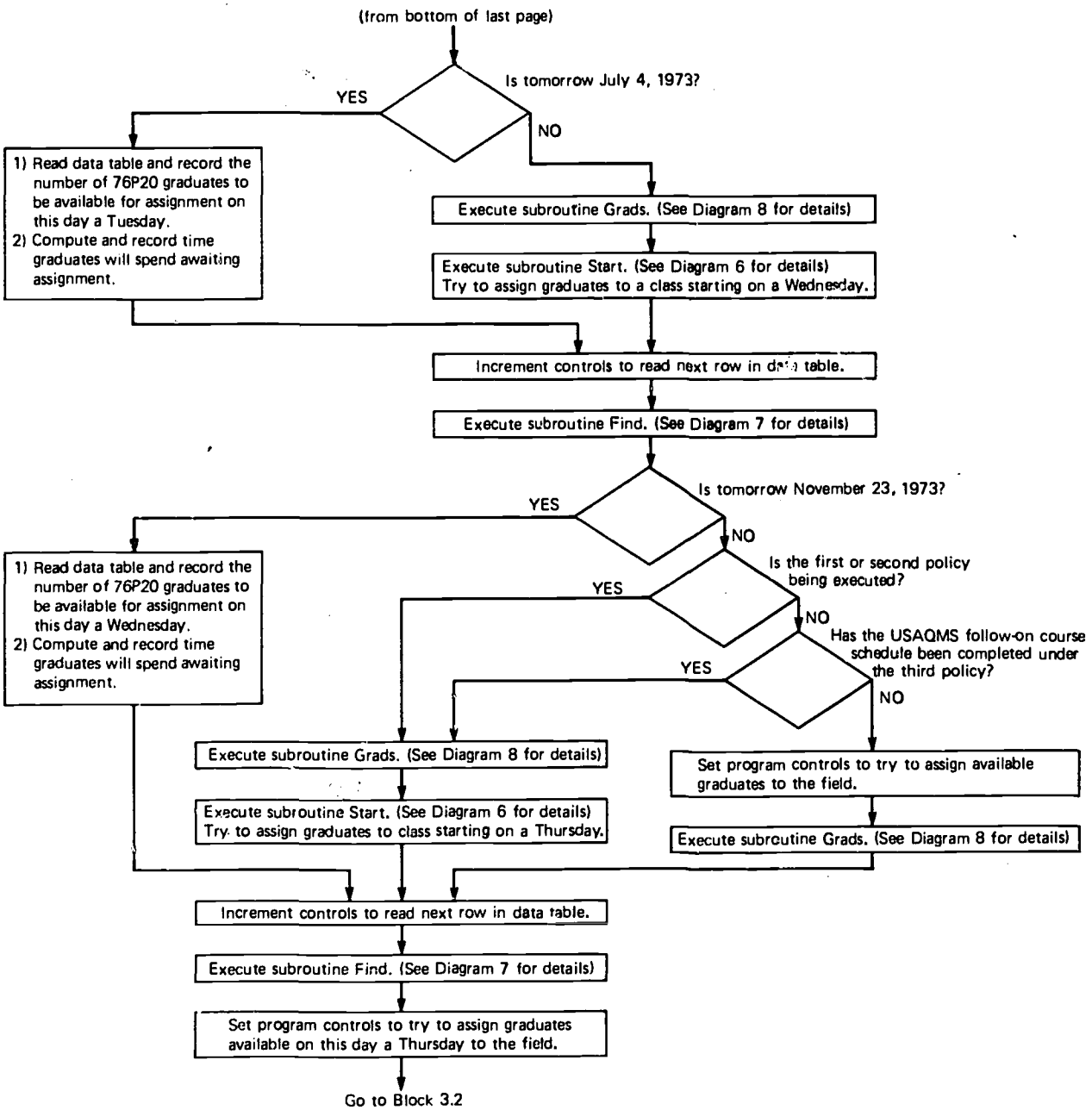
Flow Diagram 2 – Student Flow Through 76P20 Course



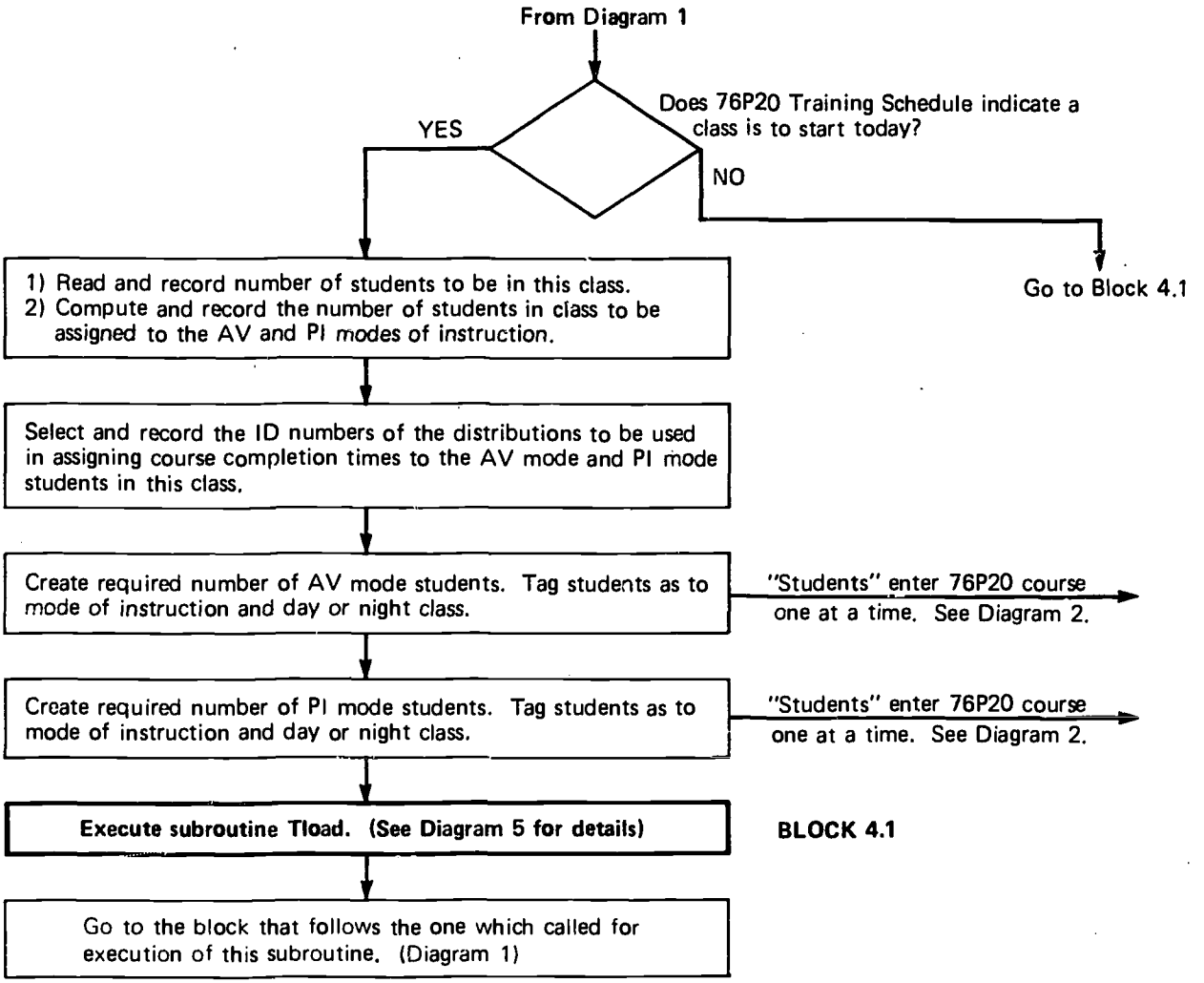
Flow Diagram 3 – Evaluation of Follow-on Course Assignment Policies (Part 1)



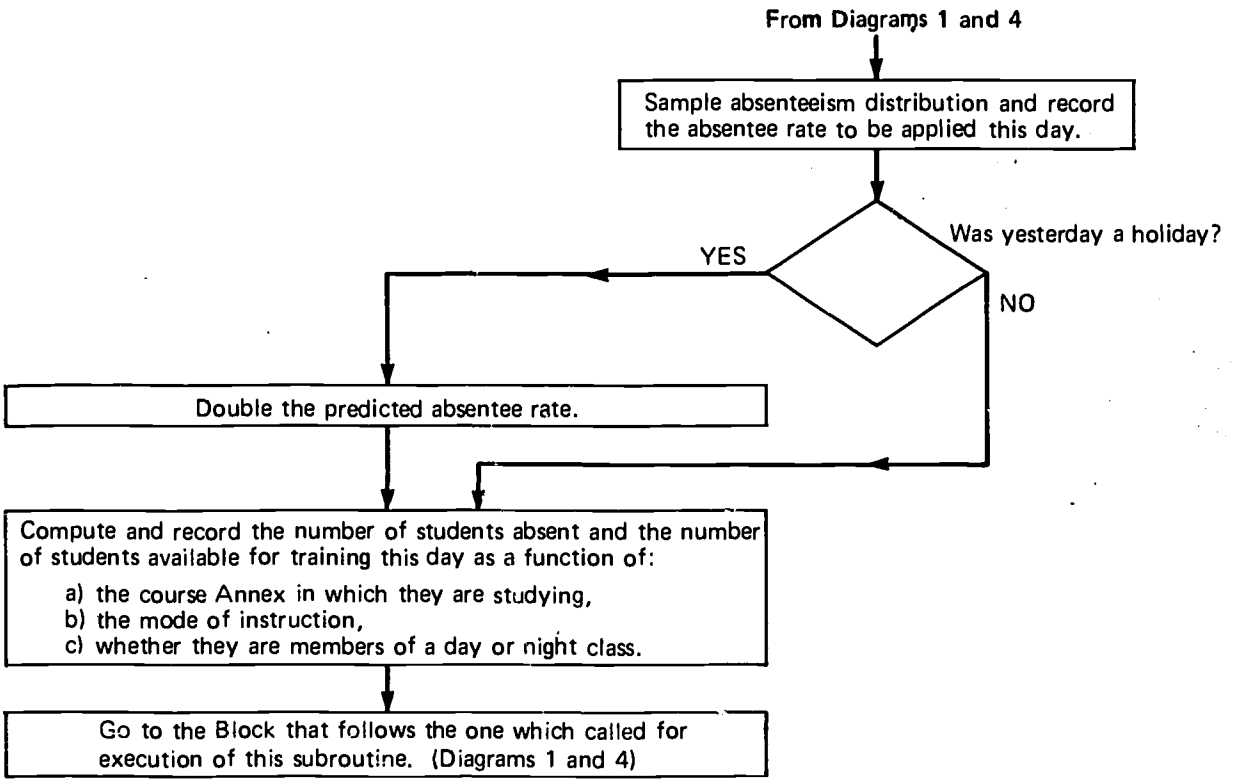
Flow Diagram 3 — Evaluation of Follow-on Course Assignment Policies (Part 2)



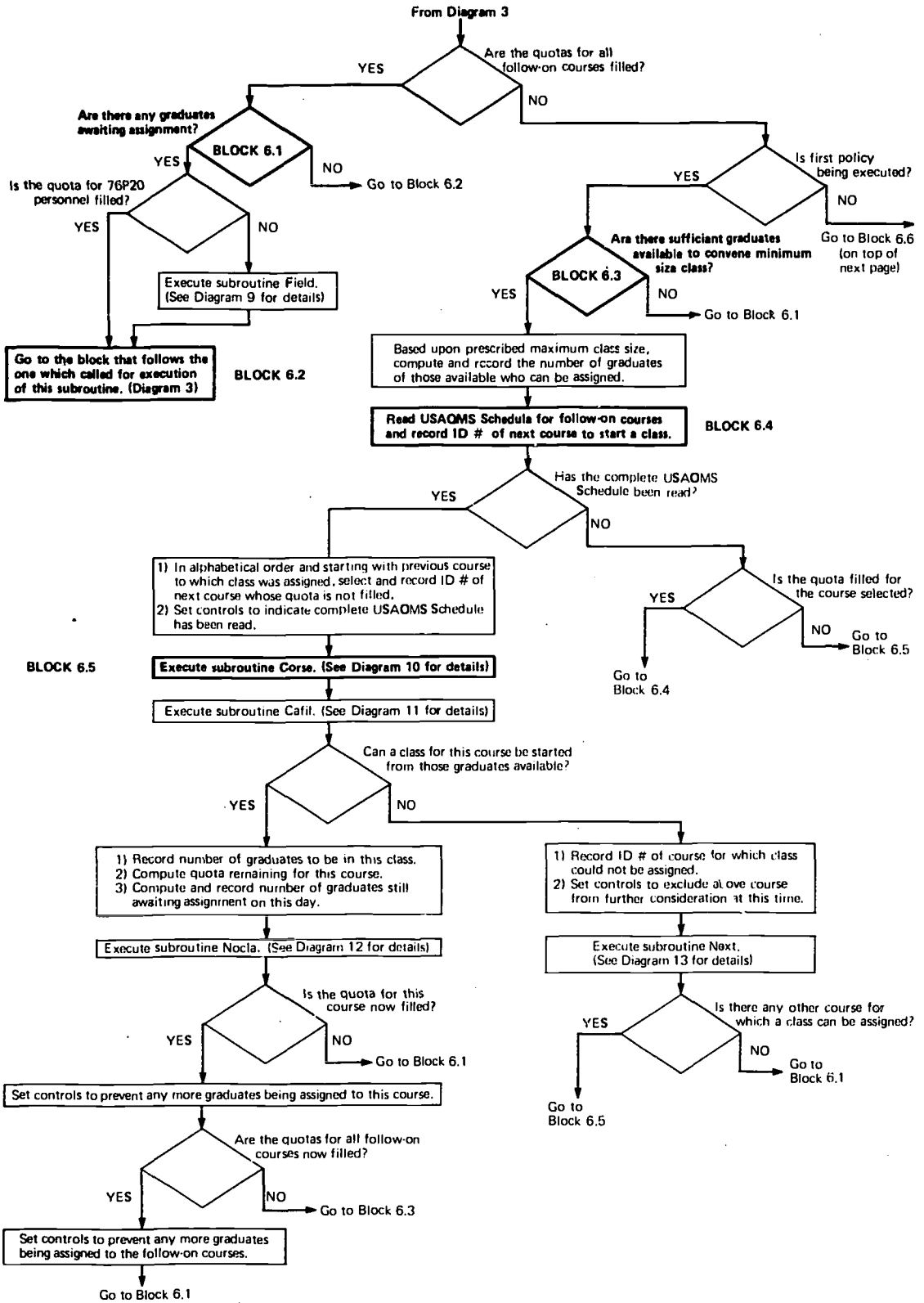
Supplementary Diagram 4 — Subroutine Class



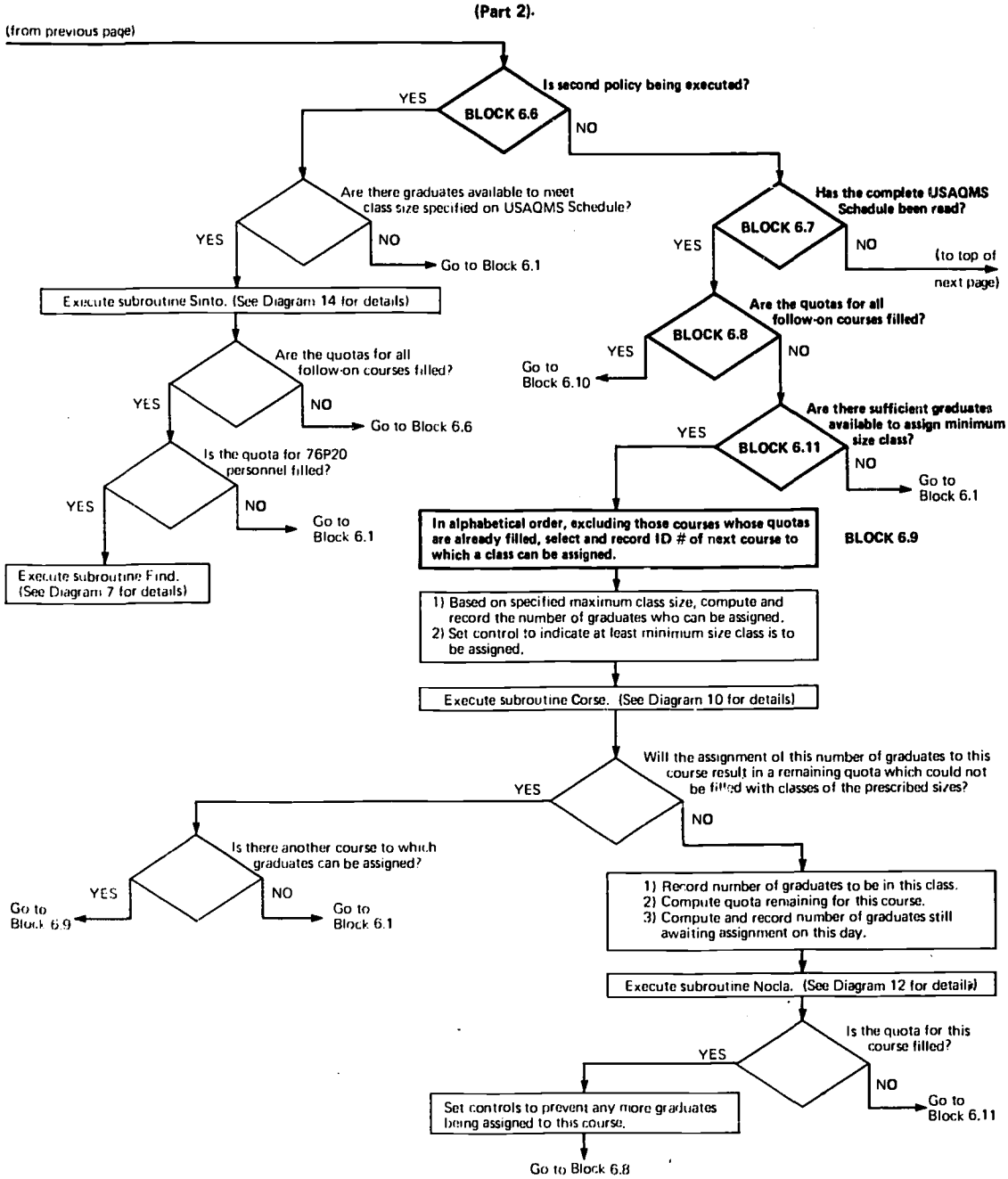
Supplementary Diagram 5 — Subroutine Tload



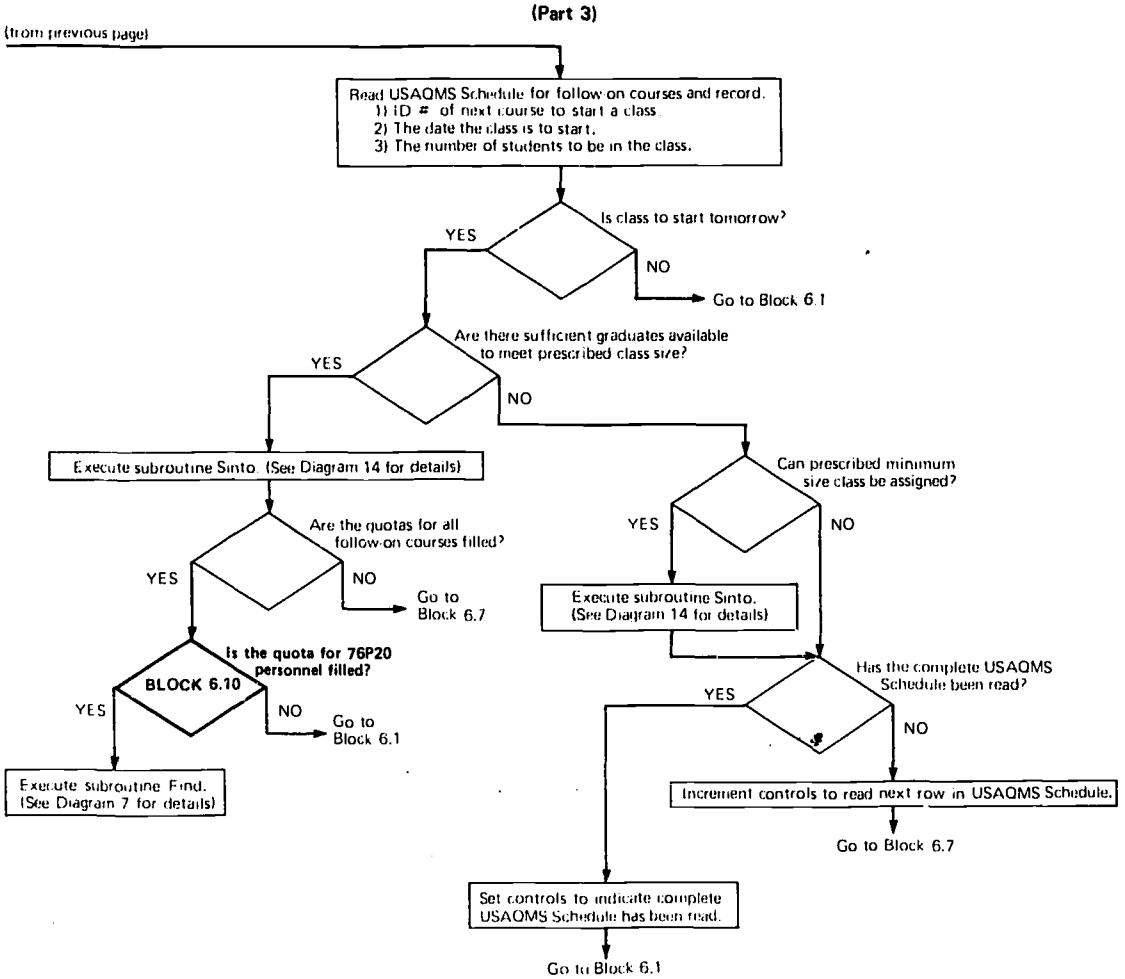
Supplementary Diagram 6 — Subroutine Start
(Part 1)



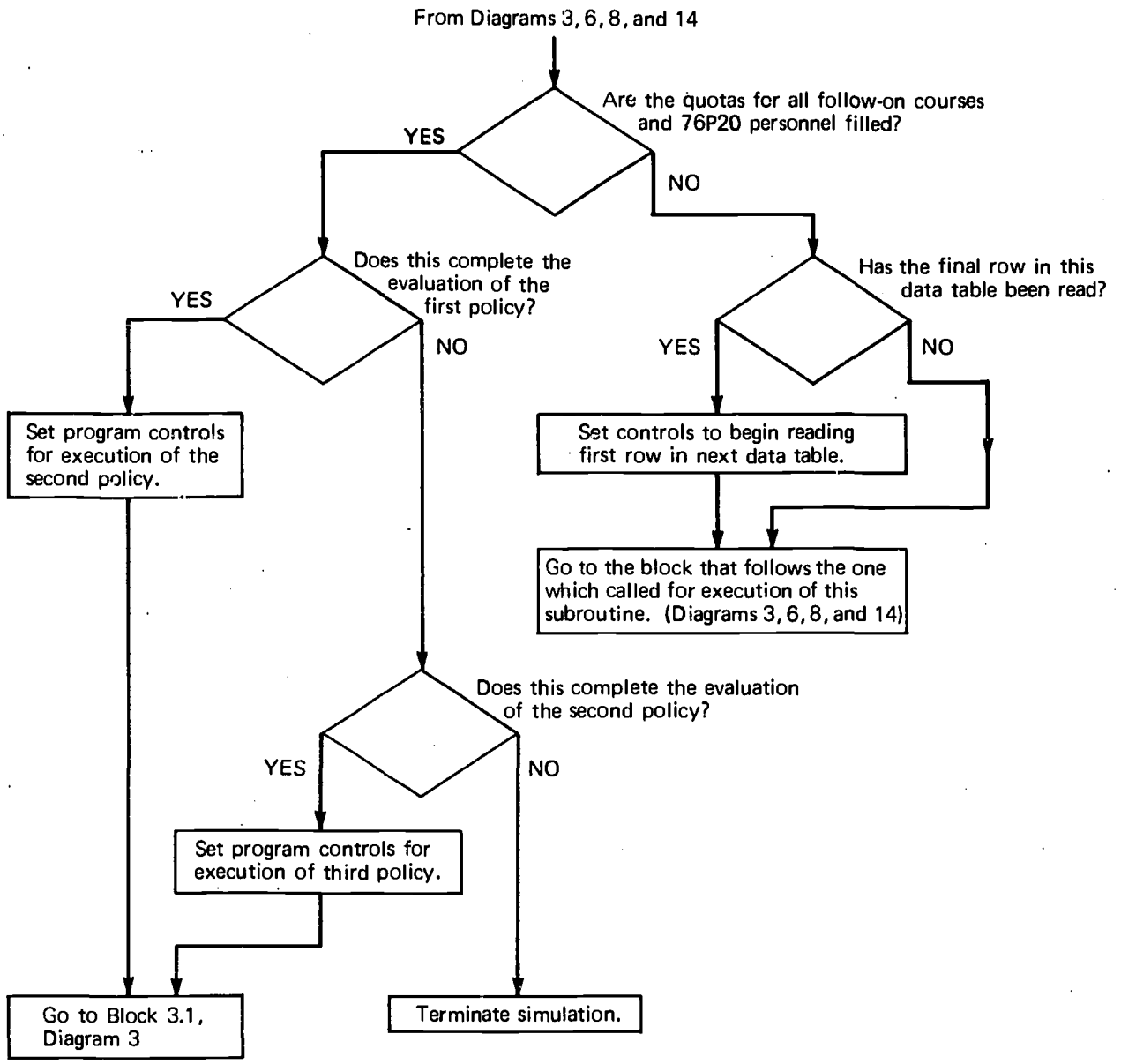
Supplementary Diagram 6 – Subroutine Start (Part 2).



