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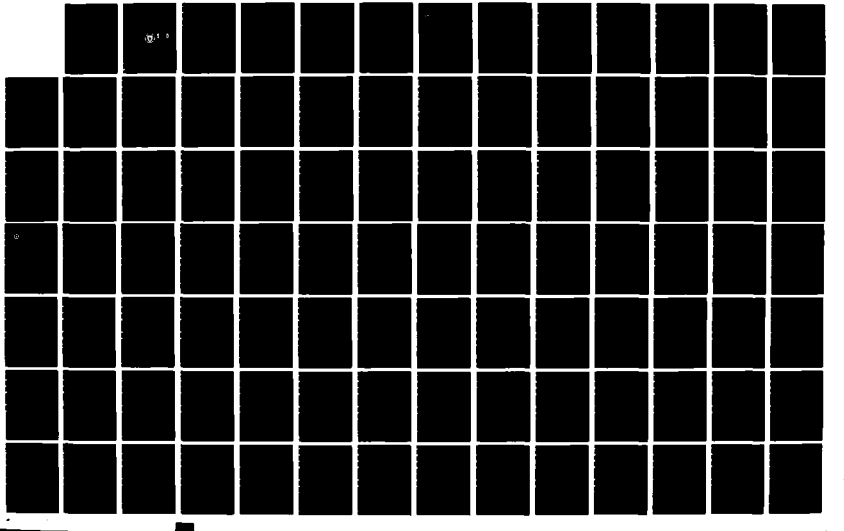

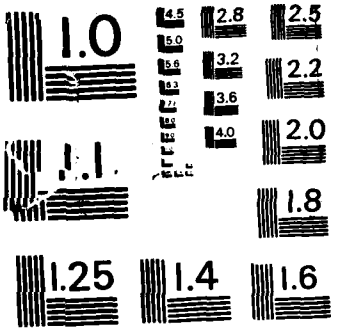

STUDY REPORT
CAA-SR-85-19
ADE 860055

NETWORK ANALYSIS PLANNING MODEL FOR THE JUDGE ADVOCATE GENERAL (NAPM-JAG)

SEPTEMBER 1985

PREPARED BY
FORCE SYSTEMS DIRECTORATE
US ARMY CONCEPTS ANALYSIS AGENCY
8120 WOODMONT AVENUE
BETHESDA, MARYLAND 20814-2797

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Director
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Manpower; officer assignments; personnel policies; simulation; personnel management; Q-GERT Network Analysis

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

The NAPM-JAG Study resulted in a model that reflects JAGC officer personnel management policies and procedures. The model is designed to facilitate personnel planning for the OTJAG in that it provides a means for evaluating the impact of change in the system.

The model simulates the professional careers of JAGC officer personnel over a 30-year period. An initial force is loaded containing TIS, TIG, gender, and

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functional area information on each officer. Lieutenants and captains are accessed each year of simulation. As the force ages, officers may be retired, be removed, be promoted, be assigned to a ~~THS~~ catagory or continue to serve another year in grade.

The Judge Advocate General Officer Personnel Model ~~(JOPM)~~ is a network simulation model constructed within the context of Q-GERT. It is currently running on a Sperry-Univac 1100/84 computer system. A single simulation run of 30 years takes approximately 3 minutes. Key to the successful operation of the model is the collection of accurate promotion probability, retention probability, career windows screening period, and career screening objective data sets.

Model outputs provide reports of officer distributions over time, histograms showing TIG distribution for promotions, plots of officer grade levels over time, and transaction tables reporting the officer status.

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CAA-SR-85-19

DEPARTMENT OF THE ARMY
US ARMY CONCEPTS ANALYSIS AGENCY
8120 WOODMONT AVENUE
BETHESDA, MARYLAND 20814-2797

REPLY TO
ATTENTION OF:

09 APR 1986

CSCA-FSP

SUBJECT: Network Analysis Planning Model for the Judge Advocate General (NAPM-JAG) Study

The Judge Advocate General
Headquarters, Department of the Army
ATTN: DAJA-PT
Washington,D.C. 20310-2200

1. Reference:

a. Letter, DAJA-PT, HQDA, 19 June 1985, subject: Study Directive, the Network Analysis Planning Model for the Judge Advocate General (NAPM-JAG).