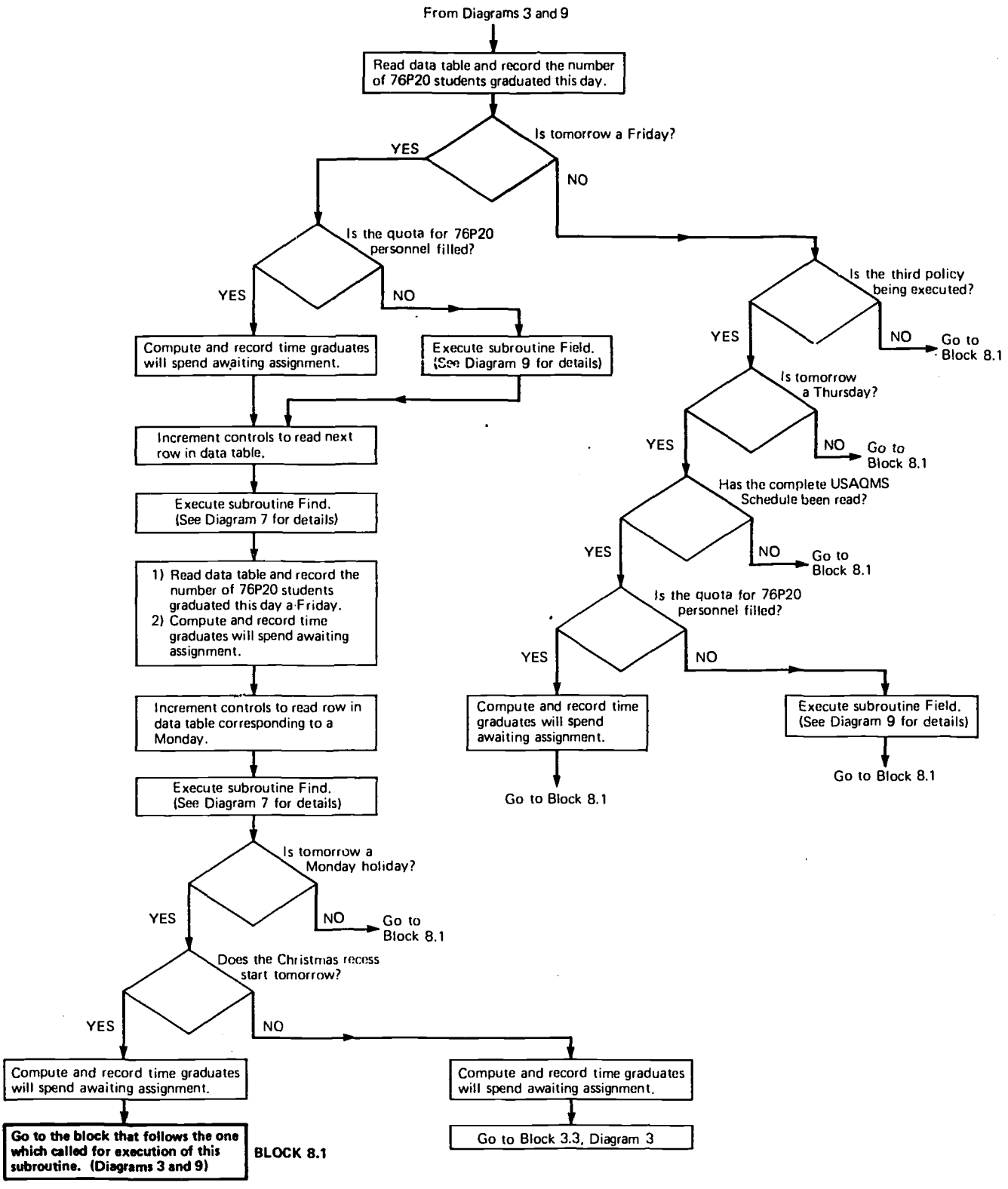
Supplementary Diagram 6 – Subroutine Start
(Part 3)



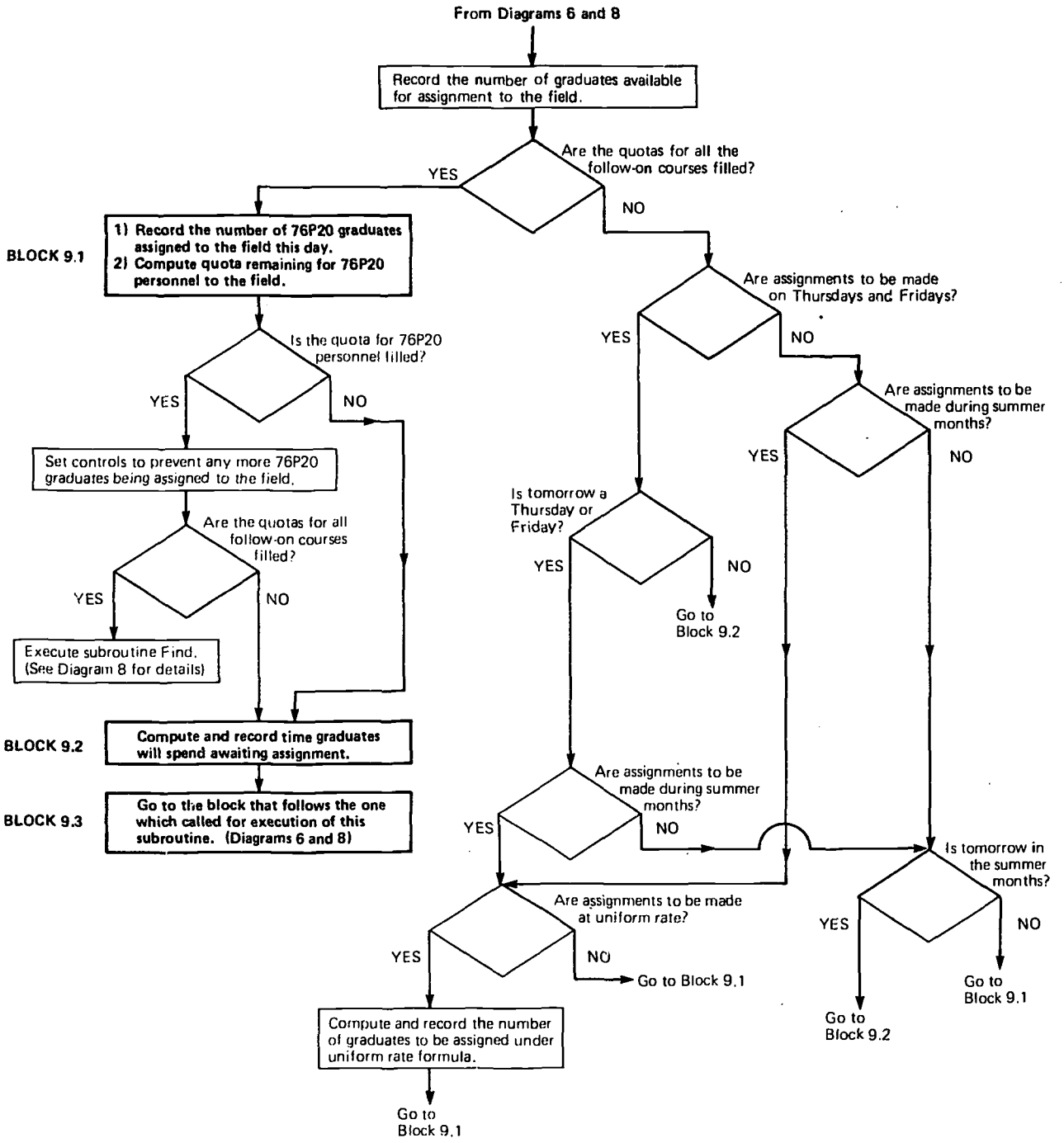
Supplementary Diagram 7 — Subroutine Find



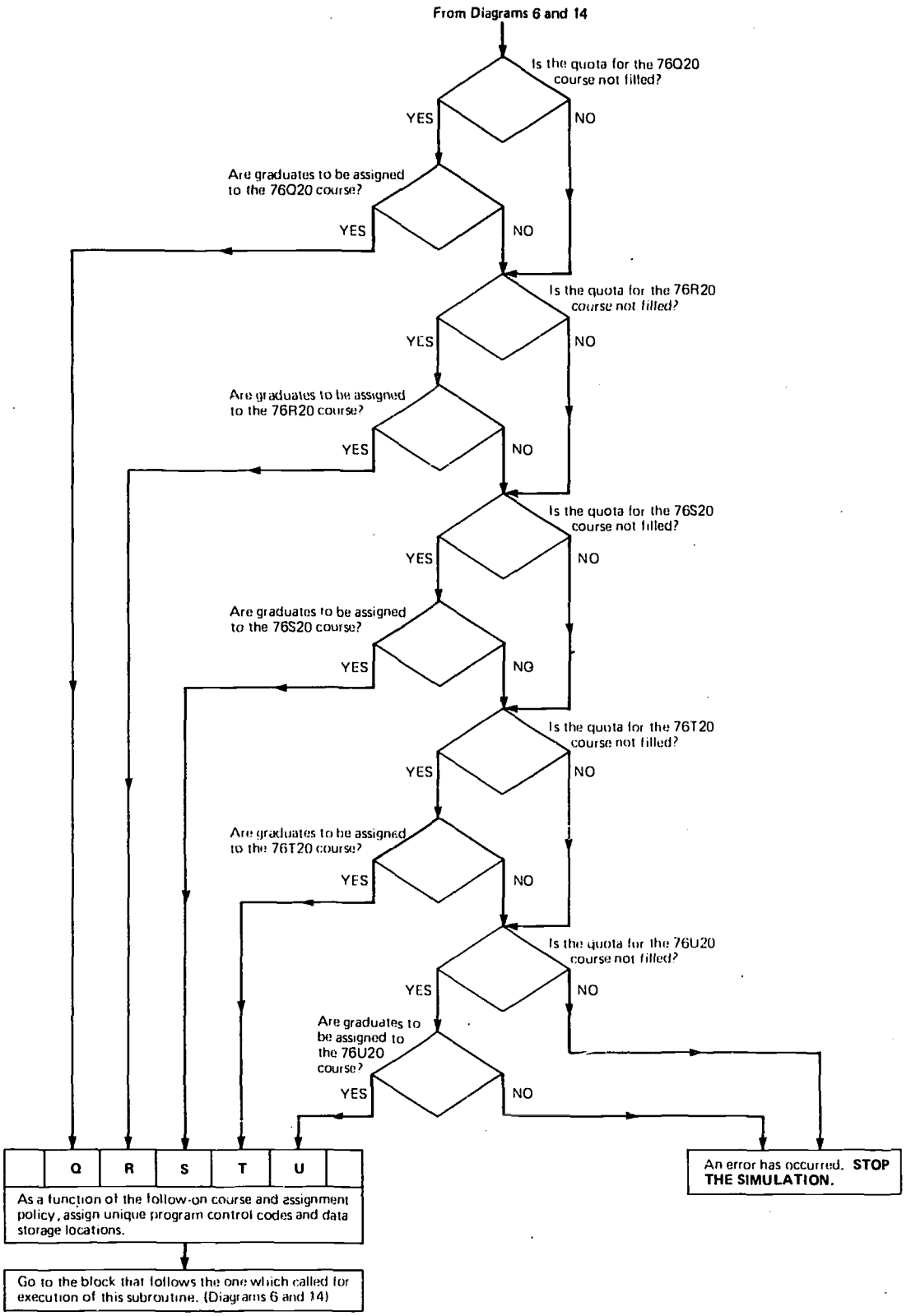
Supplementary Diagram 8 — Subroutine Grads



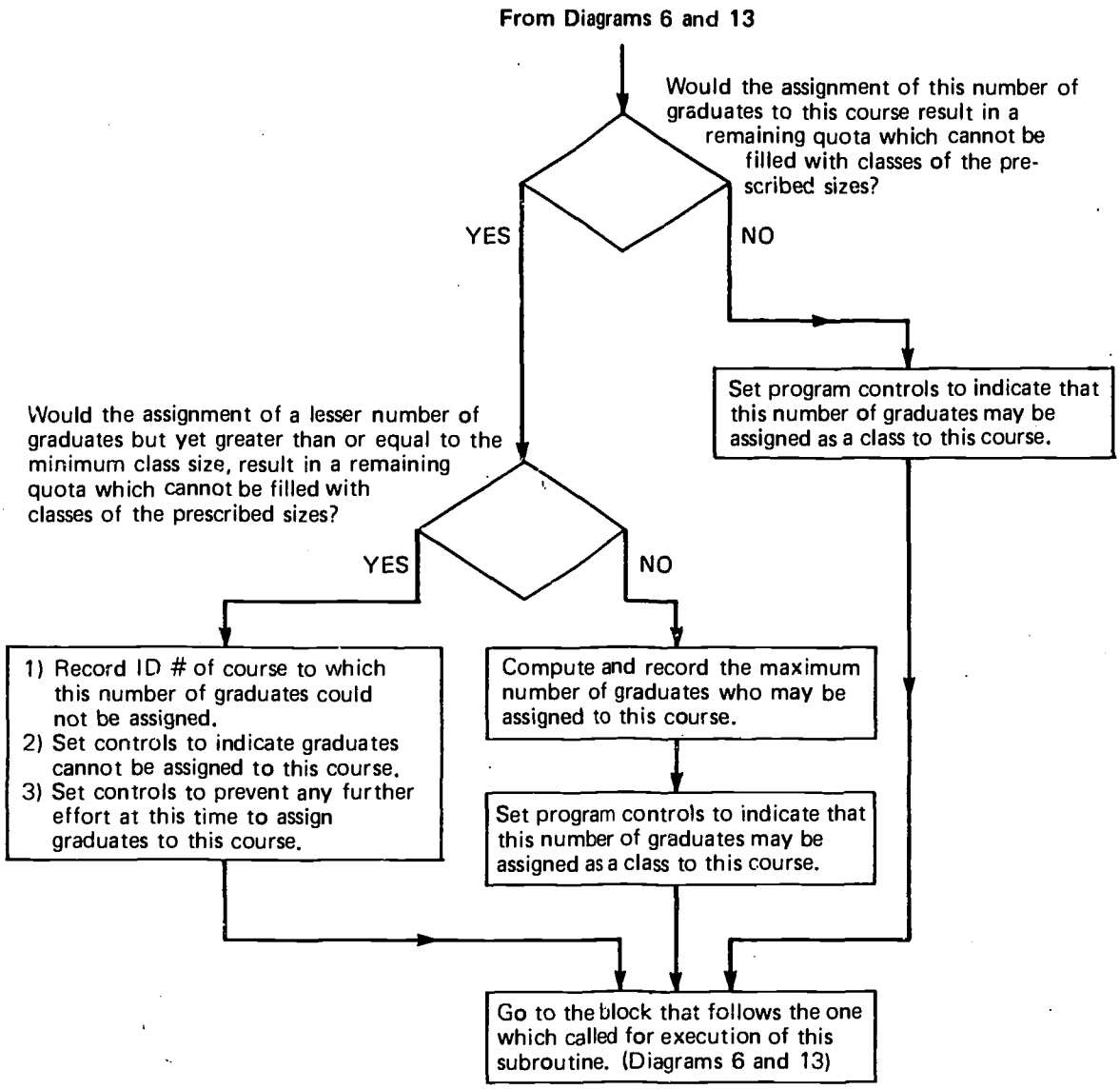
Supplementary Diagram 9 – Subroutine Field



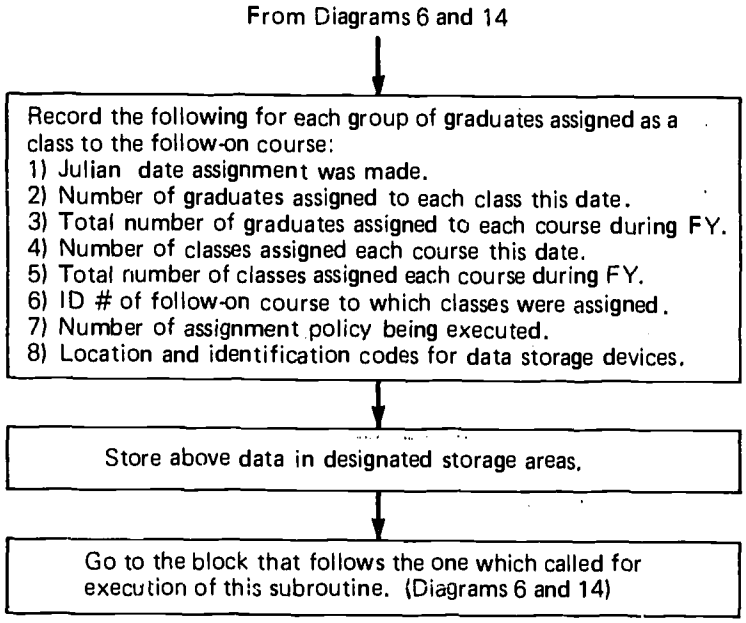
Supplementary Diagram 10 — Subroutine Corse



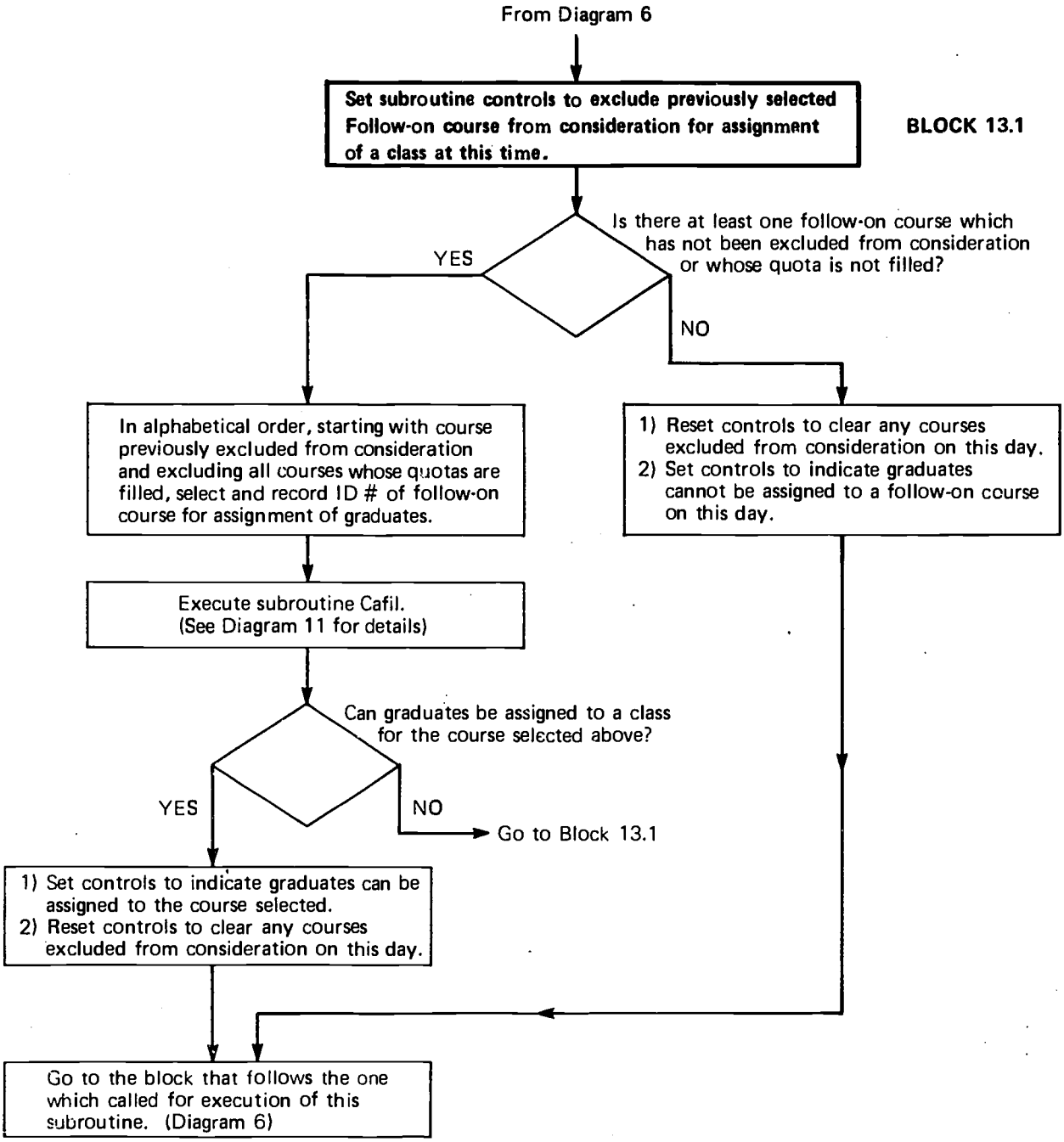
Supplementary Diagram 11 – Subroutine Cafil



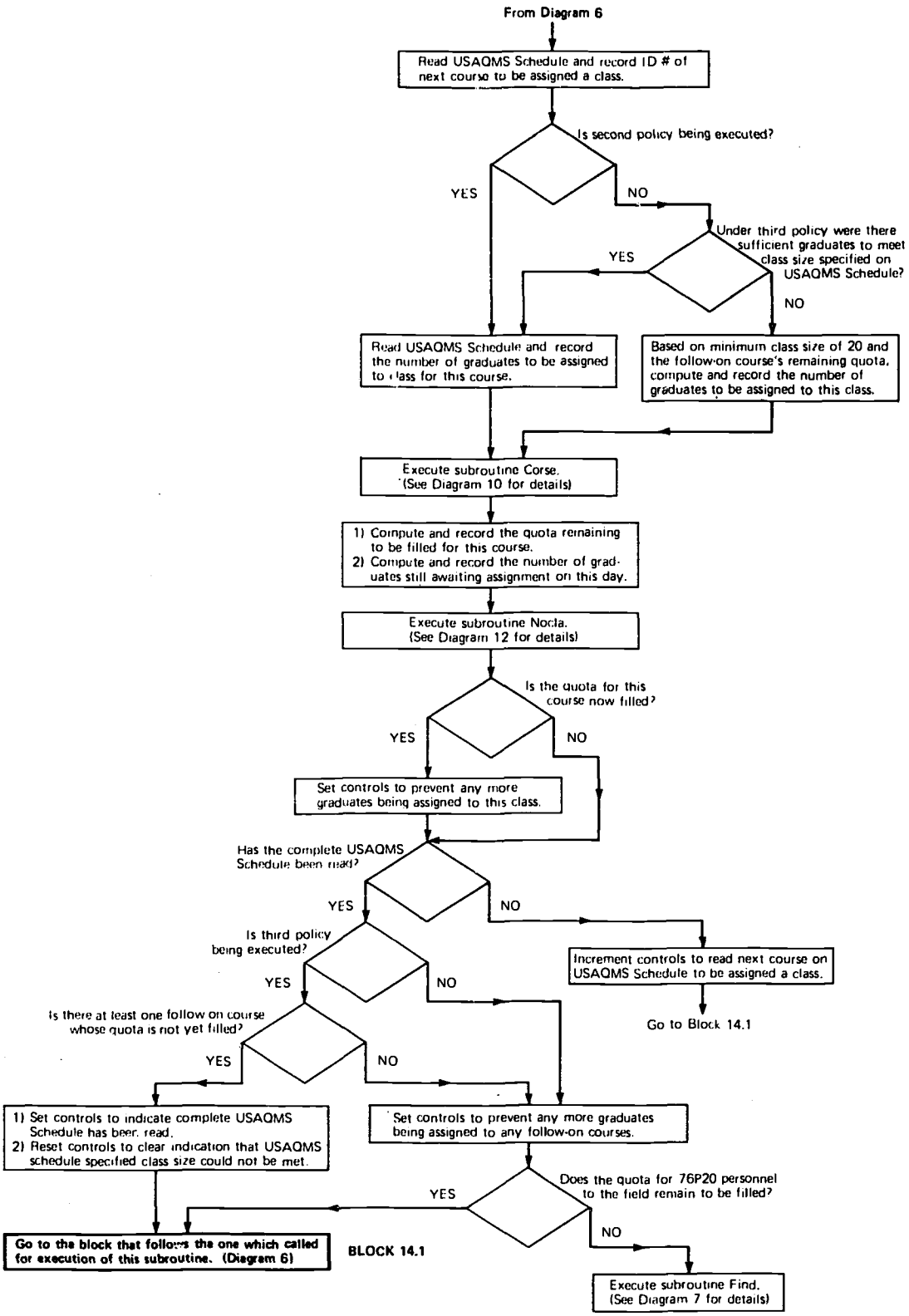
Supplementary Diagram 12 – Subroutine Nocla



Supplementary Diagram 13 — Subroutine Next



Supplementary Diagram 14 — Subroutine Sinto



Appendix B

FINAL GPSS PROGRAM

```
BLOCK
NUMBER   *LOC   OPERATION   A,B,C,D,E,F,G,H,I          COMMENTS
               SIMULATE
          1    MATRIX      H,99,50
          2    MATRIX      H,99,50
          3    MATRIX      H,99,50
          4    MATRIX      H,99,50
          5    MATRIX      H,60,50
          6    MATRIX      H,125,6
          7    MATRIX      H,125,6
          8    MATRIX      H,125,6
               STORAGE     S1-S22,1000
          *                                       ESTABLISHES CALENDAR
               INITIAL     MH1(1,1),192/MH1(2,1),193/MH1(3,1),194/MH1(4,1),195
               INITIAL     MH1(5,1),196/MH1(6,1),197/MH1(7,1),198/MH1(8,1),199
               INITIAL     MH1(9,1),200/MH1(10,1),201/MH1(11,1),202
               INITIAL     MH1(12,1),203/MH1(13,1),204/MH1(14,1),205
               INITIAL     MH1(15,1),206/MH1(16,1),207/MH1(17,1),208
               INITIAL     MH1(18,1),209/MH1(19,1),210/MH1(20,1),211
               INITIAL     MH1(21,1),212/MH1(22,1),213/MH1(23,1),214
               INITIAL     MH1(24,1),215/MH1(25,1),216/MH1(26,1),217
               INITIAL     MH1(27,1),218/MH1(28,1),219/MH1(29,1),220
               INITIAL     MH1(30,1),221/MH1(31,1),222/MH1(32,1),223
               INITIAL     MH1(33,1),224/MH1(34,1),225/MH1(35,1),226
               INITIAL     MH1(36,1),227/MH1(37,1),228/MH1(38,1),229
               INITIAL     MH1(39,1),230/MH1(40,1),231/MH1(41,1),232
               INITIAL     MH1(42,1),233/MH1(43,1),234/MH1(44,1),235
               INITIAL     MH1(45,1),236/MH1(46,1),237/MH1(47,1),238
               INITIAL     MH1(48,1),239/MH1(49,1),240/MH1(50,1),241
               INITIAL     MH1(51,1),242/MH1(52,1),243/MH1(53,1),244
               INITIAL     MH1(54,1),245/MH1(55,1),246/MH1(56,1),247
               INITIAL     MH1(57,1),248/MH1(58,1),249/MH1(59,1),250
               INITIAL     MH1(60,1),251/MH1(61,1),252/MH1(62,1),253
               INITIAL     MH1(63,1),254/MH1(64,1),255/MH1(65,1),256
               INITIAL     MH1(66,1),257/MH1(67,1),258/MH1(68,1),259
               INITIAL     MH1(69,1),260/MH1(70,1),261/MH1(71,1),262
               INITIAL     MH1(72,1),263/MH1(73,1),264/MH1(74,1),265
               INITIAL     MH1(75,1),266/MH1(76,1),267/MH1(77,1),268
               INITIAL     MH1(78,1),269/MH1(79,1),270/MH1(80,1),271
               INITIAL     MH1(81,1),272/MH1(82,1),273/MH1(83,1),274
               INITIAL     MH1(84,1),275/MH1(85,1),276/MH1(86,1),277
               INITIAL     MH1(87,1),278/MH1(88,1),279/MH1(89,1),280
               INITIAL     MH1(90,1),281/MH1(91,1),282/MH1(92,1),283
               INITIAL     MH1(93,1),284/MH1(94,1),285/MH1(95,1),286
               INITIAL     MH1(96,1),287/MH1(97,1),288/MH1(98,1),289
               INITIAL     MH1(99,1),290
               INITIAL     MH2(1,1),291/MH2(2,1),292/MH2(3,1),293/MH2(4,1),294
               INITIAL     MH2(5,1),295/MH2(6,1),296/MH2(7,1),297/MH2(8,1),298
               INITIAL     MH2(9,1),299/MH2(10,1),300/MH2(11,1),301
               INITIAL     MH2(12,1),302/MH2(13,1),303/MH2(14,1),304
               INITIAL     MH2(15,1),305/MH2(16,1),306/MH2(17,1),307
               INITIAL     MH2(18,1),308/MH2(19,1),309/MH2(20,1),310
               INITIAL     MH2(21,1),311/MH2(22,1),312/MH2(23,1),313
               INITIAL     MH2(24,1),314/MH2(25,1),315/MH2(26,1),316
               INITIAL     MH2(27,1),317/MH2(28,1),318/MH2(29,1),319
               INITIAL     MH2(30,1),320/MH2(31,1),321/MH2(32,1),322
               INITIAL     MH2(33,1),323/MH2(34,1),324/MH2(35,1),325
```

```
STATEMENT       INITIAL     MH2(36,1),326/MH2(37,1),327/MH2(38,1),328
 NUMBER         INITIAL     MH2(39,1),329/MH2(40,1),330/MH2(41,1),331
    23          INITIAL     MH2(42,1),332/MH2(43,1),333/MH2(44,1),334
    24          INITIAL     MH2(45,1),335/MH2(46,1),336/MH2(47,1),337
    25          INITIAL     MH2(48,1),338/MH2(49,1),339/MH2(50,1),340
    26          INITIAL     MH2(51,1),341/MH2(52,1),342/MH2(53,1),343
    27          INITIAL     MH2(54,1),344/MH2(55,1),345/MH2(56,1),346
    28          INITIAL     MH2(57,1),347/MH2(58,1),348/MH2(59,1),349
    29          INITIAL     MH2(60,1),350/MH2(61,1),351/MH2(62,1),352
    30          INITIAL     MH2(63,1),353/MH2(64,1),354/MH2(65,1),355
    31          INITIAL     MH2(66,1),356/MH2(67,1),357/MH2(68,1),358
    32          INITIAL     MH2(69,1),359/MH2(70,1),360/MH2(71,1),361
    33          INITIAL     MH2(72,1),362/MH2(73,1),363/MH2(74,1),364
    34          INITIAL     MH2(75,1),365/MH2(76,1),366/MH2(77,1),1/MH2(78,1),2
    35          INITIAL     MH2(79,1),3/MH2(80,1),4/MH2(81,1),5/MH2(82,1),6
    36          INITIAL     MH2(83,1),7/MH2(84,1),8/MH2(85,1),9/MH2(86,1),10
    37          INITIAL     MH2(87,1),11/MH2(88,1),12/MH2(89,1),13/MH2(90,1),14
    38          INITIAL     MH2(91,1),15/MH2(92,1),16/MH2(93,1),17/MH2(94,1),18
    39          INITIAL     MH2(95,1),19/MH2(96,1),20/MH2(97,1),21/MH2(98,1),22
    40          INITIAL     MH2(99,1),23
    41          INITIAL     MH3(1,1),24/MH3(2,1),25/MH3(3,1),26/MH3(4,1),27
    42          INITIAL     MH3(5,1),28/MH3(6,1),29/MH3(7,1),30/MH3(8,1),31
    43          INITIAL     MH3(9,1),32/MH3(10,1),33/MH3(11,1),34/MH3(12,1),35
    44          INITIAL     MH3(13,1),36/MH3(14,1),37/MH3(15,1),38/MH3(16,1),39
    45          INITIAL     MH3(17,1),40/MH3(18,1),41/MH3(19,1),42/MH3(20,1),43
    46          INITIAL     MH3(21,1),44/MH3(22,1),45/MH3(23,1),46/MH3(24,1),47
    47          INITIAL     MH3(25,1),48/MH3(26,1),49/MH3(27,1),50/MH3(28,1),51
    48          INITIAL     MH3(29,1),52/MH3(30,1),53/MH3(31,1),54/MH3(32,1),55
    49          INITIAL     MH3(33,1),56/MH3(34,1),57/MH3(35,1),58/MH3(36,1),59
    50          INITIAL     MH3(37,1),60/MH3(38,1),61/MH3(39,1),62/MH3(40,1),63
    51          INITIAL     MH3(41,1),64/MH3(42,1),65/MH3(43,1),66/MH3(44,1),67
    52          INITIAL     MH3(45,1),68/MH3(46,1),69/MH3(47,1),70/MH3(48,1),71
    53          INITIAL     MH3(49,1),72/MH3(50,1),73/MH3(51,1),74/MH3(52,1),75
    54          INITIAL     MH3(53,1),76/MH3(54,1),77/MH3(55,1),78/MH3(56,1),79
    55          INITIAL     MH3(57,1),80/MH3(58,1),81/MH3(59,1),82/MH3(60,1),83
    56          INITIAL     MH3(61,1),84/MH3(62,1),85/MH3(63,1),86/MH3(64,1),87
    57          INITIAL     MH3(65,1),88/MH3(66,1),89/MH3(67,1),90/MH3(68,1),91
    58          INITIAL     MH3(69,1),92/MH3(70,1),93/MH3(71,1),94/MH3(72,1),95
    59          INITIAL     MH3(73,1),96/MH3(74,1),97/MH3(75,1),98/MH3(76,1),99
    60          INITIAL     MH3(77,1),100/MH3(78,1),101/MH3(79,1),102
    61          INITIAL     MH3(80,1),103/MH3(81,1),104/MH3(82,1),105
    62          INITIAL     MH3(83,1),106/MH3(84,1),107/MH3(85,1),108
    63          INITIAL     MH3(86,1),109/MH3(87,1),110/MH3(88,1),111
    64          INITIAL     MH3(89,1),112/MH3(90,1),113/MH3(91,1),114
    65          INITIAL     MH3(92,1),115/MH3(93,1),116/MH3(94,1),117
    66          INITIAL     MH3(95,1),118/MH3(96,1),119/MH3(97,1),120
    67          INITIAL     MH3(98,1),121/MH3(99,1),122
    68          INITIAL     MH4(1,1),123/MH4(2,1),124/MH4(3,1),125/MH4(4,1),126
    69          INITIAL     MH4(5,1),127/MH4(6,1),128/MH4(7,1),129/MH4(8,1),130
    70          INITIAL     MH4(9,1),131/MH4(10,1),132/MH4(11,1),133
    71          INITIAL     MH4(12,1),134/MH4(13,1),135/MH4(14,1),136
    72          INITIAL     MH4(15,1),137/MH4(16,1),138/MH4(17,1),139
    73          INITIAL     MH4(18,1),140/MH4(19,1),141/MH4(20,1),142
    74          INITIAL     MH4(21,1),143/MH4(22,1),144/MH4(23,1),145
    75          INITIAL     MH4(24,1),146/MH4(25,1),147/MH4(26,1),148
    76          INITIAL     MH4(27,1),149/MH4(28,1),150/MH4(29,1),151
    77          INITIAL     MH4(30,1),152/MH4(31,1),153/MH4(32,1),154
```

```
INITIAL    MH4(33,1),155/MH4(34,1),156/MH4(35,1),157
INITIAL    MH4(36,1),158/MH4(37,1),159/MH4(38,1),160
INITIAL    MH4(39,1),161/MH4(40,1),162/MH4(41,1),163
INITIAL    MH4(42,1),164/MH4(43,1),165/MH4(44,1),166
INITIAL    MH4(45,1),167/MH4(46,1),168/MH4(47,1),169
INITIAL    MH4(48,1),170/MH4(49,1),171/MH4(50,1),172
INITIAL    MH4(51,1),173/MH4(52,1),174/MH4(53,1),175
INITIAL    MH4(54,1),176/MH4(55,1),177/MH4(56,1),178
INITIAL    MH4(57,1),179/MH4(58,1),180/MH4(59,1),181
INITIAL    MH4(60,1),182/MH4(61,1),183/MH4(62,1),184
INITIAL    MH4(63,1),185/MH4(64,1),186/MH4(65,1),187
INITIAL    MH4(66,1),188/MH4(67,1),189/MH4(68,1),190
INITIAL    MH4(69,1),191/MH4(70,1),192/MH4(71,1),193
INITIAL    MH4(72,1),194/MH4(73,1),195/MH4(74,1),196
INITIAL    MH4(75,1),197/MH4(76,1),198/MH4(77,1),199
INITIAL    MH4(78,1),200/MH4(79,1),201/MH4(80,1),202
INITIAL    MH4(81,1),203/MH4(82,1),204/MH4(83,1),205
INITIAL    MH4(84,1),206/MH4(85,1),207/MH4(86,1),208
INITIAL    MH4(87,1),209/MH4(88,1),210/MH4(89,1),211
INITIAL    MH4(90,1),212/MH4(91,1),213/MH4(92,1),214
INITIAL    MH4(93,1),215/MH4(94,1),216/MH4(95,1),217
INITIAL    MH4(96,1),218/MH4(97,1),219/MH4(98,1),220
INITIAL    MH4(99,1),221
INITIAL    MH5(1,1),222/MH5(2,1),223/MH5(3,1),224/MH5(4,1),225
INITIAL    MH5(5,1),226/MH5(6,1),227/MH5(7,1),228/MH5(8,1),229
INITIAL    MH5(9,1),230/MH5(10,1),231/MH5(11,1),232
INITIAL    MH5(12,1),233/MH5(13,1),234/MH5(14,1),235
INITIAL    MH5(15,1),236/MH5(16,1),237/MH5(17,1),238
INITIAL    MH5(18,1),239/MH5(19,1),240/MH5(20,1),241
INITIAL    MH5(21,1),242/MH5(22,1),243/MH5(23,1),244
INITIAL    MH5(24,1),245/MH5(25,1),246/MH5(26,1),247
INITIAL    MH5(27,1),248/MH5(28,1),249/MH5(29,1),250
INITIAL    MH5(30,1),251/MH5(31,1),252/MH5(32,1),253
INITIAL    MH5(33,1),254/MH5(34,1),255/MH5(35,1),256
INITIAL    MH5(36,1),257/MH5(37,1),258/MH5(38,1),259
INITIAL    MH5(39,1),260/MH5(40,1),261
INITIAL    MH5(41,1),262/MH5(42,1),263/MH5(43,1),264
INITIAL    MH5(44,1),265/MH5(45,1),266/MH5(46,1),267
INITIAL    MH5(47,1),268/MH5(48,1),269/MH5(49,1),270
INITIAL    MH5(50,1),271/MH5(51,1),272/MH5(52,1),273
INITIAL    MH5(53,1),274/MH5(54,1),275/MH5(55,1),276
INITIAL    MH5(56,1),277/MH5(57,1),278/MH5(58,1),279
INITIAL    MH5(59,1),280/MH5(60,1),281
*                                ESTABLISHES 76P20 TNG SCHEDULE
INITIAL    MH1(1,2),90/MH1(8,2),90/MH1(15,2),90/MH1(22,2),90
INITIAL    MH1(29,2),90/MH1(36,2),90/MH1(43,2),90/MH1(50,2),90
INITIAL    MH1(58,2),90/MH1(64,2),90/MH1(71,2),90/MH1(78,2),90
INITIAL    MH1(85,2),90/MH1(93,2),90/MH1(99,2),90/MH2(2,2),45
INITIAL    MH2(8,2),90/MH2(9,2),45/MH2(14,2),90/MH2(16,2),45
INITIAL    MH2(21,2),90/MH2(23,2),45/MH2(28,2),90/MH2(30,2),45
INITIAL    MH2(35,2),90/MH2(37,2),45/MH2(42,2),90/MH2(44,2),45
INITIAL    MH2(49,2),89/MH2(51,2),45/MH2(56,2),88/MH2(58,2),45
INITIAL    MH2(84,2),98/MH2(93,2),45/MH2(98,2),98/MH3(1,2),45
INITIAL    MH3(6,2),98/MH3(8,2),45/MH3(13,2),99/MH3(15,2),45
INITIAL    MH3(20,2),100/MH3(22,2),45/MH3(28,2),100/MH3(29,2),45
INITIAL    MH3(34,2),100/MH3(36,2),45/MH3(41,2),100/MH3(43,2),44
INITIAL    MH3(48,2),100/MH3(50,2),44/MH3(55,2),100/MH3(57,2),44
```

```
INITIAL    MH3(62,2),100/MH3(64,2),44/MH3(69,2),100/MH3(71,2),44
INITIAL    MH3(76,2),102/MH3(78,2),44/MH3(83,2),102/MH3(85,2),44
INITIAL    MH3(90,2),102/MH3(92,2),44/MH3(97,2),102/MH3(99,2),44
INITIAL    MH4(5,2),102/MH4(7,2),44/MH4(12,2),102/MH4(14,2),44
INITIAL    MH4(19,2),102/MH4(27,2),102/MH4(33,2),102
INITIAL    MH4(40,2),102/MH4(47,2),102/MH4(54,2),102
INITIAL    MH4(61,2),102/MH4(68,2),102
*                              CODES CALENDAR HOLIDAYS
INITIAL    MH1(57,30),5/MH1(92,30),5/MH2(7,30),5/MH2(38,30),5
INITIAL    MH2(70,30),5
INITIAL    MH3(27,30),5/MH4(26,30),5/MH4(63,30),5/MH5(25,30),5
*                              CLOCK TIME OF HOLIDAYS
INITIAL    XH1,57/XH2,92/XH3,106/XH4,225/XH5,323/XH6,421/XH9,10
INITIAL    XH7,1/XH8,1/XH10,90
*          ESTABLISHES QMS SCHEDULE-COURSE QUOTAS
INITIAL    XH281,902/XH282,360/XH283,2105/XH284,399/XH285,895
INITIAL    XH286,902/XH287,360/XH288,2105/XH289,399/XH290,895
INITIAL    XH291,4661
*          ESTABLISHES QMS SCHEDULE-CLASS ORDER AND SIZE
INITIAL    XH169,335
INITIAL    XH170-XH173,345/XH174,144/XH175,346/XH176,145
INITIAL    XH177,545/XH178,246/XH179,537/XH180,346/XH181,445
INITIAL    XH182-XH183,345/XH184,145/XH185,345/XH186,145
INITIAL    XH187,545/XH188,346/XH189,545/XH190,246/XH191,445
INITIAL    XH192-XH195,345/XH196,145/XH197,545/XH198,145
INITIAL    XH199,345/XH200,246/XH201,445/XH202,545
INITIAL    XH203-XH206,345/XH207,145/XH208,346/XH209,145
INITIAL    XH210,545/XH211,246/XH212,445/XH213,541
INITIAL    XH214-XH215,345/XH216,541/XH217-XH218,345/XH219,344
INITIAL    XH220,541/XH221,145/XH222,345/XH223,246/XH224,145
INITIAL    XH225,545/XH226,443/XH227-XH228,345/XH229,541
INITIAL    XH230-XH231,345/XH232,138/XH233,145/XH234,345
INITIAL    XH235,247/XH236,541/XH237,344/XH238,545/XH239,145
INITIAL    XH240,445/XH241-XH242,345/XH243,541/XH244-XH245,345
INITIAL    XH246,138/XH247,145/XH248,545/XH249,541/XH250,247
INITIAL    XH251,345/XH252,343/XH253,145/XH254,445
INITIAL    XH255-XH258,345/XH259,443/XH260,137/XH261,145
INITIAL    XH262,545/XH263,541/XH264,345/XH265,443/XH266,145
INITIAL    XH267-XH269,345/XH270,236/XH271,545/XH272,535
INITIAL    XH273-XH274,135
*          ESTABLISHES QMS SCHEDULE-CLASS START DATE
INITIAL    XH309,227
INITIAL    XH310-XH311,249/XH312-XH313,255/XH314-XH315,262
INITIAL    XH316-XH317,269/XH318-XH319,276/XH320-XH321,284
INITIAL    XH322-XH323,290/XH324-XH325,298/XH326-XH327,304
INITIAL    XH328-XH329,311/XH330-XH331,318/XH332-XH333,325
INITIAL    XH334-XH335,332/XH336-XH337,339/XH338-XH339,346
INITIAL    XH340-XH342,353/XH343-XH344,8/XH345-XH346,15
INITIAL    XH347-XH348,22/XH349-XH350,29/XH351-XH353,36
INITIAL    XH354-XH356,43/XH357-XH359,51/XH360,57
INITIAL    XH361-XH362,64/XH363,73/XH364-XH365,78/XH366,80
INITIAL    XH367-XH368,85/XH369,87/XH370-XH371,92/XH372,94
INITIAL    XH373-XH374,99/XH375-XH376,106/XH377-XH378,108
INITIAL    XH379-XH380,113/XH381-XH382,120/XH383,122
INITIAL    XH384-XH385,127/XH386,129/XH387-XH388,134/XH389,136
INITIAL    XH390-XH391,141/XH392,143/XH393-XH394,149
INITIAL    XH395-XH396,155/XH397-XH398,162/XH399,163/XH400,164
```

```
308          INITIAL     XH401-XH402,169/XH403,171/XH404,176/XH405,177
309          INITIAL     XH406-XH407,183/XH408-XH409,190/XH410-XH411,197
310          INITIAL     XH412,204/XH413,211/XH414,218
311   *          *           *           *           *           *          NOTE BELOW
312   * TO JPDATE THIS PROGRAM FOR ANOTHER FY CONSIDER THE FOLLOWING
313   *  1)THE 76P20 TRAINING-CLASS START DATES AND CLASS SIZE ARE READ INTO
314   *    PROGRAM THROUGH INITIAL CARDS (MH)
315   *  2)THE SIMULATION CLOCK TIME OF ALL MONDAY HOLIDAYS ARE COMPUTED AND
316   *    READ INTO PROGRAM THROUGH INITIAL CARDS (XH)
317   *  3)THE SIMULATION CLOCK TIME OF ALL OTHER HOLIDAYS (4TH JULY AND
318   *    THANKSGIVING) INCLUDING XMAS RECESS ARE COMPUTED AND ARE BUILT IN
319   *    PROGRAM BY SPECIFIC TEST BLOCKS
320   *  4)THE ABOVE REFERENCED TEST BLOCKS ARE USED IN THE PART OF THE PRO-
321   *    GRAM TO EVALUATE POLICIES FOR ASSIGNMENT TO FOLLOW-ON COURSES
322   *  5)INITIAL CARDS (MH) ARE USED TO CODE HOLIDAYS IN COLUMN 30
323   *  6)FY73 SIMULATED INCLUDED PART OF 1972 WHICH WAS A LEAP YEAR
324   *  7)THE OMS 76P20 TRAINING SCHEDULE HAD CLASS STARTING AS FOLLOWS
325   *    A)DAY CLASSES ON MONDAY OR TUESDAY
326   *    B)NIGHT CLASSES ON WEDNESDAY ONLY
327   *          *           *           *           *           *          NOTE BELOW
328   * RANDOM NUMBER GENERATOR ASSIGNMENTS, #1 FOR ATTRITION, #2 FOR CCT
329   * DISTRIBUTION SELECTION, #3 FOR ABSENTEE RATE, #4 FOR AV AND PI CCTS
330    1      FUNCTION    RN2,D33          SELECTS AV CCT DISTRIBUTION
331   .0303,4/.0606,5/.0909,6/.1212,7/.1515,8/.1818,9/.2121,10/.2424,11
332   .2727,12/.3030,13/.3333,14/.3636,15/.3939,16/.4242,17/.4545,18/.4843,19
333   .5151,20/.5454,21/.5757,22/.6060,23/.6363,24/.6666,25/.6969,26/.7272,27
334   .7575,28/.7878,29/.8181,30/.8484,31/.8787,32/.9090,33/.9393,34/.9696,35
335   1.0,36
336    2      FUNCTION    RN2,D33          SELECTS PI CCT DISTRIBUTION
337   .0303,37/.0606,38/.0909,39/.1212,40/.1515,41/.1818,42/.2121,43/.2424,44
338   .2727,45/.3030,46/.3333,47/.3636,48/.3939,49/.4242,50/.4545,51/.4848,52
339   .5151,53/.5454,54/.5757,55/.6060,56/.6363,57/.6666,58/.6969,59/.7272,60
340   .7575,61/.7878,62/.8181,63/.8484,64/.8787,65/.9090,66/.9393,67/.9696,68
341   1.0,69
342    3      FUNCTION    RN3,C15          ABSENTEE RATE
343   0,325/.0013,350/.0062,375/.0228,400/.0668,425/.1587,450/.3085,475
344   .5,500/.6915,525/.8413,550/.9332,575/.9772,600/.9938,625/.9987,650
345   1.0,675
346   * COURSE COMPLETION TIME DISTRIBUTIONS FOR STUDENTS UNDER AV MODE
347    4      FUNCTION    RN4,D22          AV NORMAL
348   .0116,16/.0202,17/.0344,18/.0559,19/.0869,20/.1271,21/.1814,22/.2483,23
349   .3264,24/.4090,25/.5000,26/.5910,27/.6736,28/.7517,29/.8186,30/.8729,31
350   .9131,32/.9441,33/.9656,34/.9798,35/.9915,36/1.0,37
351    5      FUNCTION    RN4,D19          AV NORMAL
352   .0125,15/.0244,16/.0436,17/.0735,18/.1190,19/.1788,20/.2546,21/.3483,22
353   .4483,23/.5517,24/.6517,25/.7454,26/.8212,27/.8810,28/.9265,29/.9564,30
354   .9756,31/.9875,32/1.0,33
355    6      FUNCTION    RN4,D8           AV NORMAL
356   .0862,24/.1614,25/.322,26/.5,27/.678,28/.8386,29/.9138,30/1.0,31
357    7      FUNCTION    RN4,D24          AV NORMAL
358   .0110,15/.0188,16/.0301,17/.0475,18/.0721,19/.1056,20/.1492,21/.2033,22
359   .2643,23/.3372,24/.4168,25/.5000,26/.5832,27/.6628,28/.7357,29/.7967,30
360   .8508,31/.8944,32/.9279,33/.9525,34/.9699,35/.9812,36/.9890,37/1.0,38
361    8      FUNCTION    RN4,D15          AV NORMAL
362   .0150,22/.0336,23/.0668,24/.1210,25/.2033,26/.3085,27/.4325,28/.5675,29
363   .6915,30/.7967,31/.8790,32/.9332,33/.9664,34/.9850,35/1.0,36
364    9      FUNCTION    RN4,D11          AV NORMAL
365   .0202,27/.0559,28/.1271,29/.2483,30/.4090,31/.5910,32/.7517,33/.8729,34
366   .9441,35/.9798,36/1.0,37
```

```
 10     FUNCTION    RN4,D12                 AV NORMAL
.0188,18/.0485,19/.1056,20/.2033,21/.3409,22/.5000,23/.6591,24/.7967,25
.8944,26/.9515,27/.9812,28/1.0,29
 11     FUNCTION    RN4,D21                 AV FLAT
.025,16/.075,17/.125,18/.175,19/.225,20/.275,21/.325,22/.375,23/.425,24
.475,25/.525,26/.575,27/.625,28/.675,29/.725,30/.775,31/.825,32/.875,33
.925,34/.975,35/1.0,36
 12     FUNCTION    RN4,D23                 AV FLAT
.0227,15/.0682,16/.1136,17/.1591,18/.2045,19/.2500,20/.2955,21/.3409,22
.3864,23/.4318,24/.4773,25/.5227,26/.5682,27/.6136,28/.6591,29/.7045,30
.7500,31/.7955,32/.8409,33/.8864,34/.9318,35/.9773,36/1.0,37
 13     FUNCTION    RN4,D8                  AV LEFT SKEWED
.0286,18/.0602,19/.1182,20/.2112,21/.3472,22/.5286,23/.7643,24/1.0,25
 14     FUNCTION    RN4,D16                 AV LEFT SKEWED
.0192,18/.0286,19/.0424,20/.0614,21/.0854,22/.1188,23/.1586,24/.2112,25
.2758,26/.3472,27/.4379,28/.5519,29/.6736,30/.7953,31/.9093,32/1.0,33
 15     FUNCTION    RN4,D9                  AV LEFT SKEWED
.0264,27/.0524,28/.0950,29/.1646,30/.2670,31/.4066,32/.5930,33/.8136,34
1.0,35
 16     FUNCTION    RN4,D15                 AV LEFT SKEWED
.0198,23/.0300,24/.0456,25/.0672,26/.0950,27/.1336,28/.1836,29/.2420,30
.3243,31/.4295,32/.5535,33/.6885,34/.8125,35/.9177,36/1.0,37
 17     FUNCTION    RN4,D14                 AV LEFT SKEWED
.0204,17/.0324,18/.0500,19/.0734,20/.1074,21/.1528,22/.2112,23/.2846,24
.3812,25/.5017,26/.6423,27/.7829,28/.9034,29/1.0,30
 18     FUNCTION    RN4,D13                 AV LEFT SKEWED
.0208,20/.0340,21/.0548,22/.0836,23/.1236,24/.1770,25/.2502,26/.3370,27
.4495,28/.5931,29/.7439,30/.8875,31/1.0,32
 19     FUNCTION    RN4,D19                 AV RIGHT SKEWED
.0598,17/.1356,18/.2293,19/.3293,20/.4327,21/.5327,22/.6264,23/.7022,24
.7620,25/.8132,26/.8530,27/.8858,28/.9128,29/.9342,30/.9512,31/.9652,32
.9750,33/.9822,34/1.0,35
 20     FUNCTION    RN4,D18                 AV RIGHT SKEWED
.0698,21/.1577,22/.2601,23/.3665,24/.4729,25/.5753,26/.6632,27/.733,28
.7888,29/.8354,30/.8740,31/.9050,32/.9298,33/.9476,34/.9624,35
.9736,36/.9818,37/1.0,38
 21     FUNCTION    RN4,D25                 AV RIGHT SKEWED
.0484,15/.1063,16/.1728,17/.2464,18/.3245,19/.4041,20/.4822,21/.5558,22
.6223,23/.6802,24/.7286,25/.7698,26/.8064,27/.8384,28/.8664,29/.8904,30
.9108,31/.9282,32/.9426,33/.9544,34/.9642,35/.9722,36/.9786,37/.9836,38
1.0,39
 22     FUNCTION    RN4,D6                  AV RIGHT SKEWED
.2967,24/.5934,25/.7888,26/.9030,27/.9624,28/1.0,29
 23     FUNCTION    RN4,D14                 AV RIGHT SKEWED
.0966,15/.2171,16/.3577,17/.4983,18/.6188,19/.7154,20/.7888,21/.8472,22
.8926,23/.9266,24/.9500,25/.9676,26/.9796,27/1.0,28
 24     FUNCTION    RN4,D12                 AV RIGHT SKEWED
.1376,23/.2967,24/.4558,25/.5934,26/.7016,27/.7888,28/.853,29/.9030,30
.9386,31/.9624,32/.9780,33/1.0,34
 25     FUNCTION    RN4,D17
.0781,20/.1785,21/.2889,22/.4081,23/.5185,24/.6189,25/.6970,26/.7620,27
.8132,28/.8584,29/.8948,30/.9216,31/.9438,32/.9606,33/.9728,34/.9812,35
1.0,36
 26     FUNCTION    RN4,D12                 AV RIGHT SKEWED
.1376,25/.2967,26/.4558,27/.5934,28/.7016,29/.7888,30/.853,31/.903,32
.9386,33/.9624,34/.978,35/1.0,36
 27     FUNCTION    RN4,D14                 AV RIGHT SKEWED
.0966,18/.2171,19/.3577,20/.4983,21/.6188,22/.7154,23/.7888,24/.8472,25
.8926,26/.9266,27/.9500,28/.9676,29/.9796,30/1.0,31
```

```
 28     FUNCTION    RN4,D14                 AV RIGHT SKEWED
.0966,16/.2171,17/.3577,18/.4983,19/.6188,20/.7154,21/.7888,22/.8472,23
.8926,24/.9266,25/.9500,26/.9676,27/.9796,28/1.0,29
 29     FUNCTION    RN4,D23                 AV RIGHT SKEWED
.0601,15/.1311,16/.2072,17/.2927,18/.3803,19/.4658,20/.5419,21/.6129,22
.6730,23/.7242,24/.7698,25/.8064,26/.8414,27/.8714,28/.8968,29/.9182,30
.9356,31/.9500,32/.9616,33/.9700,34/.9774,35/.9832,36/1.0,37
 30     FUNCTION    RN4,D19                 AV RIGHT SKEWED
.0598,20/.1356,21/.2293,22/.3293,23/.4327,24/.5327,25/.6264,26/.7022,27
.7620,28/.8132,29/.8530,30/.8858,31/.9128,32/.9342,33/.9512,34/.9657,35
.9750,36/.9822,37/1.0,38
 31     FUNCTION    RN4,D9                  AV RIGHT SKEWED
.1864,22/.407,23/.5934,24/.733,25/.8354,26/.905,27/.9476,28/.9736,29
1.0,30
 32     FUNCTION    RN4,D13                 AV RIGHT SKEWED
.1125,20/.2561,21/.4069,22/.5505,23/.663,24/.7498,25/.823,26/.8764,27
.9164,28/.9452,29/.966,30/.9792,31/1.0,32
 33     FUNCTION    RN4,D18                 AV RIGHT SKEWED
.0698,16/.1577,17/.2601,18/.3665,19/.4729,20/.5753,21/.6632,22/.7330,23
.7888,24/.8354,25/.8740,26/.9050,27/.9298,28/.9476,29/.9624,30/.9736,31
.9818,32/1.0,33
 34     FUNCTION    RN4,D17                 AV BIMODAL
.0225,18/.0828,19/.1662,20/.2573,21/.3456,22/.4147,23/.4564,24/.486,25
.514,26/.5436,27/.5853,28/.6544,29/.7427,30/.8338,31/.9172,32/.9775,33
1.0,34
 35     FUNCTION    RN4,D22                 AV BIMODAL
.0146,16/.0528,17/.109,18/.1743,19/.2438,20/.312,21/.3765,22/.4264,23
.4559,24/.4788,25/.5,26/.5212,27/.5441,28/.5736,29/.6235,30/.688,31
.7562,32/.8257,33/.891,34/.9472,35/.9854,36/1.0,37
 36     FUNCTION    RN4,D14                 AV BIMODAL
.0366,19/.1315,20/.2482,21/.3615,22/.4423,23/.4824,24/.5075,25/.5326,26
.5577,27/.6385,28/.7518,29/.8685,30/.9634,31/1.0,32
* COURSE COMPLETION TIME DISTRIBUTIONS FOR STUDENTS UNDER PI MODE
 37     FUNCTION    RN4,D24                 PI NORMAL
.011,16/.0188,17/.0301,18/.0475,19/.0721,20/.1056,21/.1492,22/.2033,23
.2643,24/.3372,25/.4168,26/.5,27/.5832,28/.6628,29/.7357,30/.7967,31
.8508,32/.8944,33/.9279,34/.9525,35/.9699,36/.9812,37/.989,38/1.0,39
 38     FUNCTION    RN4,D8                  PU NORMAL
.0862,27/.1614,28/.322,29/.5,30/.678,31/.8386,32/.9138,33/1.0,34
 39     FUNCTION    RN4,D24                 PI NORMAL
.0110,17/.0188,18/.0301,19/.0475,20/.0721,21/.1056,22/.1492,23/.2033,24
.2643,25/.3372,26/.4168,27/.5000,28/.5832,29/.6628,30/.7357,31/.7967,32
.8508,33/.8944,34/.9279,35/.9525,36/.9699,37/.9812,38/.9890,39/1.0,40
 40     FUNCTION    RN4,D21                 PI NORMAL
.0119,16/.0217,17/.0367,18/.0606,19/.0951,20/.1423,21/.2033,22/.2743,23
.3594,24/.4522,25/.5478,26/.6406,27/.7257,28/.7967,29/.8577,30/.9049,31
.9394,32/.9633,33/.9783,34/.9881,35/1.0,36
 41     FUNCTION    RN4,D14                 PI NORMAL
.0162,20/.0367,21/.0764,22/.1423,23/.2389,24/.3594,25/.5000,26/.6406,27
.7611,28/.8577,29/.9236,30/.9633,31/.9838,32/1.0,33
 42     FUNCTION    RN4,D12                 PI NORMAL
.0188,29/.0485,30/.1056,31/.2033,32/.3409,33/.5000,34/.6591,35/.7967,36
.8944,37/.9515,38/.9812,39/1.0,40
 43     FUNCTION    RN4,D17                 PI NORMAL
.0136,24/.0281,25/.0526,26/.0934,27/.1515,28/.2296,29/.3300,30/.4404,31
.5596,32/.6700,33/.7704,34/.8485,35/.9066,36/.9474,37/.9719,38/.9864,39
```

```
1.0,40
 44     FUNCTION    RN4,D23                 PI FLAT
.0227,18/.0682,19/.1136,20/.1591,21/.2045,22/.2500,23/.2955,24/.3409,25
.3864,26/.4318,27/.4773,28/.5227,29/.5682,30/.6136,31/.6591,32/.7045,33
.7500,34/.7955,35/.8409,36/.8864,37/.9318,38/.9773,39/1.0,40
 45     FUNCTION    RN4,D25                 PI FLAT
.0208,16/.0624,17/.1041,18/.1458,19/.1874,20/.2291,21/.2708,22/.3124,23
.3541,24/.3958,25/.4374,26/.4791,27/.5208,28/.5624,29/.6041,30/.6458,31
.6874,32/.7291,33/.7708,34/.8124,35/.8541,36/.8958,37/.9374,38/.9791,39
1.0,40
 46     FUNCTION    RN4,D18                 PI RIGHT SKEWED
.0698,23/.1577,24/.2601,25/.3665,26/.4729,27/.5753,28/.6632,29/.733,30
.7888,31/.8354,32/.874,33/.905,34/.9298,35/.9476,36/.9624,37/.9736,38
.9818,39/1.0,40
 47     FUNCTION    RN4,D13                 PI RIGHT SKEWED
.1125,23/.2561,24/.4069,25/.5505,26/.663,27/.7498,28/.823,29/.8764,30
.9164,31/.9452,32/.966,33/.9792,34/1.0,35
 48     FUNCTION    RN4,D12                 PI RIGHT SKEWED
.1376,28/.2967,29/.4558,30/.5934,31/.7016,32/.7888,33/.853,34/.903,35
.9386,36/.9624,37/.978,38/1.0,39
 49     FUNCTION    RN4,D19                 PI RIGHT SKEWED
.0598,19/.1356,20/.2293,21/.3293,22/.4327,23/.5327,24/.6264,25/.7022,26
.762,27/.8132,28/.853,29/.8858,30/.9128,31/.9342,32/.9512,33/.9652,34
.975,35/.9822,36/1.0,37
 50     FUNCTION    RN4,D20                 PI RIGHT SKEWED
.0679,18/.1498,19/.2426,20/.3413,21/.4400,22/.5328,23/.6147,24/.6826,25
.7416,26/.7888,27/.8324,28/.8664,29/.8968,30/.9198,31/.9398,32/.9544,33
.9668,34/.9756,35/.9826,36/1.0,37
 51     FUNCTION    RN4,D19                 PI RIGHT SKEWED
.0598,22/.1356,23/.2293,24/.3293,25/.4327,26/.5327,27/.6264,28/.7022,29
.7620,30/.8132,31/.8530,32/.8858,33/.9128,34/.9342,35/.9512,36/.9652,37
.9750,38/.9822,39/1.0,40
 52     FUNCTION    RN4,D15                 PI RIGHT SKEWED
.0823,17/.1875,18/.3115,19/.4465,20/.5705,21/.6757,22/.7580,23/.8164,24
.8664,25/.9050,26/.9328,27/.9544,28/.9700,29/.9802,30/1.0,31
 53     FUNCTION    RN4,D25                 PI RIGHT SKEWED
.0484,16/.1063,17/.1728,18/.2464,19/.3245,20/.4041,21/.4822,22/.5558,23
.6223,24/.6802,25/.7286,26/.7698,27/.8064,28/.8384,29/.8664,30/.8904,31
.9108,32/.9282,33/.9426,34/.9544,35/.9642,36/.9722,37/.9786,38/.9836,39
1.0,40
 54     FUNCTION    RN4,D14                 PI RIGHT SKEWED
.0966,25/.2171,26/.3577,27/.4983,28/.6188,29/.7154,30/.7888,31/.8472,32
.8926,33/.9266,34/.9500,35/.9676,36/.9796,37/1.0,38
 55     FUNCTION    RN4,D9                  PI RIGHT SKEWED
.1864,25/.407,26/.5934,27/.733,28/.8354,29/.905,30/.9476,31/.9736,32
1.0,33
 56     FUNCTION    RN4,D23                 PI RIGHT SKEWED
.0601,16/.1311,17/.2072,18/.2927,19/.3803,20/.4658,21/.5419,22/.6129,23
.6730,24/.7242,25/.7698,26/.8064,27/.8414,28/.8714,29/.8968,30/.9182,31
.9356,32/.9500,33/.9616,34/.9700,35/.9774,36/.9832,37/1.0,38
 57     FUNCTION    RN4,D7                  PI RIGHT SKEWED
.2171,27/.4983,28/.7154,29/.7472,30/.8266,31/.8676,32/1.0,33
 58     FUNCTION    RN4,D20                 PI RIGHT SKEWED
.0679,21/.1498,22/.2426,23/.3413,24/.4400,25/.5328,26/.6147,27/.6826,28
.7416,29/.7888,30/.8324,31/.8664,32/.8968,33/.9198,34/.9398,35/.9544,36
.9668,37/.9756,38/.9826,39/1.0,40
 59     FUNCTION    RN4,D16                 PI RIGHT SKEWED
.0907,17/.2407,18/.3264,19/.4481,20/.5621,21/.6528,22/.7242,23/.7888,24
.8414,25/.8812,26/.9146,27/.9386,28/.9576,29/.9714,30/.9808,31/1.0,32
```

```
 60     FUNCTION    RN4,D16                 PI RIGHT SKEWED
.0907,20/.2047,21/.3264,22/.4481,23/.5621,24/.6528,25/.7242,26/.7888,27
.8414,28/.8812,29/.9146,30/.9386,31/.9576,32/.9714,33/.9808,34/1.0,35
 61     FUNCTION    RN4,D11                 PI LEFT  SKEWED
.0232,29/.0404,30/.0688,31/.1118,32/.1738,33/.2542,34/.3753,35/.5361,36
.7181,37/.8789,38/1.0,39
 62     FUNCTION    RN4,D18                 PI LEFT  SKEWED
.0182,19/.0264,20/.0376,21/.0524,22/.0702,23/.0950,24/.1260,25/.1646,26