2. Letter, CSCA-FSP, U.S. Army Concepts Analyis Agency, 21 October 1985, SAB.

2. The Judge Advocate General (reference 1a) requested that the U.S. Army Concepts Analysis Agency develop a model that reflects JAGC officer personnel management policies and procedures. In response to this request, our draft study report was provided for your comments by reference 1b. This final report incorporates your informal suggestions and additions to the proposed distribution list.

3. The CAA responsibility to transport and set up the model developed in this study cannot be fulfilled at this time. Because of severe cutbacks in our operating budget we do not have the $4000 required for the license to permanently install the software necessary to run the model at your site. We will try to identify the funds in the next budget year. The model is being maintained at CAA and will be made available when funds can be identified.

4. This Agency appreciates the support by all activities which contributed to this study. Questions and inquiries should be directed to the Assistant Director, Force Systems Directorate, U.S. Army Concepts Analysis Agency, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797, AUTOVON 295-1607.

E. B. VANDIVER III
Director

CAA	NETWORK ANALYSIS PLANNING MODEL FOR THE JUDGE ADVOCATE GENERAL (NAPM-JAG)	STUDY SUMMARY CAA-SR-85-19

THE REASON FOR THE STUDY was to develop an analytical tool to assist the Office of the Judge Advocate General (OJAG) personnel managers in evaluating current and future OJAG personnel policies and to assess the impact of policy changes on the Judge Advocate General Corps (JAGC) force.

THE PRINCIPAL FINDINGS of this study are:

(1) An existing US Army Concepts Analysis Agency (CAA) Network Analysis Planning Model (NAPM) could be modified and enhanced to create the Judge Advocate General Officer Personnel Model (JOPM) for the OJAG.

(2) JOPM can simulate 100 percent of the JAG officer corps of approximately 2,000 men and women, aging this force over a 30-year period.

(3) The model is flexible, allowing the simulation of different personnel policies and constraints that affect officer accession, assignment, promotion, and retention rates.

THE MAIN ASSUMPTIONS are that the force structure, personnel authorizations and historical data (personnel distribution, promotion, and continuation rates by year and gender) are valid.

THE PRINCIPAL LIMITATIONS of the work which might affect the findings are:

(1) Coarse estimates of female officer continuation rates were provided by the Military Personnel Center because historical data are very limited.

(2) The model, as currently structured, is limited to three JAG specialty areas. They are: general law, contract law, and a roll-up of other specialty areas.

(3) The model tracks officers in a schooling account, but schooling credit does not enhance promotion opportunity or career goals.

THE SCOPE OF THE STUDY incorporates and modifies the NAPM code and its associated data base to create the JOPM. The modifications introduced into the enhanced model include:

(1) Allowing for the accession of captains.

(2) Introducing special windows for screening captains as they age in the force.

(3) Simulating 100 percent of the JAG officer force.

(4) Providing a capability to simulate field grade officers remaining in the force after they attain maximum time-in-service.

(5) Providing annual output reports of numbers of officers at each grade that leave the service as well as enter that grade.

THE STUDY OBJECTIVE was to develop a model to simulate the impact of policy changes on The JAG officer force, and provide the Office of The Judge Advocate General with a capability to examine the impact of alternative personnel policies upon this force.

THE BASIC APPROACH followed in this study was to simulate an officer's career as a network process. The Queueing - Graphical Evaluation Review Technique (Q-GERT) software was selected for its ability to process problems structured as networks.

THE STUDY SPONSOR was the Office of The Judge Advocate General (OTJAG).

THE STUDY EFFORT was directed by Mr. Stanley H. Miller of the Force Systems Directorate.

COMMENTS AND QUESTIONS may be sent to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-FS, 8120 Woodmont Avenue, Bethesda, MD 20814-2797.

Tear-out copies of this synopsis are at back cover.

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NETWORK ANALYSIS PLANNING MODEL FOR THE JUDGE ADVOCATE GENERAL (NAPM-JAG)

CHAPTER 1

EXECUTIVE SUMMARY

1-1. PROBLEM. The current collection of submodels that comprise the Officer Force Management Model (OFMM) includes extensive large-scale computer programs and data files. The OFMM program set and its associated data files do not readily lend themselves to use by JAG personnel planners and managers because of their size, variety, complexity, inflexibility, and quantity of information that must be processed for different personnel policy configurations. For this reason, a model that ages the force and readily simulates the Judge Advocate General (JAG) Officer Personnel Management System (JOPMS) is needed. It will enable JAG personnel managers to evaluate and to compare different policies so that they will be able to manage their officer force according to a required force structure and budget-end strength.