.2112,27/.2670,28/.3368,29/.4247,30/.5271,31/.6335,32/.7399,33/.8423,34
.9302,35/1.0,36
 63     FUNCTION    RN4,D14                 PI LEFT  SKEWED
.0204,21/.0324,22/.0500,23/.0734,24/.1074,25/.1528,26/.2112,27/.2846,28
.3812,29/.5017,30/.6423,31/.7829,32/.9034,33/1.0,34
 64     FUNCTION    RN4,D15                 PI LEFT  SKEWED
.0198,18/.0300,19/.0456,20/.0672,21/.0950,22/.1336,23/.1836,24/.2420,25
.3243,26/.4295,27/.5535,28/.6885,29/.8125,30/.9177,31/1.0,32
 65     FUNCTION    RN4,D9                  PI LEFT  SKEWED
.0264,20/.0524,21/.0950,22/.1646,23/.2670,24/.4066,25/.5930,26/.8136,27
1.0,28
 66     FUNCTION    RN4,D16                 PI LEFT  SKEWED
.0192,25/.0286,26/.0424,27/.0614,28/.0854,29/.1188,30/.1586,31/.2112,32
.2758,33/.3472,34/.4379,35/.5519,36/.6736,37/.7953,38/.9093,39/1.0,40
 67     FUNCTION    RN4,D21                 PI BIMODAL
.0154,20/.0567,21/.1174,22/.1878,23/.2612,24/.3325,25/.3958,26/.4389,27
.4661,28/.489,29/.511,30/.5339,31/.5611,32/.6042,33/.6675,34/.7388,35
.8122,36/.8826,37/.9433,38/.9846,39/1.0,40
 68     FUNCTION    RN4,D16                 PI BIMODAL
.0225,21/.0828,22/.1662,23/.2573,24/.3456,25/.4147,26/.4564,27/.5000,28
.5436,29/.5853,30/.6544,31/.7427,32/.8338,33/.9172,34/.9775,35/1.0,36
 69     FUNCTION    RN4,D24                 PI BIMODAL
.0116,17/.0414,18/.0868,19/.1414,20/.2009,21/.2613,22/.3201,23/.3746,24
.4251,25/.4517,26/.4724,27/.4909,28/.5196,29/.5483,30/.5749,31/.6254,32
.6799,33/.7387,34/.7991,35/.8586,36/.9132,37/.9586,38/.9884,39/1.0,40
 70     FUNCTION    RN2,D2          EXERCISE RANDOM GENERATOR
.35,1/1.0,5
 1      VARIABLE    C1*1
 2      VARIABLE    C1-99
 3      VARIABLE    C1-198
 4      VARIABLE    C1-297
 5      VARIABLE    C1-396
 6      VARIABLE    S*13-(S*13*P10/10000)
 7      VARIABLE    S*13-P16
 8      VARIABLE    XH*4/100
 9      VARIABLE    XH*4@100
 10     VARIABLE    P1/100
 11     VARIABLE    P1@100
 12     VARIABLE    P4*100+V*5
 13     VARIABLE    1000+XH9
 14     VARIABLE    P3/1000
 15     VARIABLE    P3@1000
 16     VARIABLE    XH*3/P7
 17     VARIABLE    P1*100+P4
 18     VARIABLE    XH292-XH291
 19     VARIABLE    XH6+1
 20     VARIABLE    P2*100+P4-100
 21     VARIABLE    P2*100
*  $$$$$$$       $$$$$$$$$       $$$$$$$$       $$$$$$$$$     $$$$$$
```

```
22      VARIABLE    V20*1000/445      PERCENT TIME ELAPSED
23      VARIABLE    XH294*V22/1000    FIELD ASSIGNMENT QUOTA BY THIS DATE
24      VARIABLE    2*XH5
25      VARIABLE    P14/4+(P14@4)
26      VARIABLE    P8/2
27      VARIABLE    XH302*100/XH301       ATTRITION RATE
28      VARIABLE    XH*7/100          IDENTIFIES COURSE ID #
29      VARIABLE    P5*2
30      VARIABLE    P5*14
31      VARIABLE    XH304*100/(XH304+XH305)     DAILY ABSENTEE RATE
32      VARIABLE    XH301-XH292
33      VARIABLE    P2/7*2+(P2@7/3)
34      VARIABLE    P5/5*2+(P5@5/3)
35      VARIABLE    P5/3+(P5@3/2)
36      VARIABLE    XH*7@100          IDENTIFIES CLASS SIZE
37      VARIABLE    P7+140      XH INDEX # FOR JULIAN DATE OF CLASS START
38      VARIABLE    V24-1
39      VARIABLE    P8+1
40      VARIABLE    P5-(20-P14)
41      VARIABLE    V23-V45           MAX GRADS TO FIELD THIS DAY
42      VARIABLE    1000(V20-50)/295      PERCENT TIME ELAPSED
43      VARIABLE    XH294*V42/1000
44      VARIABLE    V43-V45
45      VARIABLE    XH294-XH293       NUMBER OF GRADS TO FIELD
46      VARIABLE    V24-XH6
47      VARIABLE    XH5-1
1       BVARIABLE   P14'GE'140*P14'LE'149
2       BVARIABLE   P14'GE'136*P14'LE'139
3       BVARIABLE   P14'GE'105*P14'LE'135
4       BVARIABLE   P14'GE'91*P14'LE'104
5       BVARIABLE   P14'GE'70*P14'LE'90
6       BVARIABLE   P14'GE'V19*P14'LE'V38
7       BVARIABLE   P14'GE'46*P14'LE'59
8       BVARIABLE   P14'GE'XH5*P14'LE'XH6
9       BVARIABLE   P14'GE'V46*P14'LE'V47
10      BVARIABLE   P15'GE'XH5*P15'LE'XH6
11      BVARIABLE   (LS1*LS2*LS3*LS4*LS5)
12      BVARIABLE   V10'E'1+V10'E'3       IDENTIFIES AV STUDENTS
        GENERATE    ,,1,1,1,50,H
*         *           *           *           *           *         *  NOTICE
* INSERT RANDOM NUMBER GENERATOR EXERCISER BELOW HERE
        ASSIGN      23,465
 ASS1   ASSIGN      24,FN70
        LOOP        23,ASS1
*         *           *           *           *           *         *  NOTICE
*                                   COPIES JULIAN DATE IN ROWS 21,31,AND 41
        ASSIGN      24,4
 AGN1   ASSIGN      21+,1
        ASSIGN      23,99
 AGN2   ASSIGN      22+,1
        ASSIGN      25,MH*21(*22,1)
        MSAVEVALUE  *21,*22,11,*25,H
        MSAVEVALUE  *21,*22,21,*25,H
        MSAVEVALUE  *21,*22,31,*25,H
        MSAVEVALUE  *21,*22,41,*25,H
        LOOP        23,AGN2
        ASSIGN      22,0
```

```
16              LOOP        24,AGN1
17              ASSIGN      21,5
18              ASSIGN      23,60
19      AGN3    ASSIGN      22+,1
20              ASSIGN      25,MH*21(*22,1)
21              MSAVEVALUE  *21,*22,11,*25,H
22              MSAVEVALUE  *21,*22,21,*25,H
23              MSAVEVALUE  *21,*22,31,*25,H
24              MSAVEVALUE  *21,*22,41,*25,H
25              LOOP        23,AGN3
              *       *       *       *       *       *       *  NOTICE
              *THIS IS THE START OF THE PROGRAM FOR STUDENTS
              * THIS PART IS MASTER CONTROL OF TRAINING SCHEDULE AND STUDENTS
26              ASSIGN      3-5+,1
27      ASG1    ASSIGN      1,1         CLASS IS DAY CLASS
28              ASSIGN      10,13       MH COL. FOR DAY AV ANNEX A STUDENTS
29              TRANSFER    SBR,CLASS,19
30              ADVANCE     1               EXIT ON TUESDAY
31              TEST E      C1,100,TRAN1
32              ASSIGN      4-5+,1      START NEXT MH
33              SAVEVALUE   7-8+,1,H    MH# FOR STUDENTS STARTING TNG NOW
34              LOGICS      4
35      TRAN1   TRANSFER    SBR,TLOAD,20
36      ADV1    ADVANCE     1               EXIT ON WEDNESDAY
37              TEST E      C1,360,TES1
38              LOGICR      4
39              LOGICS      2     OPENS HOLIDAY GATE ON ALL HOLIDAYS
40              ADVANCE     1               ENTER ON A WEDNESDAY AND EXIT ON THURSDAY
41              LOGICR      2
42              LOGICS      1
43              TRANSFER    ,TRAN3
44      TES1    TEST E      C1,199,GATE1
45              ASSIGN      4-5+,1      START NEXT MH
46              SAVEVALUE   7-8+,1,H    MH# FOR STUDENTS STARTING TNG NOW
47      GATE1   GATE LS     4,TRAN2
48              ASSIGN      1,3       CLASS IS NIGHT CLASS
49              ASSIGN      10,15       MH COL. FOR NIGHT AV ANNEX A STUDENTS
50              TRANSFER    SBR,CLASS,19
51      ADV3    ADVANCE     1               EXIT ON THURSDAY
52              TEST E      C1,137,TES2       IS TODAY THANKSGIVING
53              LOGICS      2
54              ADVANCE     1               ENTER ON A THURSDAY AND EXIT ON FRIDAY
55              LOGICR      2
56              LOGICS      1
57              TRANSFER    ,TES3
58      TRAN2   TRANSFER    SBR,TLOAD,20
59              TRANSFER    ,ADV3
60      TES2    TEST E      C1,298,TRAN3
61              ASSIGN      4-5+,1      START NEXT MH
62              SAVEVALUE   7-8+,1,H    MH# FOR STUDENTS STARTING TNG NOW
63      TRAN3   TRANSFER    SBR,TLOAD,20
64              ADVANCE     1               EXIT ON FRIDAY
65              TEST E      C1,166,TES3         DOES XMAS HOLIDAYS START TOMORROW
66              LOGICS      3     OPENS XMAS HOLIDAYS GATE
67              TRANSFER    SBR,TLOAD,20
68              ADVANCE     17              EXIT ON MONDAY
69              LOGICR      3     CLOSES XMAS HOLIDAYS GATE
```

```
70              LOGICS      1
71              TRANSFER    ,ASG1
72        TES3  TEST E      C1,397,TRAN4
73              ASSIGN      4-5+,1        START NEXT MH
74              SAVEVALUE   7-8+,1,H      MH# FOR STUDENTS STARTING TNG NOW
75        TRAN4 TRANSFER    SBR,TLOAD,20
76              ADVANCE     1       ENTER ON A FRIDAY EXIT ON SATURDAY
77              LOGICS      6
78              ADVANCE     1       ENTER ON A SATURDAY EXIT ON SUNDAY
79              LOGICR      6
80              ADVANCE     1       ENTER ON A SUNDAY EXIT ON MONDAY
81              TEST GE     C1,449,TES4                       ALL STUDENTS GRADUATED
82              ASSIGN      3,11          XH# WITH TOTAL TNG TIME THIS CLASS
83              ASSIGN      4,91          XH# CONTAINING MH# AND ROW# FOR CLASS DATA
84              ASSIGN      5,76          NUMBER OF 76P20 CLASSES
          * THIS PART COMPUTES CLASS MEAN COURSE COMPLETION TIME
85         ASG11 ASSIGN     7,MH*V8(V9,3)
86              MSAVEVALUE  V8,V9,3,V16,H   COMPUTE AND RECORD CLASS MEAN CCT
87              ASSIGN      3-4+,1
88              LOOP        5,ASG11
89              SAVEVALUE   302,V32,H       TOTAL STUDENTS LOST TO ATTRITION
90              SAVEVALUE   303,V27,H       ATTRITION RATE
91              SAVEVALUE   293-294,V18,H       QUOTA FOR 76P20 PERSONNEL
92              SAVEVALUE   1-20,0,H
          *         *         *         *         *         *          *  NOTICE
          * NOTE XH5 AND XH6 DEFINE MINIMUM AND MAXIMUM CLASS SIZES
93              SAVEVALUE   5,35,H        DETERMINE MIN CLASS SIZE
94              SAVEVALUE   6,45,H        DETERMINE MAX CLASS SIZE
95              LOGICS      13            SETS CLASS SIZE TO GE 35 AND LE 45
96              LOGICS      64      PERMITS GRADS TO BE SENT TO FIELD DURING SUMMER
97              LOGICS      65            PERMITS UNIFORM ASSIGNMENT TO FIELD
          * REMOVE LS66 CARD BELOW IF WANT TO ASSIGN GRADS TO FIELD MON THRU FRI
98              LOGICS      66      PERMITS GRADS TO BE ASSIGNED ON FRIDAYS ONLY
          *         *         *         *         *         *          NOTE BELOW
          * %   %   %  %  % % %  % % % % % % % % % % % %  % %  % % % %NOTE BELOW
          *PART OF PROGRAM TO RECORD NUMBER OF GRADS TO FIELD EACH MONTH
99              SAVEVALUE   20,83,H
100             SAVEVALUE   21,115,H
101             SAVEVALUE   22,145,H
102             SAVEVALUE   23,176,H
103             SAVEVALUE   24,208,H
104             SAVEVALUE   25,236,H
105             SAVEVALUE   26,267,H
106             SAVEVALUE   27,297,H
107             SAVEVALUE   28,329,H
108             SAVEVALUE   29,359,H
109             SAVEVALUE   30,390,H
110             SAVEVALUE   31,455,H
111             SAVEVALUE   32-55,0,H
          *  $$$$$$$      $$$$$$$$       $$$$$$$$       $$$$$$$$     $$$$$$
112             TRANSFER    ,ASGN1
113       TES4  TEST E      C1,XH*3,ASG1
114             ASSIGN      3+,1
115             ASSIGN      1,1       CLASS IS DAY CLASS
116             ASSIGN      10,13
117             LOGICS      2
118             ADVANCE     1     ENTER ON A MONDAY HOLIDAY EXIT ON A TUESDAY
```

```
119             LOGICR      2
120             LOGICS      1
121             TRANSFER    SBR,CLASS,19
122             TRANSFER    ,ADV1
123      CLASS  ASSIGN      8-9,MH*4(V*5,2)
               *THIS SBR CREATES STUDENT INPUT,ASSIGNS TRAINING MODE,ASSIGNS COURSE
               * COMPLETION TIME DISTRIBUTION, AND HELPS COMPUTE TRAINING LOAD
124             TEST G      P8,0,TRAN5
125             MSAVEVALUE  *4,V*5,6,*8,H
126             MSAVEVALUE  *4,V*5,7,*8,H
127             SAVEVALUE   305,P8,H          STUDENTS STARTING TRAINING TODAY
128             SAVEVALUE   9-10+,1,H
129             SAVEVALUE   XH10,V12,H        MH AND ROW #S FOR CLASS CCT DATA
130             ASSIGN      9,V26       DETERMINES NUMBER OF PI STUDENTS
131             ASSIGN      8-,P9
132             ASSIGN      2,FN1
133             MSAVEVALUE  *4,V*5,*10,*8,H
134             MSAVEVALUE  *4,V*5,30,V21,H       ID# AV CCT DISTRIBUTION
135             ASSIGN      10+,1
136             MSAVEVALUE  *4,V*5,*10,*9,H
137             SAVEVALUE   301+,P8,H         NUMBER OF STUDENTS ENTERING COURSE
138             SAVEVALUE   301+,P9,H         NUMBER OF STUDENTS ENTERING COURSE
139             SPLIT       *8,ASG5,,5
140             ASSIGN      2,FN2
141             ASSIGN      1+,1     ID FOR PI STUDENT
142             MSAVEVALUE  *4+,V*5,30,P2,H       ID# PI CCT DISTRIBUTION
143             SPLIT       *9,ASG5,,5
144      TRAN5  TRANSFER    SBR,TLOAD,20
145             TRANSFER    P,19,1
146      TLOAD  ASSIGN      10,FN3       PERCENT OF STUDENTS ABSENT
               *            *            *           *           *          NOTE BELOW
               * THIS SBR MAKES DAILY HEAD AND ABSENTEE COUNT FOR TRAINING LOAD REPORT
147             GATE LS     1,ASG6
148             ASSIGN      10+,P10     DOUBLES ABSENTEE RATE FOLLOWING HOLIDAYS
149             LOGICR      1
150      ASG6   ASSIGN      18,2
151             ASSIGN      13,5
152             ASSIGN      14,12
153             ASSIGN      12,6
154      ASG7   ASSIGN      14+,1
155             ASSIGN      11,2
156      ASG8   ASSIGN      15,4
157             ASSIGN      12+,1
158      ASG9   ASSIGN      16,V6
159             ASSIGN      17,V7
160             SAVEVALUE   304+,P17,H       ABSENTEES THIS DAY
161             SAVEVALUE   305+,P16,H       TOTAL STUDENTS IN TRAINING
162             MSAVEVALUE  *4+,V*5,5,*17,H
163             MSAVEVALUE  *4+,V*5,6,*16,H
164             MSAVEVALUE  *4+,V*5,*12,*16,H
165             MSAVEVALUE  *4+,V*5,*14,*16,H
166             ASSIGN      13-14+,1
167             LOOP        15,ASG9
168             LOOP        11,ASG8
169             LOOP        18,ASG7
170             TABULATE    3                 DAILY ABSENTEE RATE
171             SAVEVALUE   304-305,0,H
```

```
172             TRANSFER    P,20,1
173       ASG5  ASSIGN      2,FN*2
          *       *           *           *           *           *          NOTE BELOW
          * THIS PART SIMULATES STUDENT FLOW THROUGH 76P20 COURSE
174             ASSIGN      5,P2
175             ASSIGN      3,V13       CODE FOR ANNEX AND XH TO RECORD CLASS CCT
176             ASSIGN      4,P1
177             ASSIGN      4+,4
178             ASSIGN      1,V17     CODE FOR STORAGE NUMBERS
179             ASSIGN      4,V33                 ANNEX A CCT
180             ASSIGN      5-,P4
181             ASSIGN      4-,1
182             PRIORITY    0
183             ENTER       V10
184             TEST E      BV12,1,ENT2           AV STUDENT
185             ENTER       21          AV STORAGE
186       ENT1  ENTER       V11
187             JOIN        V14
188             TRANSFER    .002,,HMS3
189       ADV2  ADVANCE     1
190             TRANSFER    .002,,HMS3
191             GATE LS     6,GATE2
192             ADVANCE     1      ENTER ON A SATURDAY EXIT ON SUNDAY
193             TRANSFER    .002,,HMS3
194             TRANSFER    ,ADV2
195       ENT2  ENTER       22          PI STORAGE
196             TRANSFER    ,ENT1
197       HMS3  MSAVEVALUE  XH7+,V*XH8,4,1,H   RECORD STUDENTS LOST TO ATTRITION
198       LEAV1 LEAVE       V10
199             TEST E      BV12,1,LEAV3          AV STUDENT
200             LEAVE       21          AV STORAGE
201       LEAV4 LEAVE       V11
202             REMOVE      V14
203             TERMINATE
204       LEAV3 LEAVE       22          PI STORAGE
205             TRANSFER    ,LEAV4
206       GATE2 GATE LR     2,ADV2
207             LOOP        4,GATE3
208             EXAMINE     4,,EXAM1          STUDENTS COMPLETING ANNEX D
209             SAVEVALUE   V15+,P2,H         RECORD TOTAL CCT THIS CLASS
210             ASSIGN      4,V15
211             ASSIGN      4+,80       XH FOR MH# AND ROW# OF CLASS START
212             MSAVEVALUE  V8+,V9,3,1,H    TOTAL GRADUATES FROM THIS CLASS
213             MSAVEVALUE  XH7+,V*XH8,12,1,H
214             SAVEVALUE   292+,1,H  TOTAL STUDENTS GRADUATED
215             TEST E      BV12,1,TA81       STUDYING UNDER AV MODE
216             TABULATE    1                 CCT UNDER AV MODE
217             SAVEVALUE   276+,1,H          AV GRADUATES
218             TRANSFER    ,LEAV1
219       TA81  TABULATE    2                 CCT UNDER PI MODE
220             SAVEVALUE   277+,1,H          PI GRADUATES
221             TRANSFER    ,LEAV1
222       GATE3 GATE LS     3,ADV2                 XMAS HOLIDAYS START TOMORROW
223             ADVANCE     16
224             TRANSFER    .032,,HMS3
225             TRANSFER    ,ADV2
226       EXAM1 EXAMINE     1,,EXAM2          STUDENTS COMPLETING ANNEX A
```

```
227             ASSIGN      4,V84                   ANNEX B CCT
228       AGN4  ASSIGN      5-,P4
229       LEAV2 LEAVE       V11
230             REMOVE      V14
231             ASSIGN      1+,4
232             ASSIGN      3+,1000
233             TRANSFER    ,ENT1
234       EXAM2 EXAMINE     2,,ASG10          STUDENTS COMPLETING ANNEX B
235             ASSIGN      4,V35                   ANNEX C CCT
236             TRANSFER    ,AGN4
237       ASG10 ASSIGN      4,P5                    ANNEX D CCT
238             TRANSFER    ,LEAV2
          * THIS IS END OF PROGRAM FOR 76P20 STUDENTS
          * START OF PROGRAM TO EVALUATE FOLLOW-ON COURSE ASSIGNMENT POLICIES
239       ASGN1 ASSIGN      1-2,1
240             ASSIGN      3-4,14
241             ASSIGN      4+,1
242             ASSIGN      5,MH*1(*3,12)
243             ASSIGN      7,0
244             ASSIGN      6,15
245             ASSIGN      41,6          MH FOR CLASS START DATA
          * %   %     %  %  % % %  % % % % % % % % % % % % % %  % %  % % % %NOTE BELOW
          *PART OF PROGRAM TO RECORD NUMBER OF GRADS TO FIELD EACH MONTH
246             ASSIGN      46,20
247             ASSIGN      47,32          XH ID FOR RECORDING GRADS PER MONTH
          *  $$$$$$$       $$$$$$$$$         $$$$$$$$        $$$$$$$$$     $$$$$$
248             GATE LR     60,GATE4         WORKING ON POLICY 1
          *  $$$$$$$       $$$$$$$$$         $$$$$$$$        $$$$$$$$$     $$$$$$
249             GATE LR     69,ASG13     FOR RUNNING POLICY 1 TWICE
          *  $$$$$$$       $$$$$$$$$         $$$$$$$$        $$$$$$$$$     $$$$$$
250             ASSIGN      34,37
251       ASN1  ASSIGN      7+,1
252             LOGICR      *7
253             LOOP        6,ASN1
254             ASSIGN      7,168         CLASS ORDER AND SIZE
255             ASSIGN      35+,1         XH ID FOR WAIT TIME
256             GATE LS     60,TRFR1          NOT WORKING ON POLICY #1
257             ASSIGN      7+,1
258       TRFR1 TRANSFER    SBR,START,28
259       ASIN2 ASSIGN      3-4+,1              P3 IS MONDAY P4 IS TUESDAY
260             TRANSFER    SBR,FIND,27
261             TRANSFER    SBR,GRADS,26
262             TRANSFER    SBR,START,28
263             ASSIGN      3-4+,1              P3 IS TUESDAY P4 IS WEDNESDAY
264             TRANSFER    SBR,FIND,27
265             TEST E      MH*2(*4,1),185,TRFR2    IS TOMORROW 4TH OF JULY
266             ASSIGN      5+,MH*1(*3,12)
267             SAVEVALUE   *35+,P5,H
268             TRANSFER    ,ASGN2
          *  $$$$$$$       $$$$$$$$$         $$$$$$$$        $$$$$$$$$     $$$$$$
269       ASG13 ASSIGN      34,44         FOR RUNNING POLICY 1 TWICE
270             ASSIGN      41+,1         FOR RUNNING POLICY 1 TWICE
271             ASSIGN      47,44         ID OF XH FOR GRADS IN POLICY 1F
272             TRANSFER    ,ASN1         FOR RUNNING POLICY 1 TWICE
          *  $$$$$$$       $$$$$$$$$         $$$$$$$$        $$$$$$$$$     $$$$$$
273       TRFR2 TRANSFER    SBR,GRADS,26
274             TRANSFER    SBR,START,28
```

```
275      ASGN2 ASSIGN      3-4*,1              P3 IS WEDNESDAY P4 IS THURSDAY
276            TRANSFER    SBR,FIND,27
277            TEST E      MH*2(*4,1),328,GAT13       TOMORROW IS THANKSGIVING
278            ASSIGN      5*,MH*1(*3,12)
279            SAVEVALUE   *35*,P5,H
280            TRANSFER    ,ASGN3
281      GAT13 GATE LR     61,GAT15            NOT WORKING ON POLICY 3
282      TRFR3 TRANSFER    SBR,GRADS,26
               *  $$$$$$$        $$$$$$$$$        $$$$$$$        $$$$$$$$$     $$$$$$
283            LOGICS      63    PERMITS GRADS TO FIELD ON THURSDAY
284            TRANSFER    SBR,START,28
285            LOGICR      63    PERMITS GRADS TO FIELD ON THURSDAY
               *  $$$$$$$        $$$$$$$$$        $$$$$$$$        $$$$$$$$$     $$$$$$
286      ASGN3 ASSIGN      3-4*,1              P3 IS THURSDAY P4 IS FRIDAY
287            TRANSFER    SBR,FIND,27
288            LOGICS      6
289            TRANSFER    SBR,GRADS,26
290            TRANSFER    ,TRFR1
291      GAT15 GATE LS     7,LOG15             QMS SCHEDULE IS COMPLETED
292            TRANSFER    ,TRFR3
293      LOG15 LOGIC S     62
               *LS62 SET IF ON POL. 3,QMS SCHED. NOT COMPLETED, AND TOMORROW IS THURS
               *QMS SCHEDULE HAS NO CLASS STARTS ON THURS--SEND STUDENTS TO FIELD
294            TRANSFER    SBR,GRADS,26
295            TRANSFER    ,ASGN3
296      GATE4 GATE LR     61,ASG2             WORKING ON POLICY 2
297            ASSIGN      34,44
298            ASSIGN      41*,1         CLASS START MH # FOR 2ND POLICY
299            TRANSFER    ,ASN1
300      ASG2  ASSIGN      34,50               MH COL. FOR 76P20S TO FIELD
301            ASSIGN      41*,2
302            TRANSFER    ,ASN1
               *          *          *          *          *          *  NOTICE
               * THIS SBR CONTOLS THE ASSIGNMENT OF THE GRADUATES TO CLASSES IN ONE
               * OF THE FOLLOW-ON COURSES
303      START GATE LR     10,TST2             ALL COURSES QUOTAS NOT FILLED
304            GATE LR     60,GATE5            WORKING ON POLICY 1
305      TST1  TEST GE     P5,XH5,TST2         MORE GRADS AVAILABLE THAN MIN CLASS
306            TEST G      P5,XH6,ASN2         MORE GRADS AVAILABLE THAN MAX CLASS
307            ASSIGN      6,XH6
308      ASN3  ASSIGN      7*,1
               * LOG 7 IS SET WHEN SCHEDULE FOR 1ST 106 CLASSES IS COMPLETED
309            GATE LR     7,TST3
310            GATE LR     8,ASN4        NONE OF COURSE QUOTAS FILLED
311            ASSIGN      8,V28         COURSE ID NUMBER
312      TST4  TEST GE     P7,274,TRA1
313            LOGICS      7
314      TRA1  TRANSFER    SBR,CORSE,30
315            TEST GE     P14,150,TRA4
               * THIS PART OF SBR NOT USED UNTIL REMAINING QUOTA LESS CLASS(P14) TO BE
               * ASSIGNED IS LESS THAN 150
316      HMSA2 MSAVEVALUE  *2*,*4,*9,*6,H    RECORD ASSIGNMENT OF CLASS
317            TRANSFER    SBR,NOCLA,45      RECORDS NUMBER OF CLASSES STARTED
318            ASSIGN      5-,P6
319            SAVEVALUE   *12-,P6,H
320            TEST E      XH*12,0,TST1      IS QUOTA FOR THIS COURSE FILLED
321            LOGICS      8
```

```
322             LOGICS      *8
323             TEST E      BV11,1,TST1    ALL COURSE QUOTAS FILLED
324             LOGICS      10
325             TRANSFER    ,TST2
                *       *       *       *       *       *       *  NOTICE
                * THIS SBR RECORDS BY DATE THE NUMBER OF CLASSES STARTED EACH COURSE
326          NOCLA ASSIGN   42+,1       COUNTS CLASSES AND MH ROWS
327             ASSIGN      43,MH*2(*4,1)    JULIAN DATE
328             TEST NE     P43,P44,ASG4     IS THIS A NEW DATE FROM PREVIOUS ONE
329             MSAVEVALUE  *41,*42,1,*43,H       JULIAN DATE OF CLASS START
330          HMSA5 MSAVEVALUE *41+,*42,V39,1000,H
331             MSAVEVALUE  *41+,125,V39,1,H      TOTAL CLASSES STARTED
332             GATE LS     61,GAT21    WORKING ON POLICY 3
333             GATE LS     7,ASG15
334          ASG17 ASSIGN   13,P6
335          HMSA6 MSAVEVALUE *41+,*42,V39,*13,H
336             MSAVEVALUE  *41+,124,V39,*13,H
337          ASG16 ASSIGN   44,P43
338             TRANSFER    P,45,1
339          ASG15 ASSIGN   13,P5
340             TRANSFER    ,HMSA6
341          GAT21 GATE LR  60,ASG15    WORKING ON POLICY 1
342             TRANSFER    ,ASG17
343          ASG4  ASSIGN   42-,1       RECORD 2ND CLASS STARTED SAME DATE
344             TRANSFER    ,HMSA5
345          GATE5 GATE LR  61,GAT3           WORKING ON POLICY 2
346          TSTE1 TEST GE  P5,V36,TST2       ENOUGH GRADS TO START CLASS
347             TRANSFER    SBR,SINTO,19
348             GATE LS     10,TSTE1         ALL COURSE QUOTAS FILLED
349          GATE7 GATE LR  9,FIND
350             TRANSFER    ,TST2
                *       *       *       *       *       *       *  NOTICE
                * THIS PART OF THE PROGRAM IS USED ONLY UNDER POLICY # 3
351          GAT3  GATE LR  7,TES5           QMS SCHEDULE NOT COMPLETED
                * THIS PART WHEN QMS SCHEDULE HAS NO BEEN COMPLETED
352          TES7  TEST E   MH*2(*4,1),XH*V37,TST2    IS CLASS TO START TOMORROW
353          TES13 TEST GE  P5,V36,TES8       ENOUGH GRADS TO START CLASS
354             TRANSFER    SBR,SINTO,19
355             GATE LS     10,GAT16
356             TRANSFER    ,GATE7
357          GAT16 GATE LS  7,TES7
358             TRANSFER    ,TST2
359          TES8  TEST GE  P5,20,TES9       ENOUGH FOR MIN. SIZE CLASS
360             LOGICS      57
361             TRANSFER    SBR,SINTO,19
362             GATE LS     7,LOGS2
363             TRANSFER    ,TES10
364          LOGS2 LOGIC R  57
365             TRANSFER    ,TES7
366          TES9  TEST L   P7,274,LOGS1     QMS SCHEDULE NOT COMPLETED
367             ASSIGN      7+,1
368             TRANSFER    ,GAT3
369          LOGS1 LOGIC S  7
370             LOGICS      57
371             TRANSFER    ,TST2
372          TES5  TEST NE  BV11,1,GATE7     ALL COURSE QUOTAS NOT FILLED
                * THIS PART WHEN QMS SCHEDULE IS COMPLETED OR SCHEDULE CLASS SIZE CAN
```

```
        * NOT BE MET
373     TES10  TEST GE     P5,20,TST2
374     TES6   TEST LE     P8,4,AGN5
375            ASSIGN      8*,1
376            TRANSFER    ,GAT10
377     AGN5   ASSIGN      8,1
378     GAT10  GATE LR     *8,TES6
379            TEST LE     P5,45,AGN6
380            ASSIGN      6,P5
381     TRFR6  TRANSFER    SBR,CORSE,30
382            TEST L      P6,XH*12,AGN8
383            TEST L      P14,20,HMSA3
384            ASSIGN      16,P6
385            ASSIGN      16-,20
386            ASSIGN      15,20
387            ASSIGN      15-,P14
388            TEST GE     P16,P15,LOG9
389            ASSIGN      6-,P15
390            TRANSFER    ,HMSA3
391     AGN6   ASSIGN      6,45
392            TRANSFER    ,TRFR6
393     LOG9   LOGIC S     *8
394            TEST E      BV11,1,LOGS3
395            LOGICR      *8
396            TRANSFER    ,TST2
397     LOGS3  LOGIC R     *8
398            TRANSFER    ,TES6
399     AGN8   ASSIGN      6,XH*12
400     HMSA3  MSAVEVALUE  *2*,*4,*9,*6,H        ASSIGN TO COURSE
401            TRANSFER    SBR,NOCLA,45
402            SAVEVALUE   *12-,P6,H
403            ASSIGN      5-,P6
404            TEST LE     XH*12,0,TES12
405            LOGICS      8
406            LOGICS      *8
407     TES12  TEST E      BV11,1,GAT17
408            LOGICS      10
409            TRANSFER    ,GATE7
410     GAT17  GATE LR     11,TES15
411            ASSIGN      38,V20
412            LOGICS      11
413     TES15  TEST E      P38,V20,LOG1
414            ASSIGN      39*,1
415            TEST GE     P39,4,TES10
416            ASSIGN      39,0
417            LOGICR      11
418            TRANSFER    ,TST2
419     LOG1   LOGIC R     11
420            ASSIGN      39,0
421            TRANSFER    ,TES10
        * END OF  POLICY #3 ONLY PART OF PROGRAM
422     ASN2   ASSIGN      6,P5
423            TRANSFER    ,ASN3
424     TST3   TEST LE     P8,4,ASN5
425            ASSIGN      8*,1
426     GAT1   GATE LS     8,TRA1
427     GAT2   GATE LR     *8,TST3
```

```
428             TRANSFER    ,TRA1
429       ASN5  ASSIGN      8,1
430             TRANSFER    ,GAT1
431       ASN4  ASSIGN      8,V28       COURSE ID NUMBER
432             GATE LS     *8,TST4     QUOTA FOR THIS COURSE IS FILLED
433             ASSIGN      7+,1
434             TEST GE     P7,274,ASN4
435             LOGICS      7
436             TEST E      P7,274,TST3
437             ASSIGN      8,V28       COURSE ID NUMBER
438             TRANSFER    ,GAT2
439       TRA4  TRANSFER    SBR,CAFIL,27
440             GATE LS     12,ASN13
441             LOGICR      12
442             TRANSFER    ,HMSA2
443       CAFIL GATE LS     13,GAT18    IS CLASS SIZE GE35 & LE45
              * % % % % % % % % % % % % % % % % % % % % %NOTE BELOW
              * THIS SBR DETERMINES IF CLASS CAN BE ASSIGNED TO COURSE
              * CLASS WILL NOT BE ASSIGNED IF THE QUOTA WHICH WOULD REMAIN WOULD
              * NOT BE DIVISIBLE BY ANY NUMBER BETWEEN 35 AND 45
444             TEST E      BV1,1,TEST2     REMAINING QUOTA GE 140 & LE 149
445             ASSIGN      15,V25
446             TEST G      P6,P15,LOG12        CAN MAX CLASS SIZE BE ASSIGNED
447             ASSIGN      6,P15
448       LOG12 LOGIC S     12          CLASS CAN BE STARTED
449       TRA5  TRANSFER    P,27,1
450       GAT18 GATE LS     14,ASN20    IS CLASS SIZE GE30 & LE45 OR GE25 & LE45
451             TRANSFER    ,TEST6
452       TEST2 TEST E      BV2,1,TEST3     REMAINING QUOTA GE 136 & LE 139
453             ASSIGN      15,140
454       ASN12 ASSIGN      15-,P14
455             ASSIGN      16,P6
456             ASSIGN      16-,XH5             XH5 IS MIN CLASS SIZE
457             TEST GE     P16,P15,TRA5
              * REDUCES CLASS SIZE TO ASSURE REMAINING QUOTA CAN BE MET
458             ASSIGN      6-,P15
459             TRANSFER    ,LOG12
460       TEST3 TEST E      BV3,1,TEST4         REMAINING QUOTA GE 105 & LE 135
461             TRANSFER    ,LOG12
462       TEST4 TEST E      BV4,1,TEST5         REMAINING QUOTA GE 91 & LE 104
463             ASSIGN      15,105
464             TRANSFER    ,ASN12
465       TEST5 TEST E      BV5,1,TEST6         REMAINING QUOTA GE 70 & LE 90
466             TRANSFER    ,LOG12
467       TEST6 TEST E      BV6,1,TEST8
468             ASSIGN      15,V24
469             TRANSFER    ,ASN12
470       TEST8 TEST E      BV8,1,TEST9     REMAINING QUOTA GE XH5 & LE XH6
471             TRANSFER    ,LOG12
472       TEST9 TEST E      BV9,1,ASN20
473             ASSIGN      15,XH5              XH5 IS MIN CLASS SIZE
474             TRANSFER    ,ASN12
475       ASN20 ASSIGN      15,XH*12
476             TEST E      BV10,1,ASN23
477             TEST G      P6,P15,TRA5
478             ASSIGN      6,P15
479             TRANSFER    ,LOG12
```

```
480      ASN21 ASSIGN      69,69        ERROR STOP
481            TERMINATE   1
482      ASN13 ASSIGN      30,P8
         * CLASS NOT ASSIGNED TO NEXT SCHEDULED COURSE IF QUOTA REMAINING CANT
         * BE FILLED WITH CLASSES OF 35 TO 45 STUDENTS
483            LOGICS      *8
484            TRANSFER    SBR,NEXT,29
485            GATE LS     56,TST9
486            LOGICR      56
487            TEST E      P21,1,LOG6
488      LOG5  LOGIC R      *30
489            TRANSFER    ,TST2
490      LOG6  LOGIC R      *19
491            TRANSFER    ,LOG5
492      TST9  TEST E       P21,2,LOG8
         * IF P21 E 2 AND P20 G P19 3 COURSES HAVE SAME REMAINING QUOTAS
493            TEST G      P20,P19,LOG7
494            ASSIGN      20-,P19
495            ASSIGN      24,P20       2ND COURSE ID
496            ASSIGN      25,P8        3RD COURSE ID
         * THE PREVIOUS COURSE COULD NOT HAVE CLASS ASSIGNED FOR REMAINING QUOTA
         *COULD NOT BE FILLED WITH CLASSES OF 35 TO 45 STUDENTS
497            LOGICS      *8
498            TRANSFER    SBR,NEXT,29
499            LOGICR      *24
500            LOGICR      *25
501            GATE LS     56,TST10
502            LOGICR      56
503            TEST E      P21,1,LOG6
504            TRANSFER    ,LOG5
505      LOG7  LOGIC R      *19
506            TRANSFER    ,LOG8
507      LOG8  LOGIC R      *30
508            TRANSFER    ,TRA1        ASSIGN CLASS TO COURSE IN P8
509      TST10 TEST E       P21,2,LOG8
510            TEST G      P20,P19,LOG7
511            ASSIGN      20-,P19
512            ASSIGN      19,P20       4TH COURSE ID
513            TRANSFER    ,LOG7
514      TST2  TEST G       P5,0,TRA2
515            GATE LR     9,TRA2       QUOTA FOR 76P20 NOT FILLED
516            TRANSFER    SBR,FIELD,31     SEND TO FIELD AND RECORD WAIT TIME
517      TRA2  TRANSFER    P,28,1
518      SINTO ASSIGN      6,P5
         * THIS SBR IS USED ONLY UNDER POLICY 2 AND 3
         * USED UNDER POLICY 3 ONLY UNTIL QMS SCHEDULE IS COMPLETED
519            GATE LR     57,AGN7
520            ASSIGN      5,V36
521      AGN7  ASSIGN      8,V28
522            TRANSFER    SBR,CORSE,30
523            GATE LR     57,TES14
524      HMSA4 MSAVEVALUE  *2+,*4,*9,*5,H
525            TRANSFER    SBR,NOCLA,45     RECORDS NUMBER OF CLASSES STARTED
526            SAVEVALUE   *12-,*5,H
527            ASSIGN      6-,P5
528            ASSIGN      5,P6
529            TEST LE     XH*12,0,TSTE2
```

```
530             LOGICS      8
531             LOGICS      *8
532       TSTE2 TEST L      P7,274,GAT12
533             ASSIGN      7*,1
534       TRA7  TRANSFER    P,19,1
535       TES14 TEST L      P14,20,HMSA4
536             TEST GE     V40,20,TSTF2
537             ASSIGN      5,V40
538             TRANSFER    ,HMSA4
539       GAT12 GATE LS     61,LOG13          WORKING ON POLICY 3
540             TEST NE     BV11,1,LOG13      ALL COURSE QUOTAS NOT FILLED
541             LOGICS      7
542             LOGICS      57
543             TRANSFER    ,TRA7
544       LOG13 LOGIC S     10
545             GATE LR     9,FIND
546             TRANSFER    ,TRA7
547       CORSE GATE LR     1,GAT4
548             TEST E      P8,1,GAT4
549             ASSIGN      9,32
550             ASSIGN      10,38
551             ASSIGN      11,11
552             ASSIGN      12-13,281
553             ASSIGN      21,45
554       ASN8  ASSIGN      14,XH*12
555             ASSIGN      14-,P6
556             ASSIGN      13*,5
557             GATE LR     60,GATE9          WORKING ON POLICY 1
          *  $$$$$$$       $$$$$$$$$         $$$$$$$$        $$$$$$$$$     $$$$$$
558             GATE LS     69,TRA9     FOR RUNNING POLICY 1 TWICE
559             ASSIGN      9,P10       FOR RUNNING POLICY 1 TWICE
          *  $$$$$$$       $$$$$$$$$         $$$$$$$$        $$$$$$$$$     $$$$$$
560       TRA9  TRANSFER    P,30,1
561       GATE9 GATE LR     61,ASG3           WORKING ON POLICY 2
562             ASSIGN      9,P10
563             TRANSFER    ,TRA9
564       ASG3  ASSIGN      9,P21             MH COL.# IN POLICY 3
565             TRANSFER    ,TRA9
566       GAT4  GATE LR     2,GAT5
567             TEST E      P8,2,GAT5
568             ASSIGN      9,33
569             ASSIGN      10,39
570             ASSIGN      21,46
571             ASSIGN      11,20
572             ASSIGN      12-13,282
573             TRANSFER    ,ASN8
574       GAT5  GATE LR     3,GAT6
575             TEST E      P8,3,GAT6
576             ASSIGN      9,34
577             ASSIGN      10,40
578             ASSIGN      21,47
579             ASSIGN      11,29
580             ASSIGN      12-13,283
581             TRANSFER    ,ASN8
582       GAT6  GATE LR     4,GAT7
583             TEST E      P8,4,GAT7
584             ASSIGN      9,35
```

```
585             ASSIGN      10,42
586             ASSIGN      21,48
587             ASSIGN      11,38
588             ASSIGN      12-13,284
589             TRANSFER    ,ASN8
590       GAT7  GATE LR     5,ASN9
591             TEST E      P8,5,ASN9
592             ASSIGN      9,36
593             ASSIGN      10,43
594             ASSIGN      21,49
595             ASSIGN      11,47
596             ASSIGN      12-13,285
597             TRANSFER    ,ASN8
598       ASN9  ASSIGN      69,69
599             TERMINATE   1
          *       *           *           *           *           *           NOTE BELOW
600       NEXT  ASSIGN      16,5
          * PICKS NEXT COURSE WITH UNFILLED QUOTA AND REMAINING QUOTA NOT EQUAL
          * TO THAT FOR COURSE TO WHICH CLASS COULDNT BE ASSIGNED
601             ASSIGN      19-21,0
602       ASN27 ASSIGN      17-18,0
603             ASSIGN      21+,1
604       ASN22 ASSIGN      17+,1
605             GATE LS     *17,LOOP1
606             ASSIGN      18+,1
607       LOOP1 LOOP        16,ASN22
608             TEST LE     P18,4,LOG11
609       ASN23 ASSIGN      8+,1
610             TEST G      P8,5,GAT9
611             ASSIGN      8,1
612       GAT9  GATE LR     *8,ASN23
613             ASSIGN      12,280
614             ASSIGN      12+,P8
615             ASSIGN      14,XH*12
616             ASSIGN      14-,P6
617             TRANSFER    SBR,CAFIL,27
618             GATE LS     12,ASSI2
619             LOGICR      12
620             TRANSFER    ,TRA3
621       ASSI2 ASSIGN      19,P8
622             ASSIGN      20+,P8
623             TEST L      P18,4,LOG11
624             TEST L      P21,2,LOG11
625             LOGICS      *8
626             ASSIGN      16,5
627             TRANSFER    ,ASN27
628       LOG11 LOGIC S     56
629       TRA3  TRANSFER    P,29,1
          *       *           *           *           *           *           NOTE BELOW
630       FIELD ASSIGN      6,P5
          * TO PERMIT GRADUATES TO BE ASSIGNED TO FIELD ON ANY WEEK DAY
          * REMOVE LS63 & LR64 IN SBR GRADS & REMOVE LS66
          * LOG 10 IS SET WHEN ALL COURSE QUOTAS HAS BEEN FILLED
631             GATE LR     10,TST11        ALL COURSE QUOTAS NOT FILLED
632             GATE LS     66,GAT19    ASSIGN ON FRIDAYS ONLY
633             GATE LS     63,SAV1     IS TOMORROW A FRIDAY
634             GATE LS     64,GAT8     ASSIGN DURING SUMMER MONTHS
```

```
635      GAT20 GATE LS     65,TST11   UNIFORM ASSIGNMENT IN EFFECT
636            TEST G      P5,V41,ASN26     MORE GRADS THAN UNIFORM GOAL
637            ASSIGN      5,V41
638            TRANSFER    ,AGN9
639      GAT19 GATE LS     64,GAT8     ASSIGN DURING SUMMER MONTHS
640            TRANSFER    ,GAT20
641      GAT8  GATE LR     58,GAT14
642            TEST GE     V20,54,SAV1          TOMORROW IS SEPT 1,1972 OR LATER
643            LOGICS      58
644      GAT14 GATE LR     59,TST5
645            TEST GE     V20,330,GAT11    TOMORROW IS ON OR AFTER JUNE 1,1973
646            LOGICS      59
647      TST5  TEST L      V20,423,TST11    TOMORROW IS ON OR BEFORE SEPT 1,1973
648            TRANSFER    ,SAV1
649      TST11 TEST G      P5,XH293,ASN26
650            ASSIGN      5,XH293
651      AGN9  ASSIGN      6-,P5
652      HMSA1 MSAVEVALUE  *2,*4,*34,*5,H
         * %   %     %   %  % % % % % % % % % % % % % % % % %  % %  % % % %NOTE BELOW
         *PART OF PROGRAM TO RECORD NUMBER OF GRADS TO FIELD EACH MONTH
653            TEST G      V20,XH*46,SAVE3
654            ASSIGN      46-47+,1
655      SAVE3 SAVEVALUE   *47+,P5,H
         *  $$$$$$$        $$$$$$$$$        $$$$$$$$        $$$$$$$$     $$$$$$
656            SAVEVALUE   293-,P5,H       REDUCE REMAINING QUOTA
657            TEST E      XH293,0,ASN25     IS QUOTA FILLED
658            LOGICS      9
659            GATE LR     10,FIN0
660      ASN25 ASSIGN      5,P6
661      SAV1  SAVEVALUE   *35+,P5,H        RECORD WAIT TIME FOR WAITING GRADS
662            TRANSFER    P,31,I
663      ASN26 ASSIGN      6,0
664            TRANSFER    ,HMSA1
665      GAT11 GATE LS     65,TST11   UNIFORM ASSIGNMENT IN EFFECT
666            TEST G      P5,V44,ASN26
667            ASSIGN      5,V44
668            TRANSFER    ,AGN9
         *        *          *          *          *          *          NOTE BELOW
669      GRADS ASSIGN      6,MH*1(*3,12)
670            ASSIGN      5+,P6
671            GATE LS     6,GATE6          DOES P3 = THURSDAY
672            GATE LR     9,SAVA2          QUOTA FOR 76P20S NOT FILLED
673            TEST G      P5,0,ASIN3        ANY GRADS TODAY
674            LOGICS      63
675            TRANSFER    SBR,FIELD,31
676            LOGICR      63
677      ASIN3 ASSIGN      3-4+,1            P3 IS FRIDAY P4 IS SATURDAY
678            TRANSFER    SBR,FIN0,27
679            ASSIGN      5+,MH*1(*3,12)
680            ASSIGN      6,V29       COMPUTE WAIT TIME SATURDAY TO MONDAY
681            SAVEVALUE   *35+,P6,H  RECORD WEEKEND WAIT TIME
682            LOGICR      6
683            ASSIGN      3-4+,2
684            TRANSFER    SBR,FIN0,27
685            TEST E      MH*2(*4,30),5,TRFR4    IS TODAY A MONDAY HOLIDAY
686            TEST E      MH*2(*4,1),360,SAVE1
687            ASSIGN      3,83
```

```
688             ASSIGN      4,84
689             ASSIGN      6,V30       COMPUTE WAIT TIME OVER XMAS HOLIDAYS
690             SAVEVALUE   *35+,P6,H
691      TRFR4  TRANSFER    P,26,1
692      SAVA2  SAVEVALUE   *35+,P5,H   WAIT TIME THURS GRADS FOR NEXT CLASS
693             GATE LR     10,FIND
694             TRANSFER    ,ASIN3
695      GATE6  GATE LS     62,TRFR4        DOES P3 = WEDNESDAY
        *LS62 SET IF ON POL. 3,QMS SCHED. NOT COMPLETED, AND TOMORROW IS THURS
        *QMS SCHEDULE HAS NO CLASS STARTS ON THURS--SEND STUDENTS TO FIELD
696             LOGICR      62
697             GATE LR     9,SAVA1         QUOTA FOR 76P20 NOT FILLED
698             TEST G      P5,0,TRFR4
699             TRANSFER    SBR,FIELD,31    SEND WED GRADS TO FIELD
700      TRFR7  TRANSFER    ,TRFR4
701      SAVA1  SAVEVALUE   *35+,P5,H   WAIT TIME WEDNES GRADS FOR NEXT CLASS
702             GATE LR     10,FIND
703             TRANSFER    ,TRFR7
704      SAVE1  SAVEVALUE   *35+,P5,H
705             TRANSFER    ,ASIN2
        *         *          *          *          *          *          NOTE BELOW
706      FIND   GATE LS     9,TST12          HAS 76P20 QUOTA BEEN FILLED
        * THIS SBR CONTROLS STOPPING OF SIMULATION, STARTING POLICY 2, AND
        * CHANGING OF MATRIX AND ROW INDEX NUMBERS (P1-P4)
707             GATE LS     10,TST12    ARE QUOTAS FOR FOLLOW-ON COURSES FILLED
708             GATE LR     60,GATER        FINISHED POLICY 1
        *         *          *          *          *          *          *  NOTICE
        *   NOTE    NOTE    INSERT LS60 BELOW TO RUN POLICY 2 SERIES
709             GATE LR     70,TERM1    FOR RUNNING POLICY 1 TWICE
710             LOGICS      69          FOR RUNNING POLICY 1 TWICE
711             LOGICS      70          FOR RUNNING POLICY 1 TWICE
712             LOGICR      66     USED TO PERMIT RUNNING OF POLICIES 10 AND 1F
        *  $$$$$$$       $$$$$$$$$       $$$$$$$$       $$$$$$$$$    $$$$$$
713             PRINT       ,,LG,A
714             PRINT       281,294,XH,A
715      SAVE2  SAVEVALUE   281,XH286,H
716             SAVEVALUE   282,XH287,H
717             SAVEVALUE   283,XH288,H
718             SAVEVALUE   284,XH289,H
719             SAVEVALUE   285,XH290,H
720             SAVEVALUE   293,XH294,H
721             ASSIGN      42,0        CLEAR FOR 2ND POLICY
722             LOGICR      57
723             LOGICR      58
724             LOGICR      59
725             TRANSFER    ,ASGN1
726      GATE8  GATE LR     61,TERM1         FINISHED POLICY 2
727             LOGICS      61
728             PRINT       ,,LG,A
729             PRINT       281,294,XH,A
730             TRANSFER    ,SAVE2
731      TERM1  TERMINATE   1
732      TST12  TEST GE     P3,99,TRFR5
733             TEST E      P3,99,ASGN4
734             ASSIGN      2+,1
735             ASSIGN      4,1
736      TRFR5  TRANSFER    P,27,1
```

```
737       ASGN4 ASSIGN      1+,1
738             ASSIGN      3,1
739             TRANSFER    ,TRFR5
          1     TABLE       P2,15,1,43
          2     TABLE       P2,15,1,43
          3     TABLE       V31,0,1,15
                START       1
                REPORT
                EJECT
*                                          MATRICES COLUMN DEFINITIONS
                SPACE       2
*                 COL.1  THE NUMERICAL CALENDAR DATE
*                 COL.2  THE NUMBER OF STUDENTS REPORTING FOR 76P20 TRAINING
*                 COL.3  THE MEAN COURSE COMPLETION TIME IN DAYS FOR THIS CLASS
*                 COL.4  THE NUMBER OF STUDENTS DROPPED FROM TRAINING THIS DATE
*                 COL.5  THE NUMBER OF STUDENTS ABSENT FROM TRAINING THIS DATE
*                 COL.6  THE NUMBER OF STUDENTS PRESENT FOR TRAINING THIS DATE
*                    COL.7  TRAINING LOAD ANNEX A STUDENTS
*                    COL.8  TRAINING LOAD ANNEX B STUDENTS
*                    COL.9  TRAINING LOAD ANNEX C STUDENTS
*                    COL.10 TRAINING LOAD ANNEX D STUDENTS
                SPACE       1
*                 COL.11 THE NUMERICAL CALENDAR DATE
*                 COL.12 THE NUMBER OF STUDENTS COMPLETING TRAINING THIS DATE
*                       COL.13  ANNEX A,DAY STUDENTS IN AV MODE
*                       COL.14  ANNEX A,DAY STUDENTS IN PI MODE
*                       COL.15  ANNEX A,NIGHT STUDENTS IN AV MODE
*                       COL.16  ANNEX A,NIGHT STUDENTS IN PI MODE
                SPACE       1
*                          COL.17  ANNEX B,DAY STUDENTS IN AV MODE
*                          COL.18  ANNEX B,DAY STUDENTS IN PI MODE
*                          COL.19  ANNEX B,NIGHT STUDENTS IN AV MODE
*                          COL.20  ANNEX B,NIGHT STUDENTS IN PI MODE
                SPACE       1
*                 COL.21 THE NUMERICAL CALENDAR DATE
*                             COL.22  ANNEX C,DAY STUDENTS IN AV MODE
*                             COL.23  ANNEX C,DAY STUDENTS IN PI MODE
*                             COL.24  ANNEX C,NIGHT STUDENTS IN AV MODE
*                             COL.25  ANNEX C,NIGHT STUDENTS IN PI MODE
                SPACE       1
*                                COL.26  ANNEX D,DAY STUDENTS IN AV MODE
*                                COL.27  ANNEX D,DAY STUDENTS IN PI MODE
*                                COL.28  ANNEX D,NIGHT STUDENTS IN AV MODE
*                                COL.29  ANNEX D,NIGHT STUDENTS IN PI MODE
*                                                    COL.30 TOT OF AV AND PI
I CCT DISTRIBUTIONS FOR CLASSES (AV/PI)
                SPACE       1
*                 COL.31 THE NUMERICAL CALENDAR DATE
*                                      COL. 32 Q CLASSES UNDER POLICY #10'
*                                      COL. 33 R CLASSES UNDER POLICY #10'
*                                      COL. 34 S CLASSES UNDER POLICY #10'
*                                      COL. 35 T CLASSES UNDER POLICY #10'
*                                      COL. 36 U CLASSES UNDER POLICY #10'
*                                      COL. 37 GRADUATES ASSIGNED TO FIELD AS 76
6P20S UNDER POLICY #10'
                SPACE       1
*                                         COL. 38 Q CLASSES UNDER POLICY #1F'
```

```
*                                       COL. 39 R CLASSES UNDER POLICY #1F'
*                                       COL. 40 S CLASSES UNDER POLICY #1F'
*         COL.41 THE NUMERICAL CALENDAR DATE
*                                       COL. 42 T CLASSES UNDER POLICY #1F'
*                                       COL. 43 U CLASSES UNDER POLICY #1F'
*                                       COL. 44 GRADUATES ASSIGNED TO THE FI
IELD AS 76P2OS UNDER POLICY #1F'
        SPACE       1
*                                            COL. 45 Q CLASSES IN POLICY #3
*                                            COL. 46 R CLASSES IN POLICY #3
*                                            COL. 47 S CLASSES IN POLICY #3
*                                            COL. 48 T CLASSES IN POLICY #3
*                                            COL. 49 U CLASSES IN POLICY #3
*                                            COL. 50 GRADUATES ASSIGNED TO X
THE FIELD AS 76P2OS UNDER POLICY #3
        EJECT
* POLICY #1D' FOR ASSIGNMENT OF 76P2O GRADUATES TO FOLLOW-ON COURSES
        SPACE       1
*         1)CLASS WILL NOT CONTAIN LESS THAN 35 OR MORE 45 STUDENTS
*         2)CLASSES WILL START MONDAY THROUGH THURSDAY EXCEPT HOLIDAYS
*         3)ORDER OF CLASSES ASSIGNED TO COURSES BASED ON QMS SCHEDULE
*         4)CLASSES ASSIGNED IN ALPHABETICAL ORDER AFTER FIRST 1O6 CLASSE
ES OR COMPLETION OF QMS SCHEDULE
*         5)QMS INPUT QUOTA FOR EACH FOLLOW-ON COURSE WILL BE FILLED
*         6)FIRST PRIORITY IS GIVEN TO ASSIGNMENT OF 76P2O GRADUATES TO O
ONE OF THE FOLLOW-ON COURSES
*         7)76P2O GRADUATES ARE ASSIGNED TO THE FIELD ON THURSDAYS AND FR
RIDAYS ONLY
        SPACE       3
*         POLICY #1F' FOR ASSIGNMENT OF 76P2O GRADUATES TO FOLLOW-ON COUR
RSES
*                    1)76P2O GRADUATES ARE ASSIGNED TO THE FIELD MONDAY TH
HROUGH FRIDAY EXCEPT HOLIDAYS
*                    2) A MORE UNIFORM RATE OF ASSIGNMENT OF 76P2O GRADUAT
TES TO THE FIELD THAN THAT USED IN POLICY 1D' IS USED
*                    3)ALL OTHER RULES SAME AS FOR POLICY #1D'
        SPACE       1
        SPACE       3
*                    POLICY #3 FOR ASSIGNMENT OF 76P2O GRADUATES TO FOLLOW
W-ON COURSES
        SPACE       1
*                              1)CLASS SIZE AND CLASS START DATE IS SAME A
AS QMS SCHEDULE
*                              2)IF SCHEDULED CLASS SIZE CANT BE MET, CLAS
SS WILL BE STARTED WITH 20 TO 45 STUDENTS
*                              3)IF ALL COURSE QUOTAS ARE NOT FILLED BEFOR
RE QMS SCHEDULE IS COMPLETED
*                                 A)CLASSES ASSIGNED IN ALPHABETICAL ORDER
R
*                                 B)CLASS WILL NOT CONTAIN LESS THAN 20 OR
R MORE THAN 45 STUDENTS
*                                 C)IF COMPLIANCE WITH B) ABOVE WOULD PREV
VENT A QUOTA BEING FILLED, CLASS SIZE IGNORED
*                                 D)CLASSES WILL START MONDAY THROUGH THUR
RSDAY EXCEPT HOLIDAYS
*                                 E)NOT MORE THAN FOUR (4) CLASSES WILL ST
TART ON THE SAME DAY
```

```
*                              4)GRADUATES WILL NOT BE ASSIGNED TO THE FIE
ELD IF SUCH ACTION WOULD PREVENT MEETING QMS SCHEDULE
        SPACE       3
*               POLICY FOR ASSIGNMENT OF 76P20 GRADUATES TO THE FIELD
        SPACE       1
*   1)76P20 GRADUATES IN EXCESS OF THE SPECIFIED FOLLOW-ON COURSE QUOTAS
S ARE ASSIGNED TO THE FIELD
*   2)FIRST PRIORITY IS GIVEN TO ASSIGNMENT OF GRADUATES TO FOLLOW-ON CO
OURSES
*   3)UNDER POLICY #1D' 76P20 GRADUATES ARE ASSIGNED TO THE FIELD ON THU
URSDAYS AND FRIDAYS ONLY EXCEPT
*       A)WHEN ALL FOLLOW-ON COURSE QUOTAS ARE FILLED, ASSIGNMENTS ARE MA
ADE ON ANY WEEK DAY OTHER THAN A HOLIDAY
*   4)UNDER POLICY #1F' 76P20 GRADUATES ARE ASSIGNED TO THE FIELD ON MON
NDAY THROUGH FRIDAY EXCEPT HOLIDAYS
*   5)ASSIGNMENTS TO THE FIELD ARE MADE DURING THE SUMMER MONTHS
*   6)AN EFFORT IS MADE TO PROVIDE A UNIFORM ASSIGNMENT OF 76P20 GRADUAT
TES TO FIELD UNTIL FOLLOW-ON COURSE QUOTAS ARE FILLED
        EJECT
 HMS    TITLE       1,76P20 INPUT AND OUTPUT 10 JULY THRU 16 OCT 1972
        EJECT
 HMS    TITLE       2,76P20 INPUT AND OUTPUT 17 OCT 1972 THRU 23 JAN 1973
        EJECT
 HMS    TITLE       3,76P20 INPUT AND OUTPUT 24 JAN THRU 2 MAY 1973
        EJECT
 HMS    TITLE       4,76P20 INPUT AND OUTPUT 3 MAY THRU 9 AUG 1973
        EJECT
 HMS    TITLE       5,76P20 INPUT AND OUTPUT 10 AUG THRU 7 OCT 1973
        EJECT
*                                                   76P20 COURSES STATISTICS FOR
R FY73
        SPACE       2
 25     TEXT        A TOTAL OF #XH276,2/XXXX# STUDENTS TRAINED UNDER AV MO
ODE
        SPACE       1
 25     TEXT        THE PEAK NUMBER OF AV STUDENTS WAS #S21,8/XXX#
*                                                                       (PEAK
K NUMBER EQUALS MAXIMUM STUDENTS AVAILABLE FOR
*                                                                       TRAI
INING ASSUMING ZERO ABSENTEEISM.)
 25     TEXT        THE PEAK NUMBER OF DAY AV STUDENTS WAS #S1,8/XXX#
        SPACE       1
 30     TEXT        THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX A WAS #S5,
,8/XXX#
 30     TEXT        THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX B WAS #S9,
,8/XXX#
 30     TEXT        THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX C WAS #S13
3,8/XXX#
 30     TEXT        THE PEAK NUMBER OF DAY AV STUDENTS IN ANNEX D WAS #S17
7,8/XXX#
        SPACE       2
 25     TEXT        THE PEAK NUMBER OF NIGHT AV STUDENTS WAS #S3,8/XXX#
        SPACE       1
 30     TEXT        THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX A WAS #S
S7,8/XX#
 30     TEXT        THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX B WAS #S
S11,8/XX#
```

```
 30     TEXT        THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX C WAS #S
S15,0/XX#
 30     TEXT        THE PEAK NUMBER OF NIGHT AV STUDENTS IN ANNEX D WAS #S
S19,8/XX#
        SPACE       3
 25     TEXT        A TOTAL OF #XH277,2/XXXX# STUDENTS TRAINED UNDER PI MO
ODE
        SPACE       1
 25     TEXT        THE PEAK NUMBER OF PI STUDENTS WAS #S22,8/XXX#
        SPACE       2
 25     TEXT        THE PEAK NUMBER OF DAY PI STUDENTS WAS #S2,8/XXX#
        SPACE       1
 30     TEXT        THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX A WAS #S6,
,8/XXX#
 30     TEXT        THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX B WAS #S10
0,8/XXX#
 30     TEXT        THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX C WAS #S14
4,8/XXX#
 30     TEXT        THE PEAK NUMBER OF DAY PI STUDENTS IN ANNEX D WAS #S18
8,8/XXX#
        SPACE       2
 25     TEXT        THE PEAK NUMBER OF NIGHT PI STUDENTS WAS #S4,8/XXX#
        SPACE       1
 30     TEXT        THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX A WAS #S
S8,8/XX#
 30     TEXT        THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX B WAS #S
S12,8/XX#
 30     TEXT        THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX C WAS #S
S16,8/XX#
 30     TEXT        THE PEAK NUMBER OF NIGHT PI STUDENTS IN ANNEX D WAS #S
S20,8/XX#
        SPACE       3
 25     TEXT        OF THE #XH301,2/XXXX# STUDENTS WHO ENTERED THE COURSE,
 33     TEXT        #XH292,2/XXXX# GRADUATED FROM THE COURSE
 34     TEXT        #XH302,2/XXX# WERE DROPPED FOR ACADEMIC, ADMINISTRATIV
VE, OR DISCIPLINARY REASONS
        SPACE       1
 25     TEXT        THE ATTRITION RATE WAS #XH303,2/X#%
        SPACE       1
 25     TEXT        THE AVERAGE DAILY ABSENTEE RATE WAS #T3,3/X.X#%. THE R
RATE NEARLY DOUBLED ON DAYS FOLLOWING HOLIDAYS
        SPACE       1
 25     TEXT        THE AVERAGE NUMBER OF DAYS SPENT IN TRAINING BY STUDEN
NTS UNDER THE AV MODE WAS #T1,3/XX.X# DAYS
        SPACE       1
 25     TEXT        THE AVERAGE NUMBER OF DAYS SPENT IN TRAINING BY STUDEN
NTS UNDER THE PI MODE WAS #T2,3/XX.X# DAYS
        EJECT
*                                                       INPUT QUOTAS #
FOR USAOMS FOLLOW-ON COURSES IN FY 73
        SPACE       3
 70     TEXT        76Q20 COURSE QUOTA WAS #XH286,2/XXX#
        SPACE       1
 70     TEXT        76R20 COURSE QUOTA WAS #XH287,2/XXX#
        SPACE       1
 70     TEXT        76S20 COURSE QUOTA WAS #XH288,2/XXXX#
        SPACE       1
 70     TEXT        76T20 COURSE QUOTA WAS #XH289,2/XXX#
        SPACE       1
 70     TEXT        76U20 COURSE QUOTA WAS #XH290,2/XXX#
        SPACE       1
```

```
 25     TEXT        #XH294,2/XXX# 76P20 COURSE GRADUATES DID NOT ATTEND  A
A FOLLOW-ON COURSE BUT WERE ASSIGNED TO THE FIELD
        EJECT
*               DATA TABLES ON FOLLOW-ON COURSE CLASSES
*                           COLUMN DEFINITIONS
        SPACE       1
* CELL ENTRIES UNDER COLS. 2-6 IDENTIFY THE NUMBER OF CLASSES STARTED AN
ND THE NUMBER OF STUDENTS IN THE CLASSES
* THE FIRST DIGIT (X000) INDICATES THE NUMBER OF CLASSES
* THE LAST TWO DIGITS (00XX) INDICATE THE NUMBER OF STUDENTS
        SPACE       2
*         COL.1  JULIAN DATE CLASSES STARTED
*         COL.2 76Q20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
*         COL.3 76R20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
*         COL.4 76S20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
*         COL.5 76T20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
*         COL.6 76U20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
*                     ROW 124 IDENTIFIES THE TOTAL NUMBER OF STUDENTS ASSIG
GNED TO EACH COURSE
*                     ROW 125 IDENTIFIES THE TOTAL NUMBER OF CLASSES STARTE
ED FOR EACH COURSE
        SPACE       3
 HMS    TITLE       6,FOLLOW-ON COURSE CLASSES UNDER POLICY #1D'
        EJECT
 HMS    TITLE       7,FOLLOW-ON COURSE CLASSES UNDER POLICY #1F'
        EJECT
 TAB    TITLE       1,COURSE COMPLETION TIME STATISTICS FOR AV STUDENTS
        SPACE       2
 TAB    TITLE       2,COURSE COMPLETION TIME STATISTICS FOR PI STUDENTS
        SPACE       2
 TAB    TITLE       3,DAILY ABSENTEE STATISTICS
        EJECT
 STD    TITLE       1,DAY AV MODE STUDENTS
        SPACE       3
 STD    TITLE       2,DAY PI MODE STUDENTS
        SPACE       3
 STD    TITLE       3,NIGHT AV MODE STUDENTS
        SPACE       3
 STD    TITLE       4,NIGHT PI MODE STUDENTS
        SPACE       3
        EJECT
*RESULTS OF POLICIES FOR ASSIGNMENT OF 76P20 GRADUATES TO FOLLOW-ON COUR
RSES AND TO THE FIELD
        SPACE       2
 HSV    TITLE       1,MAN DAYS WAIT TIME UNDER POLICY #1D'
        SPACE       1
 HSV    TITLE       2,MAN DAYS WAIT TIME UNDER POLICY #1F'
        SPACE       1
        EJECT
 HSV    INCLUDE     ,XH281-XH285
 HSV    INCLUDE     ,XH293-XH294
        EJECT
*    BELOW SAVEVALUES IDENTIFY THE NUMBER OF GRADS TO FIELD EACH MONTH

        SPACE       2
*                    UNDER POLICY 1D'
 HSV    INCLUDE     ,XH32-XH43
        SPACE       2
*                    UNDER POLICY 1F
 HSV    INCLUDE     ,XH44-XH55
        EJECT
        OUTPUT
        END
```