1-2. BACKGROUND

a. This study was conducted for the Office of Personnel, Plans, and Training, JAG, because of the need for adequate planning and analysis of personnel policies that directly affect officer accessions, promotion opportunities, professional development, and specialty assignments.

b. The US Army Concepts Analysis Agency (CAA) was officially tasked by the Office of The Judge Advocate General (OTJAG) to develop an analytical tool that would aid personnel managers in evaluating current and future OTJAG personnel policies, and to assess the impact of the policies on the Judge Advocate General Corps (JAGC) force structure. The study directive is at Appendix B.

c. The generalized Network Analysis Planning Model (NAPM), developed at CAA, simulates the procedures which reflect the annual accessions and assignments of officers by specialty code. It provides outputs displaying tables of annual force levels over a 30-year period, time-dependent plots of these data, and time-in-grade histograms when officers were promoted.

1-3. PURPOSE AND OBJECTIVES. The Network Analysis Planning Model for the Judge Advocate General (NAPM-JAG) Study simulates the aging process of officers within the JAGC. It is designed to assist the Office of Personnel, Plans and Training, JAG, in evaluating the impact of alternative personnel policies over a time span. Specific objectives of this study are to:

a. Examine the JAG personnel system and determine those factors which cause fluctuations in the population within the JAGC.

b. Modify the NAPM to meet specific JAG requirements, thereby enabling OTJAG managers to observe the effects of alternative JAG management policies.

c. Provide sample analytical results to the study proponent emphasizing those elements which impact on the stability of the JAG population.

d. Provide necessary model documentation to permit operation of the model by OTJAG at their facility.

1-4. SCOPE AND LIMITATIONS

a. The study adapts an existing CAA force-aging simulation model (NAPM) to create the JAG Officer Personnel Model (JOPM). The enhancement of the model allows for the accession of captains, introduces special windows for screening captains as they age in the force, simulates 100 percent of the JAG officer force, provides a capability to simulate field grade officers remaining in the force after they attain maximum time-in-service, provides annual reports of numbers of officers at each grade that leave the service as well as enter that grade, and allows for lieutenants to enter the JAGC in a special law category.

b. A limitation of the study related to data is that sufficient historical data are not available for establishing accurate career profiles of female officers within the JAGC.

c. The limitations of the study relative to modeling are:

(1) The model is structured to simulate only three JAG officer groups. They are general lawyers, contract law specialists, and other law specialists (i.e., regulatory, labor, and patent).

(2) The model assigns officers into a schooling account. The schooling credit does not enhance their promotion opportunities.

1-5. TIMEFRAME. Current (1985).

1-6. ASSUMPTION. The force structure, personnel authorizations, and historical data (personnel distribution, promotion, and continuation rates by year and gender) are valid.

1-7. STUDY APPROACH AND METHODOLOGY. The approach employed in this study is presented in three phases: background, development, and validation.

a. The background phase provided the study team with a working knowledge of the JAG personnel system and the current policies and procedures affecting its operation. This was accomplished through:

(1) Review of literature pertaining to operation of the JAG personnel system.

(2) Correlation of the knowledge of how the JAG personnel system works, the availability of data maintained on the operation of the JAG personnel system, and the relevancy of this data when simulating the JAGC Officer Personnel Management System.

(3) Determing what, if any, Army models and methodologies are in use, or could be used, to forecast the impact of JAGC personnel policies.

(4) Review of the selected analytical tools and techniques proposed for use in the study, and reconfirming the study directive recommendation to utilize NAPM as the basis for the JAGC personnel model.

b. The development phase provided the establishment of the JAG personnel network, the logic that contains the policy elements selected for simulation, and the testing of the model. This covered:

(1) Building the network of the JAGC personnel system as it pertains to the flow of officers from accessed lieutenants to promoted colonels.

(2) Developing the necessary logic that guides officers though the network, utilizing decision rules which reflect Army policy as well as allow the simulation of alternative policies.

c. The validation phase checked the model's ability to simulate alternative personnel policies. Modifications were made to the data base to verify this ability. The inputs that reflect policy variations were varied (increased and decreased) to ensure that the model was sensitive to these changes. Policy variables that can be simulated are discussed in Chapter 3. Examples of these inputs are:

(1) Yearly accession rates.

(2) Percentage by gender in any one year.

(3) Percentage promoted in any one year.

(4) Percentage retiring in any one year.

(5) Percentage practicing in any one law category.