Appendix C

GPSS SIMULATION PRINTOUT—STAGE III

MATRICES COLUMN DEFINITIONS

COL.1 THE NUMERICAL CALENDAR DATE
COL.2 THE NUMBER OF STUDENTS REPORTING FOR 76P20 TRAINING
COL.3 THE MEAN COURSE COMPLETION TIME IN DAYS FOR THIS CLASS
COL.4 THE NUMBER OF STUDENTS DROPPED FROM TRAINING THIS DATE
COL.5 THE NUMBER OF STUDENTS ABSENT FROM TRAINING THIS DATE
COL.6 THE NUMBER OF STUDENTS PRESENT FOR TRAINING THIS DATE
COL.7 TRAINING LOAD ANNEX A STUDENTS
COL.8 TRAINING LOAD ANNEX B STUDENTS
COL.9 TRAINING LOAD ANNEX C STUDENTS
COL.10 TRAINING LOAD ANNEX D STUDENTS

COL.11 THE NUMERICAL CALENDAR DATE
COL.12 THE NUMBER OF STUDENTS COMPLETING TRAINING THIS DATE
COL.13 ANNEX A,DAY STUDENTS IN AV MODE
COL.14 ANNEX A,DAY STUDENTS IN PI MODE
COL.15 ANNEX A,NIGHT STUDENTS IN AV MODE
COL.16 ANNEX A,NIGHT STUDENTS IN PI MODE

COL.17 ANNEX B,DAY STUDENTS IN AV MODE
COL.18 ANNEX B,DAY STUDENTS IN PI MODE
COL.19 ANNEX B,NIGHT STUDENTS IN AV MODE
COL.20 ANNEX B,NIGHT STUDENTS IN PI MODE

COL.21 THE NUMERICAL CALENDAR DATE
COL.22 ANNEX C,DAY STUDENTS IN AV MODE
COL.23 ANNEX C,DAY STUDENTS IN PI MODE
COL.24 ANNEX C,NIGHT STUDENTS IN AV MODE
COL.25 ANNEX C,NIGHT STUDENTS IN PI MODE

COL.26 ANNEX D,DAY STUDENTS IN AV MODE
COL.27 ANNEX D,DAY STUDENTS IN PI MODE
COL.28 ANNEX D,NIGHT STUDENTS IN AV MODE
COL.29 ANNEX D,NIGHT STUDENTS IN PI MODE
COL.30 ID# OF AV AND PI CCT DISTRIBUTIONS FOR CLASSES (AV/PI)

COL.31 THE NUMERICAL CALENDAR DATE
COL. 32 Q CLASSES UNDER POLICY #1D'
COL. 33 R CLASSES UNDER POLICY #1D'
COL. 34 S CLASSES UNDER POLICY #1D'
COL. 35 T CLASSES UNDER POLICY #1D'
COL. 36 U CLASSES UNDER POLICY #1D'
COL. 37 GRADUATES ASSIGNED TO FIELD AS 76P20S UNDER POLICY #1D'

COL. 38 Q CLASSES UNDER POLICY #1F'
COL. 39 R CLASSES UNDER POLICY #1F'
COL. 40 S CLASSES UNDER POLICY #1F'
COL.41 THE NUMERICAL CALENDAR DATE
COL. 42 T CLASSES UNDER POLICY #1F'
COL. 43 U CLASSES UNDER POLICY #1F'
COL. 44 GRADUATES ASSIGNED TO THE FIELD AS 76P20S UNDER POLICY #1F'

COL. 45 Q CLASSES IN POLICY #3
COL. 46 R CLASSES IN POLICY #3
COL. 47 S CLASSES IN POLICY #3
COL. 48 T CLASSES IN POLICY #3
COL. 49 U CLASSES IN POLICY #3
COL. 50 GRADUATES ASSIGNED TO THE FIELD AS 76P20S UNDER POLICY #3

POLICY #1D* FOR ASSIGNMENT OF 76P20 GRADUATES TO FOLLOW-ON COURSES

1)CLASS WILL NOT CONTAIN LESS THAN 35 OR MORE 45 STUDENTS
2)CLASSES WILL START MONDAY THROUGH THURSDAY EXCEPT HOLIDAYS
3)ORDER OF CLASSES ASSIGNED TO COURSES BASED ON OMS SCHEDULE
4)CLASSES ASSIGNED IN ALPHABETICAL ORDER AFTER FIRST 106 CLASSES OR COMPLETION OF OMS SCHEDULE
5)OMS INPUT QUOTA FOR EACH FOLLOW-ON COURSE WILL BE FILLED
6)FIRST PRIORITY IS GIVEN TO ASSIGNMENT OF 76P20 GRADUATES TO ONE OF THE FOLLOW-ON COURSES
7)76P20 GRADUATES ARE ASSIGNED TO THE FIELD ON THURSDAYS AND FRIDAYS ONLY

POLICY #1F* FOR ASSIGNMENT OF 76P20 GRADUATES TO FOLLOW-ON COURSES

1)76P20 GRADUATES ARE ASSIGNED TO THE FIELD MONDAY THROUGH FRIDAY EXCEPT HOLIDAYS
2) A MORE UNIFORM RATE OF ASSIGNMENT OF 76P20 GRADUATES TO THE FIELD THAN THAT USED IN POLICY 1D* IS USED
3)ALL OTHER RULES SAME AS FOR POLICY #1D*