1-8. SUMMARY OF FINDINGS AND OBSERVATIONS

a. **Essential Elements of Analysis (EEA).** The EEA which guided the conduct of the study are stated and discussed below.

(1) **Does the model reflect the current policies and procedures of the JAGC Officer Personnel Management System and permit changes to the policies?** The JOPM is specifically designed to collect, analyze, and report information concerning the distribution of officers in the JAGC over time. Information is collected on the number of officers in each grade as a function of time. Histograms report the TIG distributions of promoted officers. Graphic displays plot the number of officers in each group as a function of time. A

reference simulation, based on current policy, establishes a force profile over a 30-year simulation period. Changes are made to the data to reflect alternative policies and the model is rerun. Comparing results from various runs allows personnel managers to assess the impact of alternative policies. Data input requirements are detailed in Appendix E.

(2) Although not an EEA, the question was often asked, does the model allow the OJAG to project force size into the future? JOPM is not a predictive model. The model user must prepare and input expected rates and probability distributions. The model will simulate up to 30 years of activity, but the results should only be used to project as far into the future as the model user has faith in the input data. The major benefit to accrue with the model is that the user may input most-optimistic and most-pessimistic rates and probabilities to obtain a range of expected force distributions. Since the model runs in a short time, it is quite responsive to this type of operation and does not, therefore, require extensive data preparation by the user.

b. Summary of Key Findings and Observations. The major observations resulting from the study are as follows:

(1) The model, as developed, is successful in assessing the impact of policy decision changes on the JAGC officer distribution.

(2) The most influencing factors which cause fluctuations in the distribution of the officer force are:

(a) Time period when screening of captains occurs.

(b) Percent of captains cut at each screening window.

(c) Probability of promotion of each officer group.

(d) The voluntary resignation rates of officers.

(3) The JOPM forte is in applications that measure relative differences between alternative policies. The model's fast running time and ease of operation provide the user with the ability to look at the future impact that policy decisions have on the system.

1-9. CONTENTS OF THE REPORT. The following chapters, supported by appendices, present the results of this study. Chapter 2 contains a discussion of the JAG personnel system, emphasizing those aspects which impact on this study. Chapter 3 discusses the study methodology employed and general tasks performed, while Chapters 4 and 5 detail the model design, validation, operation, and application. Chapter 6 completes the report with observations about the study.

CHAPTER 2

THE JUDGE ADVOCATE GENERAL PERSONNEL SYSTEM

2-1. INTRODUCTION

a. In order to understand the flow of officers into, through, and out of the JAGC, it was necessary to become familiar with the Defense Officer Personnel Management Act (DOPMA) Senate Bill. This Bill, passed into law effective September 1981, is the basis for the management of the officer corps.

(1) DOPMA provides for a single promotion process of all officers on active duty and on the active duty list (ADL) regardless of their component.

(2) The distribution of grades major and above is established and controlled by DOPMA, and may be further constrained by Congress, the Office of the Secretary of the Army (OSA), or the Chief of Staff of the Army (CSA).

(3) In effect, the number of field grade and general officer requirements by grade is a function of the total officer authorized strength levels. The total number of officer authorizations is based on the total size of the Army and is prescribed by the Secretary of the Army.

(4) DOPMA establishes minimum time-in-grade (TIG) requirements for promotion to the next higher grade as shown below:

(a) Promotion to first lieutenant = 18 months

(b) Promotion to captain = 2 years

(c) Promotion to major = 3 years

(d) Promotion to lieutenant colonel = 3 years

(e) Promotion to colonel = 3 years

The minimum TIG requirements for company grade officers in the JAGC have been modified by specific Secretary of the Army guidance.

(5) DOPMA authorizes below the zone (BZ) promotions for those outstanding officers who have demonstrated performance and superior skills. BZ promotions apply to the grades of major, lieutenant colonel, and colonel. A maximum of 5 percent of the promotion list to major and 10 percent of the list to lieutenant colonel and colonel may come from officers below the zone.

2-2. THE JUDGE ADVOCATE GENERAL CORPS (JAGC)

a. General. The mission of the JAGC is to provide professional legal service to the Army and its members.

b. Description. The JAGC consists of attorneys who are graduates of the American Bar Association's approved law schools and have been admitted to practice and have membership in good standing of the bar of the highest court of a state or a Federal court.

c. Specialties

(1) The areas of practice in the JAGC are divided into two special skill identification (SSI) categories. Within the JAG specialty code (SC) 55, there is the SC55A Judge Advocate designator, the general specialty for all JAGC officers, and the SC55B Military Judge designator for both the trial and appellate jurists.