POLICY #3 FOR ASSIGNMENT OF 76P20 GRADUATES TO FOLLOW-ON COURSES

1)CLASS SIZE AND CLASS START DATE IS SAME AS OMS SCHEDULE
2)IF SCHEDULED CLASS SIZE CANT BE MET, CLASS WILL BE STARTED WITH 20 TO 45 STUDENTS
3)IF ALL COURSE QUOTAS ARE NOT FILLED BEFORE OMS SCHEDULE IS COMPLETED
  A)CLASSES ASSIGNED IN ALPHABETICAL ORDER
  B)CLASS WILL NOT CONTAIN LESS THAN 20 OR MORE THAN 45 STUDENTS
  C)IF COMPLIANCE WITH 3) ABOVE WOULD PREVENT A QUOTA BEING FILLED, CLASS SIZE IGNORED
  D)CLASSES WILL START MONDAY THROUGH THURSDAY EXCEPT HOLIDAYS
  E)NOT MORE THAN FOUR (4) CLASSES WILL START ON THE SAME DAY
4)GRADUATES WILL NOT BE ASSIGNED TO THE FIELD IF SUCH ACTION WOULD PREVENT MEETING OMS SCHEDULE

POLICY FOR ASSIGNMENT OF 76P20 GRADUATES TO THE FIELD

1)76P20 GRADUATES IN EXCESS OF THE SPECIFIED FOLLOW-ON COURSE QUOTAS ARE ASSIGNED TO THE FIELD
2)FIRST PRIORITY IS GIVEN TO ASSIGNMENT OF GRADUATES TO FOLLOW-ON COURSES
3)UNDER POLICY #1D* 76P20 GRADUATES ARE ASSIGNED TO THE FIELD ON THURSDAYS AND FRIDAYS ONLY EXCEPT
  A)WHEN ALL FOLLOW-ON COURSE QUOTAS ARE FILLED, ASSIGNMENTS ARE MADE ON ANY WEEK DAY OTHER THAN A HOLIDAY
4)UNDER POLICY #1F* 76P20 GRADUATES ARE ASSIGNED TO THE FIELD ON MONDAY THROUGH FRIDAY EXCEPT HOLIDAYS
5)ASSIGNMENTS TO THE FIELD ARE MADE DURING THE SUMMER MONTHS
6)AN EFFORT IS MADE TO PROVIDE A UNIFORM ASSIGNMENT OF 76P20 GRADUATES TO FIELD UNTIL FOLLOW-ON COURSE QUOTAS ARE FILLED

76P20 INPUT AND OUTPUT 17 OCT 1972 THRU 23 JAN 1973
HALFWORD MATRIX 2

ROW/COLUMN	1	2	3	4	5	6	7	8	9	10
1	291	0	0	0	22	457	177	100	39	141
2	292	45	33	0	20	492	211	96	41	144
3	293	0	0	0	21	473	203	91	44	135
4	294	0	0	1	14	466	165	123	40	138
5	295	0	0	0	0	0	0	0	0	0
6	296	0	0	1	0	0	0	0	0	0
7	297	0	0	1	0	0	0	0	0	0
8	298	90	26	0	39	510	212	140	41	117
9	299	45	31	2	23	547	230	168	39	111
10	300	0	0	4	18	533	210	185	33	105
11	301	0	0	1	26	501	183	199	30	99
12	302	0	0	3	0	0	0	0	0	0
13	303	0	0	0	0	0	0	0	0	0
14	304	90	25	2	18	540	261	201	32	86
15	305	0	0	0	26	550	239	198	43	70
16	306	45	24	1	21	590	259	187	75	69
17	307	0	0	2	27	571	220	165	126	66
18	308	0	0	2	25	561	189	179	135	59
19	309	0	0	2	0	0	0	0	0	0
20	310	0	0	0	0	0	0	0	0	0
21	311	90	24	0	27	639	245	177	145	72
22	312	0	0	3	23	635	201	204	137	93
23	313	45	29	0	30	661	208	215	112	126
24	314	0	0	4	27	650	161	242	111	146
25	315	0	0	0	27	650	138	249	95	178
26	316	0	0	2	0	0	0	0	0	0
27	317	0	0	2	0	0	0	0	0	0
28	318	90	25	1	26	729	202	260	67	199
29	319	0	0	1	31	708	174	264	64	206
30	320	45	26	2	21	748	216	226	94	208
31	321	0	0	1	34	724	193	178	139	215
32	322	0	0	0	35	698	162	151	176	209
33	323	0	0	3	0	0	0	0	0	0
34	324	0	0	3	0	0	0	0	0	0
35	325	90	23	1	30	762	225	147	185	205
36	326	0	0	3	28	725	194	152	173	206
37	327	45	28	4	32	737	214	151	158	214
38	328	0	0	0	0	0	0	0	0	0
39	329	0	0	1	85	646	152	169	94	231
40	330	0	0	0	0	0	0	0	0	0
41	331	0	0	2	0	0	0	0	0	0
42	332	90	21	1	27	756	236	177	87	256
43	333	0	0	3	25	728	195	200	69	264
44	334	45	23	2	19	749	216	210	70	253
45	335	0	0	3	32	708	192	195	82	239
46	336	0	0	2	31	685	160	202	91	232
47	337	0	0	1	0	0	0	0	0	0
48	338	0	0	2	0	0	0	0	0	0
49	339	89	30	2	28	747	208	215	103	221
50	340	0	0	2	24	709	169	216	115	209

51	341	45	29	2	25	707	187	206	124	190
52	342	0	0	1	29	672	156	192	145	179
53	343	0	0	2	27	639	140	180	128	191
54	344	0	0	1	0	0	0	0	0	0
55	345	0	0	0	0	0	0	0	0	0
56	346	88	25	2	23	696	216	162	131	187
57	347	0	0	1	27	658	210	140	112	206
58	348	45	27	3	25	692	246	108	127	211
59	349	0	0	1	27	669	200	141	97	231
60	350	0	0	2	19	646	173	135	109	229
61	351	0	0	1	0	0	0	0	0	0
62	352	0	0	3	0	0	0	0	0	0
63	353	0	0	0	23	608	146	147	97	218
64	354	0	0	1	23	579	108	163	82	226
65	355	0	0	3	18	547	67	200	73	207
66	356	0	0	0	14	514	36	221	56	201
67	357	0	0	0	18	492	26	220	50	186
68	358	0	0	0	0	0	0	0	0	0
69	359	0	0	0	0	0	0	0	0	0
70	360	0	0	0	0	0	0	0	0	0
71	361	0	0	0	0	0	0	0	0	0
72	362	0	0	0	0	0	0	0	0	0
73	363	0	0	0	0	0	0	0	0	0
74	364	0	0	0	0	0	0	0	0	0
75	365	0	0	0	0	0	0	0	0	0
76	366	0	0	0	0	0	0	0	0	0
77	1	0	0	0	0	0	0	0	0	0
78	2	0	0	0	0	0	0	0	0	0
79	3	0	0	0	0	0	0	0	0	0
80	4	0	0	0	0	0	0	0	0	0
81	5	0	0	0	0	0	0	0	0	0
82	6	0	0	0	0	0	0	0	0	0
83	7	0	0	16	0	0	0	0	0	0
84	8	98	28	0	29	519	116	204	39	160
85	9	0	0	0	18	506	107	174	70	153
86	10	0	0	3	17	486	97	156	100	139
87	11	0	0	1	15	465	94	112	129	130
88	12	0	0	0	15	447	86	83	156	122
89	13	0	0	1	0	0	0	0	0	0
90	14	0	0	0	0	0	0	0	0	0
91	15	0	0	1	17	417	73	71	133	140
92	16	0	0	1	11	401	62	61	128	150
93	17	45	20	0	13	427	99	67	100	161
94	18	0	0	0	16	408	90	57	68	193
95	19	0	0	2	14	398	85	57	61	195
96	20	0	0	0	0	0	0	0	0	0
97	21	0	0	0	0	0	0	0	0	0
98	22	98	28	3	15	474	155	72	42	205
99	23	0	0	1	15	456	134	85	35	202

ROW/COLUMN	11	12	13	14	15	16	17	18	19	20
1	291	12	85	92	0	0	58	42	0	0
2	292	18	83	83	23	22	50	46	0	0
3	293	14	77	83	22	21	47	44	0	0
4	294	18	54	66	23	22	61	62	0	0
5	295	0	0	0	0	0	0	0	0	0
6	296	0	0	0	0	0	0	0	0	0
7	297	0	0	0	0	0	0	0	0	0
8	298	24	83	89	20	20	64	76	0	0
9	299	17	81	82	44	43	85	83	0	0
10	300	20	51	72	44	43	92	93	0	0
11	301	15	46	53	42	42	90	109	1	0
12	302	0	0	0	0	0	0	0	0	0
13	303	0	0	0	0	0	0	0	0	0
14	304	20	89	89	42	41	84	115	2	0
15	305	10	78	85	37	39	80	111	6	1
16	306	12	59	85	55	60	86	86	12	3
17	307	10	50	85	43	42	63	61	22	19
18	308	6	43	67	39	40	64	67	26	21
19	309	0	0	0	0	0	0	0	0	0
20	310	0	0	0	0	0	0	0	0	0
21	311	8	84	91	30	40	54	68	34	21
22	312	9	71	71	24	35	56	80	41	27
23	313	4	53	60	45	50	64	77	41	33
24	314	6	44	51	27	39	59	82	58	43
25	315	9	32	50	24	32	65	78	57	49
26	316	0	0	0	0	0	0	0	0	0
27	317	0	0	0	0	0	0	0	0	0
28	318	14	64	91	22	25	70	82	55	53
29	319	14	45	85	22	22	79	92	48	55
30	320	9	44	82	46	44	70	55	46	55
31	321	24	43	72	36	42	55	50	36	37
32	322	25	42	53	27	40	39	50	28	34
33	323	0	0	0	0	0	0	0	0	0
34	324	0	0	0	0	0	0	0	0	0
35	325	38	85	79	23	38	28	64	26	29
36	326	26	76	61	23	34	26	74	23	29
37	327	34	66	55	44	49	23	77	23	28
38	328	0	0	0	0	0	0	0	0	0
39	329	35	46	43	28	35	34	74	31	30
40	330	0	0	0	0	0	0	0	0	0
41	331	0	0	0	0	0	0	0	0	0
42	332	29	88	88	25	35	41	77	31	28
43	333	27	66	81	22	26	60	74	29	37
44	334	26	53	74	44	45	73	73	26	38
45	335	21	48	64	39	41	68	60	28	39
46	336	25	32	50	37	41	79	63	24	36
47	337	0	0	0	0	0	0	0	0	0
48	338	0	0	0	0	0	0	0	0	0
49	339	40	56	82	32	38	90	67	21	37
50	340	44	47	64	30	28	77	74	23	42

51	341	29	44	56	49	38	65	70	21	50
52	342	34	43	47	35	31	43	69	29	51
53	343	32	43	46	26	25	30	66	37	47
54	344	0	0	0	0	0	0	0	0	0
55	345	0	0	0	0	0	0	0	0	0
56	346	22	86	86	22	22	19	58	39	46
57	347	22	83	84	22	21	14	49	35	42
58	348	18	74	84	45	43	16	27	32	33
59	349	30	50	67	42	41	39	40	34	28
60	350	28	43	51	37	42	44	46	29	16
61	351	0	0	0	0	0	0	0	0	0
62	352	0	0	0	0	0	0	0	0	0
63	353	29	42	44	28	32	43	49	34	21
64	354	36	29	33	23	23	56	55	29	23
65	355	34	15	11	20	21	69	76	30	25
66	356	28	5	0	12	19	76	87	33	25
67	357	34	1	0	8	17	73	86	35	26
68	358	0	0	0	0	0	0	0	0	0
69	359	0	0	0	0	0	0	0	0	0
70	360	0	0	0	0	0	0	0	0	0
71	361	0	0	0	0	0	0	0	0	0
72	362	0	0	0	0	0	0	0	0	0
73	363	0	0	0	0	0	0	0	0	0
74	364	0	0	0	0	0	0	0	0	0
75	365	0	0	0	0	0	0	0	0	0
76	366	0	0	0	0	0	0	0	0	0
77	1	0	0	0	0	0	0	0	0	0
78	2	0	0	0	0	0	0	0	0	0
79	3	0	0	0	0	0	0	0	0	0
80	4	0	0	0	0	0	0	0	0	0
81	5	0	0	0	0	0	0	0	0	0
82	6	0	0	0	0	0	0	0	0	0
83	7	0	0	0	0	0	0	0	0	0
84	8	26	49	49	4	14	65	78	35	26
85	9	19	47	47	2	11	45	64	34	31
86	10	20	47	47	0	3	33	52	29	36
87	11	17	47	47	0	0	22	37	23	30
88	12	27	39	47	0	0	21	18	15	29
89	13	0	0	0	0	0	0	0	0	0
90	14	0	0	0	0	0	0	0	0	0
91	15	21	26	47	0	0	32	9	11	19
92	16	16	35	47	0	0	36	0	8	17
93	17	16	7	47	23	22	42	0	8	17
94	18	12	2	45	22	21	36	2	4	15
95	19	19	2	40	22	21	32	7	3	15
96	20	0	0	0	0	0	0	0	0	0
97	21	0	0	0	0	0	0	0	0	0
98	22	15	49	63	22	21	26	34	1	11
99	23	18	47	47	18	22	22	47	6	10

ROW/COLUMN	21	22	23	24	25	26	27	28	29	30
1	291	14	25	0	0	44	97	0	0	0
2	292	22	19	0	0	37	107	0	0	1666
3	293	28	16	0	0	31	104	0	0	0
4	294	31	9	0	0	31	107	0	0	0
5	295	0	0	0	0	0	0	0	0	0
6	296	0	0	0	0	0	0	0	0	0
7	297	0	0	0	0	0	0	0	0	5
8	298	32	9	0	0	29	88	0	0	2738
9	299	31	7	0	0	31	80	0	0	866
10	300	27	6	0	0	37	68	0	0	0
11	301	25	5	0	0	37	52	0	0	0
12	302	0	0	0	0	0	0	0	0	0
13	303	0	0	0	0	0	0	0	0	0
14	304	24	8	0	0	43	43	0	0	558
15	305	31	12	0	0	40	30	0	0	0
16	306	39	36	0	0	42	27	0	0	3140
17	307	67	59	0	0	42	18	0	0	0
18	308	65	70	0	0	46	13	0	0	0
19	309	0	0	0	0	0	0	0	0	0
20	310	0	0	0	0	0	0	0	0	0
21	311	62	82	1	0	55	17	0	0	2343
22	312	53	83	1	0	72	21	0	0	0
23	313	40	70	2	0	83	43	0	0	2066
24	314	48	60	3	0	99	57	0	0	0
25	315	35	43	6	1	100	77	1	0	0
26	316	0	0	0	0	0	0	0	0	0
27	317	0	0	0	0	0	0	0	0	0
28	318	30	25	9	3	105	93	1	0	756
29	319	27	18	15	4	103	101	2	0	0
30	320	33	44	16	5	99	105	4	0	539
31	321	38	53	28	19	98	108	7	2	0
32	322	44	65	43	24	90	107	10	2	0
33	323	0	0	0	0	0	0	0	0	0
34	324	0	0	0	0	0	0	0	0	0
35	325	49	59	47	30	80	111	11	3	3340
36	326	45	52	43	33	76	108	17	5	0
37	327	49	39	41	37	69	109	29	7	1254
38	328	0	0	0	0	0	0	0	0	5
39	329	27	27	18	26	75	96	43	17	0
40	330	0	0	0	0	0	0	0	0	0
41	331	0	0	0	0	0	0	0	0	0
42	332	22	20	18	27	75	102	51	23	2350
43	333	8	22	17	22	80	94	56	34	0
44	334	5	28	20	17	73	85	53	42	3153
45	335	11	43	14	14	63	78	56	42	0
46	336	13	45	17	16	53	77	59	43	0
47	337	0	0	0	0	0	0	0	0	0
48	338	0	0	0	0	0	0	0	0	0
49	339	21	48	19	15	46	72	58	45	1848
50	340	38	48	16	13	36	74	48	51	0

51	341	45	47	17	15	26	73	43	49	838
52	342	64	47	15	19	24	64	45	46	0
53	343	55	35	12	26	44	68	39	40	0
54	344	0	0	0	0	0	0	0	0	0
55	345	0	0	0	0	0	0	0	0	0
56	346	52	41	13	25	54	63	38	32	3065
57	347	39	36	11	26	69	72	35	30	0
58	348	33	51	11	32	78	71	31	31	1969
59	349	17	40	9	31	92	79	26	34	0
60	350	15	39	18	37	84	86	23	36	0
61	351	C	0	0	0	0	0	0	0	0
62	352	0	0	0	0	0	0	0	0	0
63	353	11	34	18	34	74	81	22	41	0
64	354	5	27	23	27	67	86	21	52	0
65	355	4	22	24	23	55	80	20	52	0
66	356	5	13	22	16	44	77	24	56	0
67	357	11	6	20	13	32	73	25	56	0
68	358	0	0	0	0	0	0	0	0	0
69	359	0	0	0	0	0	0	0	0	0
70	360	0	0	0	0	0	0	0	0	5
71	361	0	0	0	0	0	0	0	0	0
72	362	0	0	0	0	0	0	0	0	0
73	363	0	0	0	0	0	0	0	0	0
74	364	0	0	0	0	0	0	0	0	0
75	365	0	0	0	0	0	0	0	0	0
76	366	0	0	0	0	0	0	0	0	0
77	1	0	0	0	0	0	0	0	0	0
78	2	0	0	0	0	0	0	0	0	0
79	3	0	0	0	0	0	0	0	0	0
80	4	0	0	0	0	0	0	0	0	0
81	5	0	0	0	0	0	0	0	0	0
82	6	0	0	0	0	0	0	0	0	0
83	7	0	0	0	0	0	0	0	0	0
84	8	12	7	12	8	21	56	30	53	2961
85	9	34	20	12	4	18	47	34	54	0
86	10	45	33	16	6	13	45	33	48	0
87	11	49	47	19	14	20	36	34	40	0
88	12	52	63	26	15	22	31	31	38	0
89	13	0	0	0	0	0	0	0	0	0
90	14	0	0	0	0	0	0	0	0	0
91	15	34	56	22	21	39	38	31	32	0
92	16	31	55	20	22	48	42	34	26	0
93	17	25	45	14	16	54	46	36	25	2352
94	18	20	19	14	15	67	67	36	23	0
95	19	24	13	10	14	66	72	38	19	0
96	20	0	0	0	0	0	0	0	0	0
97	21	0	0	0	0	0	0	0	0	0
98	22	24	4	7	7	67	75	36	27	654
99	23	20	3	6	6	69	75	32	26	0

ROW/COLUMN	31	32	33	34	35	36	37	38	39	40
1	291	0	0	45	0	0	0	0	0	0
2	292	0	0	0	0	0	0	0	0	36
3	293	0	0	40	0	0	0	0	0	0
4	294	0	0	0	0	0	13	0	0	0
5	295	0	0	0	0	0	0	0	0	0
6	296	0	0	0	0	0	0	0	0	0
7	297	0	0	0	0	0	0	0	0	0
8	298	0	0	0	0	0	0	45	0	0
9	299	43	0	0	0	0	0	0	0	0
10	300	0	0	0	0	0	11	0	0	0
11	301	0	0	0	0	0	1	0	0	0
12	302	0	0	0	0	0	0	0	0	0
13	303	0	0	0	0	0	0	0	0	0
14	304	0	0	40	0	0	0	0	0	45
15	305	0	0	0	0	0	0	0	0	0
16	306	0	0	0	0	0	0	42	0	0
17	307	42	0	0	0	0	0	0	0	0
18	308	0	0	0	0	0	10	0	0	0
19	309	0	0	0	0	0	0	0	0	0
20	310	0	0	0	0	0	0	0	0	0
21	311	0	0	0	0	0	0	0	0	0
22	312	0	0	0	0	0	0	0	0	0
23	313	0	0	0	0	0	0	0	0	0
24	314	0	0	0	0	0	13	0	0	0
25	315	0	0	0	0	0	1	0	0	0
26	316	0	0	0	0	0	0	0	0	0
27	317	0	0	0	0	0	0	0	0	0
28	318	0	0	0	0	0	0	0	0	0
29	319	0	0	0	0	42	0	0	0	0
30	320	0	0	0	0	0	0	0	0	0
31	321	0	0	0	0	0	11	0	0	40
32	322	0	0	0	0	0	1	0	0	0
33	323	0	0	0	0	0	0	0	0	0
34	324	0	0	0	0	0	0	0	0	0
35	325	0	0	45	0	0	0	0	0	0
36	326	0	0	0	0	45	0	0	38	0
37	327	0	0	0	0	0	0	0	0	0
38	328	0	0	0	0	0	0	0	0	0
39	329	0	0	0	0	0	12	0	0	0
40	330	0	0	0	0	0	0	0	0	0
41	331	0	0	0	0	0	0	0	0	0
42	332	0	45	0	45	0	0	0	0	39
43	333	0	0	0	0	0	0	0	0	0
44	334	0	0	45	0	0	0	0	0	45
45	335	0	0	38	0	0	0	0	0	0
46	336	0	0	0	0	0	12	0	0	0
47	337	0	0	0	0	0	0	0	0	0
48	338	0	0	0	0	0	0	0	0	0
49	339	0	0	0	0	0	0	0	0	45
50	340	0	0	45	0	0	0	0	0	45

51	341	0	0	45	0	0	0	45	0	0
52	342	45	0	0	0	0	10	0	0	0
53	343	0	0	0	0	0	2	0	0	0
54	344	0	0	0	0	0	0	0	0	0
55	345	0	0	0	0	0	0	0	0	0
56	346	0	0	0	0	45	0	45	0	0
57	347	43	0	0	0	0	0	0	0	35
58	348	0	0	0	0	0	0	0	0	0
59	349	0	0	40	0	0	0	0	36	0
60	350	0	0	0	0	0	12	0	0	0
61	351	0	0	0	0	0	0	0	0	0
62	352	0	0	0	0	0	0	0	0	0
63	353	0	45	0	0	0	0	0	0	0
64	354	0	0	0	0	0	0	0	0	0
65	355	0	0	0	45	0	0	0	0	0
66	356	0	0	0	0	45	10	0	0	45
67	357	0	0	0	0	0	2	0	0	0
68	358	0	0	0	0	0	0	0	0	0
69	359	0	0	0	0	0	0	0	0	0
70	360	0	0	0	0	0	0	0	0	0
71	361	0	0	0	0	0	0	0	0	0
72	362	0	0	0	0	0	0	0	0	0
73	363	0	0	0	0	0	0	0	0	0
74	364	0	0	0	0	0	0	0	0	0
75	365	0	0	0	0	0	0	0	0	0
76	366	0	0	0	0	0	0	0	0	0
77	1	0	0	0	0	0	0	0	0	0
78	2	0	0	0	0	0	0	0	0	0
79	3	0	0	0	0	0	0	0	0	0
80	4	0	0	0	0	0	0	0	0	0
81	5	0	0	0	0	0	0	0	0	0
82	6	0	0	0	0	0	0	0	0	0
83	7	0	0	0	0	0	0	0	0	0
84	8	0	0	45	0	0	0	0	0	45
85	9	0	0	41	0	0	0	0	0	0
86	10	0	0	0	0	0	0	0	0	39
87	11	0	0	39	0	0	0	0	0	0
88	12	0	0	0	0	0	17	0	0	0
89	13	0	0	0	0	0	0	0	0	0
90	14	0	0	0	0	0	0	0	0	0
91	15	0	0	0	0	0	0	0	0	45
92	16	0	0	45	0	0	0	0	0	0
93	17	0	0	0	0	0	0	43	0	0
94	18	35	0	0	0	0	0	0	0	0
95	19	0	0	0	0	0	12	0	0	0
96	20	0	0	0	0	0	0	0	0	0
97	21	0	0	0	0	0	0	0	0	0
98	22	0	0	0	0	0	0	0	0	42
99	23	0	0	0	0	0	0	0	0	0

ROW/COLUMN	41	42	43	44	45	46	47	48	49	50
1	291	0	0	3	0	0	0	0	0	0
2	292	0	0	0	0	0	0	0	0	0
3	293	0	0	4	0	0	0	0	0	0
4	294	0	0	1	0	0	0	0	0	0
5	295	0	0	0	0	0	0	0	0	0
6	296	0	0	0	0	0	0	0	0	0
7	297	0	0	0	0	0	0	0	0	0
8	298	0	0	0	0	0	0	0	0	0
9	299	0	0	9	0	0	0	0	0	0
10	300	0	0	2	0	0	0	0	0	0
11	301	0	0	1	0	0	0	0	0	0
12	302	0	0	0	0	0	0	0	0	0
13	303	0	0	0	0	0	0	0	0	0
14	304	0	0	6	0	0	0	0	0	0
15	305	0	0	1	0	0	0	0	0	0
16	306	0	0	0	0	0	0	0	0	0
17	307	0	0	3	0	0	0	0	0	0
18	308	0	0	3	0	0	0	0	0	0
19	309	0	0	0	0	0	0	0	0	0
20	310	0	0	0	0	0	0	0	0	0
21	311	0	0	4	0	0	0	0	0	0
22	312	0	0	2	0	0	0	0	0	0
23	313	0	0	2	0	0	0	0	0	0
24	314	0	35	0	0	0	0	0	0	0
25	315	0	0	3	0	0	0	0	0	0
26	316	0	0	0	0	0	0	0	0	0
27	317	0	0	0	0	0	0	0	0	0
28	318	0	0	5	0	0	0	0	0	0
29	319	0	0	2	0	0	0	0	0	0
30	320	0	0	2	0	0	0	0	0	0
31	321	0	0	0	0	0	0	0	0	0
32	322	0	0	3	0	0	0	0	0	0
33	323	0	0	0	0	0	0	0	0	0
34	324	0	0	0	0	0	0	0	0	0
35	325	0	45	1	0	0	0	0	0	0
36	326	0	0	0	0	0	0	0	0	0
37	327	0	0	8	0	0	0	0	0	0
38	328	0	0	0	0	0	0	0	0	0
39	329	0	0	3	0	0	0	0	0	0
40	330	0	0	0	0	0	0	0	0	0
41	331	0	0	0	0	0	0	0	0	0
42	332	45	0	0	0	0	0	0	0	0
43	333	0	0	7	0	0	0	0	0	0
44	334	0	0	2	0	0	0	0	0	0
45	335	0	0	1	0	0	0	0	0	0
46	336	0	0	2	0	0	0	0	0	0
47	337	0	0	0	0	0	0	0	0	0
48	338	0	0	0	0	0	0	0	0	0
49	339	0	0	5	0	0	0	0	0	0
50	340	0	0	2	0	0	0	0	0	0