(2) Opportunities exist for specialization in areas of international, contract, regulatory, labor, patent, environmental, and tax law.

2-3. OBSERVED JAGC PERSONNEL SYSTEM

a. General. At present, the Judge Advocate General Corps receives about 200 officers per year. The majority of these officers enter the Army as first lieutenants. This is a change from the pre-DOPMA era where JAG officers entered the Army as captains. Today, only a very small percentage of JAG officers enter the Corps as captains. These officers are either branch transfers (with a law degree and passed a state bar exam) or they are officers with 2 to 6 years of active duty who are sent to law school by the Army. Of all the first lieutenants entering the JAG Corps, the vast majority (99 percent) will get promoted to captain in 6 to 8 months. Promotion to captain is on a fully-qualified basis. JAG officers are given 3 years of constructive credit for law school. This is why they enter the Army as first lieutenants and are promoted to captain within a year.

b. Officer Promotions

(1) JAG captains are screened between their third and fourth years of service. Of the approximately 200 officers screened, 100 will be retained on active duty. JAG captains are screened again between their fifth and sixth years of service. Of the approximately 100 officers screened, 60 will be retained on active duty. The 60 captains retained on active duty are screened at the eighth year of service for promotion to major. Of the 60 captains screened, 80 percent, or approximately 48, are selected for promotion. At approximately the fourteenth year of service, JAG officers are considered for promotion to lieutenant colonel. Of the 48 eligible, 70 percent, or about 34 officers, will be selected for promotion. At the nineteenth year of service, eligible lieutenant colonels are screened for promotion to colonel. Of the 34 eligible, 50 percent, or 17, will be selected for promotion to colonel.

(2) Captains who are not selected for promotion to major are not retained on active duty. This is the current policy of the JAG Corps. Majors who are not selected for promotion to lieutenant colonel (with 14 years of service) are selectively continued on active duty for 20 years.

(3) Judges are accounted for in the figures currently being utilized in the study. Officers are eligible to become judges at the grade of major level.

c. Officer Specialties. The JAG officer specialty areas are: contract law, international law, labor law, claims, and patents. Approximately 30 percent of JAG officers work in one of these specialty areas. Working in a specialty area has no effect on promotions or schooling considerations; however, many JAG officers hesitate to go into a specialty area because they feel that they are getting away from the "mainstream," and that specializing will hurt their careers in the Army. These specialty areas are not additional specialties (ADSPECS) as with other Army officers.

(1) Training Opportunities

(a) JAG officers attend military schools in basically the same manner as other Army officers. Upon entry on active duty, JAG officers attend an officer basic course. This course is approximately 3 months in duration. Between the fifth and eighth years of service, JAG officers attend an officer advanced course (9 months). They also attend a Combined Arms Staff Service School (CAS^3) for 9 weeks. Between the tenth and fourteenth years of service, about 10 percent of the JAG officers are selected to attend the Command and General Staff College (C&GSC) for 9 months. Approximately 10 percent of eligible colonels are selected to attend the War College for 1 year.

(b) The number of quotas available to the JAG corps is very limited. C&GSC is not a requirement for promotion in the JAG corps.

d. Female Officers

(1) The JAG Corps has no overall policy affecting the type of job that female officers are assigned. However, OTJAG has stated that there will be no more than two female officers in the 2d Infantry Division (Korea) at any given time.

(2) The JAG Corps has a problem with female officers staying in service past their first tour. Currently, there are only about 20 female field grade officers on active duty now. The situation is better now than in the past due to sheer numbers. There are now more females going to law school, therefore more are entering the service.

2-4. SUMMARY. The emphasis in this chapter has been to provide background on those elements which are of major importance in understanding the portion of the system to be modeled, and those factors of the system which have major impact on the modeling effort.

CHAPTER 3

STUDY METHODOLOGY

3-1. INTRODUCTION. This chapter describes the methodology employed and general tasks performed during the conduct of the NAPM-JAG Study. The methodology will be described in terms of three phases: background, development, and validation. The various tasks which occurred during these phases will then be described.