51	341	0	0	2	0	0	0	0	0	0
52	342	0	40	0	0	0	0	0	0	0
53	343	0	0	3	0	0	0	0	0	0
54	344	0	0	0	0	0	0	0	0	0
55	345	0	0	0	0	0	0	0	0	0
56	346	0	0	5	0	0	0	0	0	0
57	347	0	0	0	0	0	0	0	0	0
58	348	0	0	4	0	0	0	0	0	0
59	349	0	0	0	0	0	0	0	0	0
60	350	0	0	3	0	0	0	0	0	0
61	351	0	0	0	0	0	0	0	0	0
62	352	0	0	0	0	0	0	0	0	0
63	353	45	0	5	0	0	0	0	0	0
64	354	0	0	2	0	0	0	0	0	0
65	355	0	45	1	0	0	0	0	0	0
66	356	0	0	3	0	0	0	0	0	0
67	357	0	0	1	0	0	0	0	0	0
68	358	0	0	0	0	0	0	0	0	0
69	359	0	0	0	0	0	0	0	0	0
70	360	0	0	0	0	0	0	0	0	0
71	361	0	0	0	0	0	0	0	0	0
72	362	0	0	0	0	0	0	0	0	0
73	363	0	0	0	0	0	0	0	0	0
74	364	0	0	0	0	0	0	0	0	0
75	365	0	0	0	0	0	0	0	0	0
76	366	0	0	0	0	0	0	0	0	0
77	1	0	0	0	0	0	0	0	0	0
78	2	0	0	0	0	0	0	0	0	0
79	3	0	0	0	0	0	0	0	0	0
80	4	0	0	0	0	0	0	0	0	0
81	5	0	0	0	0	0	0	0	0	0
82	6	0	0	0	0	0	0	0	0	0
83	7	0	0	0	0	0	0	0	0	0
84	8	0	0	24	0	0	0	0	0	0
85	9	0	0	6	0	0	0	0	0	0
86	10	0	0	0	0	0	0	0	0	0
87	11	0	0	4	0	0	0	0	0	0
88	12	0	0	2	0	0	0	0	0	0
89	13	0	0	0	0	0	0	0	0	0
90	14	0	0	0	0	0	0	0	0	0
91	15	0	0	5	0	0	0	0	0	0
92	16	0	0	2	0	0	0	0	0	0
93	17	0	0	0	0	0	0	0	0	0
94	18	0	0	3	0	0	0	0	0	0
95	19	0	0	2	0	0	0	0	0	0
96	20	0	0	0	0	0	0	0	0	0
97	21	0	0	0	0	0	0	0	0	0
98	22	0	0	0	0	0	0	0	0	0
99	23	0	0	7	0	0	0	0	0	0

Follow-On Class Schedule Developed Under Policy 1D'

DATA TABLES ON FOLLOW-ON COURSE CLASSES
COLUMN DEFINITIONS

CELL ENTRIES UNDER COLS. 2-6 IDENTIFY THE NUMBER OF CLASSES STARTED AND THE NUMBER OF STUDENTS IN THE CLASSES
THE FIRST DIGIT (X000) INDICATES THE NUMBER OF CLASSES
THE LAST TWO DIGITS (00XX) INDICATE THE NUMBER OF STUDENTS

COL.1 JULIAN DATE CLASSES STARTED
COL.2 76J20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
COL.3 76R20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
COL.4 76S20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
COL.5 76T20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
COL.6 76U20 COURSE CLASSES STARTED/NUMBER OF STUDENTS
ROW 124 IDENTIFIES THE TOTAL NUMBER OF STUDENTS ASSIGNED TO EACH COURSE
ROW 125 IDENTIFIES THE TOTAL NUMBER OF CLASSES STARTED FOR EACH COURSE

FOLLOW-ON COURSE CLASSES UNDER POLICY #10'
HALFWORD MATRIX 6

ROW/COLUMN	1	2	3	4	5	6
1	235	0	0	1040	0	0
2	237	0	0	1045	0	0
3	242	0	0	1045	0	0
4	243	0	0	1045	0	0
5	249	0	0	1045	0	0
6	251	1040	0	0	0	0
7	265	0	0	1045	0	0
8	270	1045	0	0	0	0
9	271	0	0	0	0	1045
10	276	0	1045	0	0	0
11	277	0	0	0	0	1045
12	279	0	0	1042	0	0
13	286	0	0	0	1045	0
14	291	0	0	1045	0	0
15	293	0	0	1040	0	0
16	299	1043	0	0	0	0
17	304	0	0	1040	0	0
18	307	1042	0	0	0	0
19	319	0	0	0	0	1042
20	325	0	0	1045	0	0
21	326	0	0	0	0	1045
22	332	0	1045	0	1045	0
23	334	0	0	1045	0	0
24	335	0	0	1038	0	0
25	340	0	0	1045	0	0
26	341	0	0	1045	0	0
27	342	1045	0	0	0	0
28	346	0	0	0	0	1045
29	347	1043	0	0	0	0
30	349	0	0	1040	0	0
31	353	0	1045	0	0	0
32	355	0	0	0	1045	0
33	356	0	0	0	0	1045
34	8	0	0	1045	0	0
35	9	0	0	1041	0	0
36	11	0	0	1039	0	0
37	16	0	0	1045	0	0
38	18	1035	0	0	0	0
39	24	0	0	1045	0	0
40	29	1045	0	0	0	0
41	30	0	0	0	0	1045
42	31	0	1040	0	0	0
43	36	0	0	0	1039	0
44	43	0	0	0	0	1037
45	53	0	0	1039	0	0
46	59	0	0	1045	0	0
47	60	0	0	0	0	1045
48	64	0	0	1045	0	0
49	65	0	0	1045	0	0
50	66	0	0	1045	0	0
51	71	0	0	0	0	1045
52	73	1045	0	0	0	0
53	78	0	1038	1045	0	0
54	80	1045	0	0	0	0
55	91	0	0	0	0	1036

Figure C-1 *(Continued)*

Follow-On Class Schedule Developed Under Policy 1D' *(Continued)*

56	86	0	0	0	1045	0
57	88	0	0	1042	0	0
58	92	0	0	1045	0	0
59	93	0	0	0	0	1045
60	94	0	0	1045	0	0
61	99	1043	0	1045	0	0
62	101	1045	0	0	0	0
63	102	0	0	1045	0	0
64	106	0	1042	0	0	0
65	108	0	0	0	0	1045
66	113	0	0	1045	0	0
67	115	0	0	0	0	1037
68	120	1045	0	0	0	0
69	122	0	0	0	1041	0
70	123	0	0	1044	0	0
71	127	0	0	1039	0	0
72	128	0	0	0	0	1038
73	129	0	0	1039	0	0
74	134	0	0	1045	0	0
75	135	1045	0	0	0	0
76	136	1045	0	0	0	0
77	141	0	0	0	0	1045
78	142	0	0	0	0	1039
79	144	0	1035	0	0	0
80	149	0	0	1045	0	0
81	150	0	0	1045	0	0
82	151	1037	0	0	0	0
83	156	0	0	0	1035	0
84	159	0	0	1045	0	0
85	162	0	0	1045	0	0
86	164	0	0	1042	0	0
87	169	0	0	1045	0	0
88	170	0	0	0	1035	0
89	171	1039	0	0	0	0
90	176	1045	0	0	0	0
91	177	0	0	0	0	1044
92	179	0	0	0	0	1043
93	183	0	0	1045	0	0
94	186	0	0	0	1035	0
95	190	1044	0	0	0	0
96	192	0	0	1039	0	0
97	197	0	0	1045	0	0
98	198	0	0	1035	0	0
99	200	0	1035	0	0	0
100	204	0	0	0	0	1045
101	206	0	0	1035	0	0
102	212	1045	0	0	0	0
103	214	1041	0	0	0	0
104	218	0	1035	0	0	0
105	219	0	0	1037	0	0
106	225	0	0	0	1035	0
107	226	0	0	0	0	1039
	ROWS 109-123, COLUMNS 1-6 ARE ZERO					
124	0	902	360	2105	399	895
125	0	21	9	49	10	21

Figure C-1

Follow-On Class Schedule Developed Under Policy 1F

FOLLOW-ON COURSE CLASSES UNDER POLICY #1F'
HALFWORD MATRIX 7

ROW/COLUMN	1	2	3	4	5	6
1	235	0	0	1035	0	0
2	237	0	0	1042	0	0
3	242	0	0	1045	0	0
4	243	0	0	1045	0	0
5	249	0	0	1045	0	0
6	251	1039	0	0	0	0
7	265	0	0	1045	0	0
8	270	1045	0	0	0	0
9	271	0	0	0	0	1045
10	276	0	1045	0	0	1038
11	279	0	0	1045	0	0
12	285	0	0	0	1036	0
13	290	0	0	1045	0	0
14	292	0	0	1036	0	0
15	298	1045	0	0	0	0
16	304	0	0	1045	0	0
17	306	1042	0	0	0	0
18	314	0	0	0	0	1035
19	321	0	0	1040	0	0
20	325	0	0	0	0	1045
21	326	0	1038	0	0	0
22	332	0	0	1039	1045	0
23	334	0	0	1045	0	0
24	339	0	0	1045	0	0
25	340	0	0	1045	0	0
26	341	1045	0	0	0	0
27	342	0	0	0	0	1040
28	346	1045	0	0	0	0
29	347	0	0	1035	0	0
30	349	0	1036	0	0	0
31	353	0	0	0	1045	0
32	355	0	0	0	0	1045
33	356	0	0	1045	0	0
34	8	0	0	1045	0	0
35	10	0	0	1039	0	0
36	15	0	0	1045	0	0
37	17	1043	0	0	0	0
38	22	0	0	1042	0	0
39	25	1043	0	0	0	0
40	29	0	0	0	0	1045
41	30	0	1045	0	0	0
42	31	0	0	0	1036	0
43	36	0	0	0	0	1044
44	43	0	0	1037	0	0
45	57	0	0	1036	0	0
46	59	0	0	0	0	1045
47	60	0	0	1045	0	0
48	64	0	0	2080	0	0
49	65	0	0	0	0	1037
50	67	1037	0	0	0	0
51	71	0	0	1044	0	0
52	74	0	1045	0	0	0
53	78	1045	0	0	0	0
54	79	0	0	0	0	1045
55	81	0	0	0	1045	0
56	85	0	0	1045	0	0
57	88	0	0	1045	0	0
58	92	0	0	0	0	1045
59	93	0	0	1045	0	0
60	94	0	0	1045	0	0
61	99	2090	0	0	0	0
62	101	0	0	1045	0	0
63	102	0	1045	0	0	0

Figure C-2 *(Continued)*

Follow-On Class Schedule Developed Under Policy 1F' *(Continued)*

64	106	0	0	0	0	1045
65	108	0	0	1045	0	0
66	113	0	0	0	0	1045
67	115	1035	0	0	0	0
68	120	0	0	0	1039	0
69	122	0	0	1045	0	0
70	123	0	0	1044	0	0
71	127	0	0	0	0	1045
72	128	0	0	1038	0	0
73	129	0	0	1039	0	0
74	134	2080	0	0	0	0
75	136	0	0	0	0	1045
76	141	0	0	0	0	1045
77	142	0	1036	0	0	0
78	143	0	0	1037	0	0
79	144	0	0	1038	0	0
80	149	1045	0	0	0	0
81	151	0	0	0	1045	0
82	156	0	0	1045	0	0
83	158	0	0	1045	0	0
84	162	0	0	1045	0	0
85	164	0	0	1038	0	0
86	169	1045	0	0	1038	0
87	171	1036	0	0	0	0
88	176	0	0	0	0	1045
89	177	0	0	0	0	1045
90	179	0	0	1040	0	0
91	183	0	0	0	1035	0
92	184	1037	0	0	0	0
93	190	0	0	1045	0	0
94	192	0	0	1045	0	0
95	197	0	1035	1045	0	0
96	200	0	0	0	0	1036
97	204	0	0	0	0	1035
98	205	1035	0	0	0	0
99	211	1035	0	0	0	0
100	212	0	1035	0	0	0
101	214	0	0	1041	0	0
102	218	0	0	0	1035	0
103	220	1035	0	0	0	0
104	225	0	0	1035	0	0
105	226	0	0	1035	0	0
	ROWS 106-123, COLUMNS 1-6 ARE ZERO					
124	0	902	360	2105	399	895
125	0	22	9	50	10	21

Figure C-2

Sample Printout of Course Completion Time Statistics for AV Students

COURSE COMPLETION TIME STATISTICS FOR AV STUDENTS
TABLE 1

ENTRIES IN TABLE	MEAN ARGUMENT	STANDARD DEVIATION	SUM OF ARGUMENTS	
	25.130	4.828	68706.000	NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
15	27	.98	.9	99.0	.596	-2.098
16	71	2.59	3.5	96.4	.636	-1.891
17	77	2.81	6.4	93.5	.676	-1.683
18	99	3.62	10.0	89.9	.716	-1.476
19	101	3.69	13.7	86.2	.756	-1.269
20	130	4.75	18.4	81.5	.795	-1.062
21	150	5.48	23.9	76.0	.835	-.855
22	167	6.10	30.0	69.9	.875	-.648
23	195	7.13	37.1	62.8	.915	-.441
24	191	6.98	44.1	55.8	.955	-.234
25	262	9.58	53.7	46.2	.994	-.026
26	192	7.02	60.7	39.2	1.034	.180
27	205	7.49	68.2	31.7	1.074	.387
28	186	6.80	75.0	24.9	1.114	.594
29	159	5.81	80.9	19.0	1.153	.801
30	141	5.15	86.0	13.9	1.193	1.008
31	104	3.80	89.8	10.1	1.233	1.215
32	91	3.32	93.1	6.8	1.273	1.422
33	64	2.34	95.5	4.4	1.313	1.629
34	44	1.60	97.1	2.8	1.352	1.837
35	36	1.31	98.4	1.5	1.392	2.044
36	27	.98	99.4	.5	1.432	2.251
37	11	.40	99.8	.1	1.472	2.459
38	3	.10	99.9	.0	1.512	2.665
39	1	.03	100.0	.0	1.551	2.872

REMAINING FREQUENCIES ARE ALL ZERO

Figure C-3

Sample Printout of Course Completion Time Statistics for PI Students

COURSE COMPLETION TIME STATISTICS FOR PI STUDENTS

TABLE 2

ENTRIES IN TABLE	MEAN ARGUMENT	STANDARD DEVIATION	SUM OF ARGUMENTS	
	28.664	5.234	76994.000	NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
15	0	.00	.0	100.0	.523	-2.610
16	13	.48	.4	99.5	.558	-2.419
17	18	.67	1.1	98.8	.593	-2.228
18	46	1.71	2.8	97.1	.627	-2.037
19	46	1.71	4.5	95.4	.662	-1.846
20	72	2.68	7.2	92.7	.697	-1.655
21	69	2.56	9.8	90.1	.732	-1.464
22	85	3.16	12.9	87.0	.767	-1.273
23	115	4.28	17.2	82.7	.802	-1.082
24	124	4.61	21.8	78.1	.837	-.891
25	144	5.36	27.2	72.7	.872	-.700
26	164	6.10	33.3	66.6	.907	-.509
27	200	7.44	40.8	59.1	.941	-.318
28	213	7.93	48.7	51.2	.976	-.127
29	222	8.26	56.9	43.0	1.011	.064
30	166	6.18	63.1	36.8	1.046	.255
31	173	6.44	69.6	30.3	1.081	.446
32	163	6.06	75.6	24.3	1.116	.637
33	148	5.51	81.1	18.8	1.151	.828
34	108	4.02	85.2	14.7	1.186	1.019
35	91	3.38	88.6	11.3	1.221	1.210
36	106	3.94	92.5	7.4	1.255	1.401
37	70	2.60	95.1	4.8	1.290	1.592
38	62	2.30	97.4	2.5	1.325	1.783
39	50	1.86	99.3	.6	1.360	1.974
40	18	.67	100.0	.0	1.395	2.165

REMAINING FREQUENCIES ARE ALL ZERO

Figure C-4

Sample Printout of Daily Absentee Statistics

DAILY ABSENTEE STATISTICS

TABLE 3

ENTRIES IN TABLE	MEAN ARGUMENT	STANDARD DEVIATION	SUM OF ARGUMENTS	
	3.072	1.453	928.000	NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
0	31	10.26	10.2	89.7	-.000	-2.114
1	2	.66	10.9	89.0	.325	-1.426
2	25	8.27	19.2	80.7	.650	-.738
3	134	44.37	63.5	36.4	.976	-.050
4	99	32.78	96.3	3.6	1.301	.638
5	4	1.32	97.6	2.3	1.627	1.326
6	0	.00	97.6	2.3	1.952	2.014
7	3	.99	98.6	1.3	2.278	2.702
8	2	.66	99.3	.6	2.603	3.390
9	0	.00	99.3	.6	2.928	4.078
10	1	.33	99.6	.3	3.254	4.767
11	1	.33	100.0	.0	3.579	5.455

REMAINING FREQUENCIES ARE ALL ZERO

Figure C-5

Wait-Time Data for Policies 1D' and 1F'

RESULTS OF POLICIES FOR ASSIGNMENT OF 76P20 GRADUATES TO FOLLOW-ON COURSES AND TO THE FIELD

MAN DAYS WAIT TIME UNDER POLICY #1D'

NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS
1 9667					

MAN DAYS WAIT TIME UNDER POLICY #1F'

NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS	NUMBER - CONTENTS
2 10486					

Figure C-6

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: HumRRO-TR-73-34	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): COMPUTER SIMULATION AS AN AID TO MANAGERS OF TRAINING	5. TYPE OF REPORT & PERIOD COVERED: Technical Report
6. PERFORMING ORG. REPORT NUMBER: Technical Report 73-34	
7. AUTHOR(S): Harold Wagner and Patrick J. Butler	8. CONTRACT OR GRANT NUMBER(S): DAHC 19-73-C-0004
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Human Resources Research Organization (HumRRO), 300 North Washington Street, Alexandria, Virginia 22314	10. PROGRAM ELEMENT PROJECT TASK AREA & WORK UNIT NUMBERS: Proj. 2Q062107A745, Work Unit 110
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Research Institute for the Behavioral and Social Sciences, 1300 Wilson Blvd., Arlington, Virginia 22209	12. REPORT DATE: December 1973
	13. NUMBER OF PAGES: 104
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

*Computerized simulation
Course completion time
General Purpose Simulation System (GPSS)
Individualized instruction

(Continued)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

General Purpose Simulation System (GPSS) simulations of hypothetical self-paced training programs were performed in this study. The purpose was to evaluate the utility of this technique as a planning aid for managers of training who are faced with implementing a self-paced course. These managers must have information that permits reliable and accurate planning of instructional resources, facilities, and materials. Completion time distributions from the self-paced Stock Control

(Continued)

ERIC

19. *(Continued)*

*Models
Scheduling of training
Self-paced training
Simulations
Student flow model
Training management
*Training programs

20. *(Continued)*

and Accounting Specialist (MOS 76P20) course were used in the GPSS simulations. Other variables that entered the model included attrition rates, absentee rates, and follow-on course quotas. The final GPSS model forecasts such items as the daily training load, the daily student output, and the number of absentees. In addition, the model permits the evaluation and selection of optimum follow-on course scheduling policies.

DISTRIBUTION LIST

1 OIR OASD MANPOWER (PP&GR)
1 DIR DASD MANPOWER & RES AFFAIRS
1 NASA SCI & TECH INFO FACILITY COLLEGE PARK MD
1 CG 1ST ARMY ATTN DCSDT FT MEADE MD
1 OIR HEL APG MD
1 TECH LIB ARMY NATICK LABS NATICK MASS
1 REDSTONE SCIENTIFIC INFO CTR USA MSL COMD ATTN CHF DOC SEC
1 CG FT ORD ATTN G3 TNG DIV
1 CO HQ ARMY ENLISTED EVAL CTR FT HARRISON IND
1 DIR OF INTERN TNG USA LOG MGT CTR FT LEE
1 LIB ARMY WAR COLL CARLISLE BKS
1 OIR OF MIL PSYCHOL & LDRSHP US MIL ACAD
1 COMDT ARMY SECUR AGY TNG CTR & SCH ATTN LIB
1 COMDT INDSTR COLL OF THE ARMED FORCES FT MCNAIR
1 COMDT THE ARMOR SCH ATTN DOI FT KNOX
1 COMDT USA CHAPLAIN SCH ATTN DOI FT HAMILTON
1 USA FINANCE SCH FT HARRISON ATTN EA
1 COMDT USAIS ATTN EA FT BENNING
1 COMDT USAIS ATTN AJIIS-D-EPRD FT BENNING
1 HQ USA ADJ GEN SCH FT HARRISON ATTN COMDT
1 CO USA SEC AGCY TNG CTR & SCH ATTN IATEV RSCH AOV
1 COMDT USA MIL POLICE SCH ATTN PLNS & PROG ODOI
1 COMDT USA SE SIG SCH ATTN EA
1 COMDT USA AD SCH ATTN DOI FT BLISS
1 COMDT USA ENGR SCH ATTN EA AHBBES-EA
1 COMDT ARMY AVN SCH FT RUCKER ATTN ED ADV
1 DIR OF INSTR US MIL ACAD WEST POINT NY
1 OIR OF MILIT INSTR US MIL ACAD WEST POINT NY
1 COMDT USA CA SCH ATTN EA FT BRAGG
1 COMDT USA ARTY SCH ATTN EA FT SILL
1 USA INST FOR MIL ASST ATTN EA FT BRAGG
1 DCS-PERS OA ATTN CHF C&S DIV
1 DIR OF PERS STUDIES & RSCH ODCSPER DA WASH DC
1 ACSFOR DA ATTN CHF TNG DIV WASH DC
1 CG USA MAT COMD ATTN AMCRD-TE
1 HQ ARMY MAT COMD R & D DRCTE ATTN AMCRD-RC
1 CHF OF PERS OPNS PERS DRCTE OA ATTN OPSC
1 OPO PERS MGT DEV OFC ATTN MOS SEC (NEW EQUIP)
12 ADMIN DDC ATTN TCA (HEALY) CAMERON STA
1 COMDT USA CBT SURVEIL SCH & TNG CTR ATTN EA
1 TNG & DEVEL DIV ODCSPERS
15 COMD USA TRADOC ATTN ATTS ITR
2 COMD USA TRADOC ATTN LIB
1 USA RECRUITING COMD HAMPTON VA
1 RSCH CONTRACTS & GRANTS BR USA
1 BSO SCI DIV ARD
1 CDR TNG COMMAND US PACIFIC FLT SAN DIEGO
3 TECH LIB PERS 11B BUR OF NAV PERS ARL ANNEX
2 OIR PERS RES DIV BUR OF NAV PERS
1 ENGNR PSYCHOL BR ONR CODE 455 ATTN ASST HEAD WASH OC
1 CO & OIR NAV TNG DEVICE CTR ORLANDO ATTN TECH LIB
1 CO FLEET TNG CTR USN STA SAN DIEGO
1 CO SERV SCH COMD NAV TNG CTR SAN DIEGO
1 CO FLT ANTI-SUB WARFARE SCH SAN DIEGO
1 CHF OF NAVL RSCH PERS & TNG BR (CODE 458) ARL VA
1 DIR US NAV RES LAB ATTN CODE 5120
1 OIR NAVAL RSCH LAB ATTN LIB CODE 2029
1 CHF OF NAV AIR TNG TNG RSCH DEPT NAV AIR STA PENSACOLA
1 OIC NAV PERS RES ACTVY SAN DIEGO
1 DIR PERS RSCH LAB NAV PERS PROGRAM SUPPORT ACTIVY WNY
2 COMDT MARINE CORPS HQ MARINE CORPS ATTN CODE AO-1B
1 CHF OF NAV OPNS OP-01P1
1 CHF OF NAVL OPS OP-039 WASH DC
1 CHF OF NAV OPNS OP-07 TL
1 CHF OF NAV AIR TECH TNG NAV AIR STA MEMPHIS
1 DIR OPS EVAL GRP OFF OF CHF OF NAV OPS OPO3EG
1 CO USCG TNG CTR GOVERNORS ISLAND NY
1 SUPT USCG ACAD NEW LONDON CONN
1 TECH DIR TECH TNG DIV (HRD) AFHRL LOWRY AFB COLO
1 CHF ANAL DIV (AFPDPL (R) DIR OF PERSNL PLNG HQS USAF
1 AFHRL/TT ATTN CAPT W S SELLMAN LOWRY AFB
1 AFHRL (HRT) WRIGHT-PATTERSON AFB
1 HQS ATC DCS/TECH TNG (ATTMS) RANDOLPH AFB
1 USAFA DIR OF THE LIB USAF ACAD CDLO
1 6570TH PERS RSCH LAB PRA-4 AEROSPACE MED DIV LACKLAND AFB
1 TECH TNG CTR (LMTC/OP-I-L1)LOWRY AFB
1 CO HUMAN RESOURCES LAB BROOKS AFB
1 DIR NATL SECUR AGCY FT MEADE ATTN TDL
1 DIR NATL SECUR AGCY FT MEADE ATTN DIR OF TNG
1 DEPT OF TRANS FAA ACQ SEC HQ 610A WASH DC
1 ERIC OE WASH DC
1 SYS DEVEL CORP SANTA MONICA ATTN LIB
1 DUNLAP & ASSOC INC DARIEN ATTN LIB
1 GRC/OAD ATTN DOC LIB
1 OIR RAND CORP SANTA MONICA ATTN LIB
1 MITRE CORP BEDFORD MASS ATTN LIB
1 SIMULATION ENGR CORP ATTN DIR OF ENGR FAIRFAX VA
1 LEARNING R&D CTR U OF PITTS ATTN DIR
1 HUMAN SCI RSCH INC VA
1 CHRYSLER CORP MSL DIV DETROIT ATTN TECH INFO CTR
1 SCI & TECH DIV IDA ARL VA
1 DIR CTR FOR RES ON LEARNING & TEACHING U OF MICH
1 AIR SILVER SPRING MD
1 AIR ATTN LIBN PA
1 MATRIX RSCH CO FALLS CHURCH VA
1 EDUC & TNG CONSLT CO LA CALIF
1 GE CO WASH DC
1 AIR ATTN LIB PALO ALTO CALIF
1 SCI RSCH ASSOC INC DIR OF EVAL CHICAGO
1 APA ATTN PSYCHOL ABSTR
1 BELL TEL LABS INC TECH INFO LIB NJ
1 AMER BEHAV SCI CALIF
1 CHRYSLER CORP DEF ENGR ATTN OR H BERMAN DETROIT
1 DR H SHOEMAKER DIR TNG RSCH GP NY
1 FLORIDA STATE U LIB GIFTS & EXCH
1 LIB GW UNIV ATTN SPEC COLL DEPT
1 CATHOLIC U LIB EDUC & PSYCHOL LIB WASH DC
1 GEORGETOWN U LIB SER DEPT WASH OC
1 ARI 1300 WILSON BLVD ARL VA
1 DIR USA MOTV & TNG LAB ARL VA
1 CBT ARMS TNG BD FT BENNING
1 DR L BAKER ARMY RSCH GP EUROPE
1 OIR EDUC CTR MARINE CORPS DEV & EDUC CTR QUANTICO
1 DPTY CHF OF STAFF (AIR) (MC-AA1) HQ USMC
1 NAVL TNG EQUIP CTR TNG ANAL & EVAL GP FLA
1 DEPT OF AF DEPT OF LIFE & BEHAV SCI ATTN OIR USAF ACAD
1 DR L WILLIAMS DIR EDUC & PLNG & DEV VA COMMONWEALTH UNIV
1 COMDT USA QM SCH ATTN DIR ENLISTED SUPPLY DEPT
1 COMDT USA QM SCH ATTN DPTY DIR ENLISTED SUPPLY DEPT
1 COMDT USA QM SCH ATTN EO OFC OF DPTY COMD FOR TNG & EDUC
1 COMDT USA QM SCH ATTN CHF STOCK ACCT DIV ENLISTED SUPPLY DEPT

HUMAN RESOURCES RESEARCH ORGANIZATION

300 North Washington Street • Alexandria, Virginia 22314

President	Dr. Meredith P. Crawford
Executive Vice President	Dr. William A. McClelland
Executive Officer	Mr. Saul Lavisky
Director for Business Affairs & Treasurer	Mr. Charles W. Smith
Director for Program Development	Mr. David S. Bushnell
Director for Research Design & Reporting	Dr. Eugene A. Cogan
Director Editorial & Production Center	Mrs. Lola M. Zook

RESEARCH DIVISIONS

HumRRO Division No. 1 (System Operations) 300 North Washington Street Alexandria, Virginia 22314	Dr. J. Daniel Lyons Director
HumRRO Division No. 2 Fort Knox, Kentucky 40121	Dr. Donald F. Haggard Director
HumRRO Western Division Post Office Box 5787 Presidio of Monterey, California 93940	Dr. Howard H. McFann Director
HumRRO Division No. 4 Post Office Box 2086 Fort Benning, Georgia 31905	Dr. T.O. Jacobs Director
HumRRO Division No. 6 Post Office Box 428 Fort Rucker, Alabama 36360	Dr. Wallace W. Prophet Director
HumRRO Division No. 7 (Social Science) 300 North Washington Street Alexandria, Virginia 22314	Dr. Robert G. Smith, Jr. Director