3-2. THE METHODOLOGY OF THE STUDY. The background phase provided the study team with a working knowledge of the JAG personnel system and the current policies and procedures affecting its operation. Further, the study team became familiar with the type data available and the data sources, existing methodologies, and tools and techniques for model and methodology development. During the development phase, relevant data were selected, statistical techniques were used to manipulate the data, and the personnel flow/decision network methodology and model were developed. Test data were input to the model to ensure the functioning of the model and the validity of the methodology. During the validation phase, output from the model was analyzed to determine how well the model reflected "real life."

a. Background Phase. The four tasks of the background phase are described below:

(1) The first task of this phase was accomplished through a review of literature pertaining to the operation of the JAG personnel system. Examination of current regulatory guidance provided the basic knowledge which was augmented by interviewing JAG personnel who were knowledgeable in the JAG personnel system. With this knowledge, the study team was able to describe, in detail, the process by which officers flow into and out of the JAGC.

(2) The second task was to correlate the knowledge of how the system worked, the availability of data maintained on the operation of the JAG personnel system, and the relevancy of this data when simulating the JAGC Officer Personnel Management System. The object was to develop a simulation model that reflects current policies and procedures and permits the measurement of the impact that policy changes have on the system.

(3) The third task was to determine what, if any, Army models and methodologies were in use, or could be used, to forecast the impact of JAGC personnel policies. The approach demonstrated in NAPM, as discussed in the directive for this study (see Appendix B), established guidance that modifications to the current NAPM could produce the desired JAGC personnel model.

(4) The last task was to review the selected analytical tools and techniques for use in the study. This task reconfirmed the study directive recommendation to utilize NAPM as the basis for the JAGC personnel model. The Q-GERT simulation language, utilized in NAPM, is a procedural network technique which simulates sequential, time-phased activities, and is extremely flexible to problem formulation.

b. Development Phase. This phase provided for the development of the JAG personnel network, development of the logic that contained the policy elements selected for simulation, and the testing of the model.

(1) The first task was to build the network of the JAGC personnel system as it pertains to the flow of officers from accessed lieutenants to promoted colonels. The modeling tool applied was Q-GERT (see Appendix D). This task involved graphically representing each activity and decision point to route officers into and out of the JAGC. The actual methodology and model development is more fully explained in Chapter 4.

(2) The next task was to develop the necessary logic that guides officers through the network, utilizing decision rules which reflect current policy as well as allow the simulation of alternative policies. These were implemented in the new model called JAG Officer Personnel Model (JOPM). The following policy variations that impact on the JAGC personnel structure can be played in JOPM:

(a) Yearly accession rates for male and female (lieutenant and captain) officers.

(b) Percentage of yearly accessions who are male and female.

(c) Percentage of officers who voluntarily leave the service in any year.

(d) Percentage of officers who are promoted in any year.

(e) Percentage of officers who are assigned into a THS category in any year.

(f) Percentage of officers who practice law in one of the special law categories.

(g) Percentage of officers who practice law in the contract law category.

(h) Percentage of captains who are cut from the JAGC during screening operations that occur between the third and fourth year of service.

(i) Percentage of captains who are cut from the JAGC during the screening operations that occur between the fifth and sixth year of service.

(j) In addition to the above, the following options are allowed during a run of the model:

1. A switch can be set permitting lieutenants to practice law in one of the special law categories.

2. The screening year (currently set at the third and fifth years) for captains can be set to any other 2-year set.

3. A switch can be set permitting field grade officers to continue to serve beyond the maximum time in service, if the JAGC is operating under strength. This is referred to as the force leveling option that allows continuation in service without additional opportunity for promotion.

(3) The final task in the development phase was to control the input data, and test the methodology/model to ensure personnel flow was occurring in the manner for which the model was developed.

c. Validation Phase. In this phase, the model output was examined to ensure that the model operation and input were such that "real world" results were reflected. Input rates and policy criteria were drawn from experienced military sources. Model outputs were compared to actual JAG personnel populations. The inputs and policy criteria were varied (increased and decreased) such that the study team was assured that input of a range of policy criteria resulted in a range of expected "personnel in the system" distributions which would permit more analytical management of JAGC personnel.

3-3. PROGRAMS AND DOCUMENTATION. Program routines and the Q-GERT Model have been provided, in automated form, to OTJAG for their use. These programs and routines are included at Appendix F. User documentation is provided at Appendix E.

3-4. QUALITY ASSURANCE. Quality assurance of the study product was achieved through continuous close coordination with knowledgeable and experienced personnel at the Personnel, Plans, and Training Office, OTJAG. As concepts were developed and data analyzed during the study, discussions were held with appropriate Points of Contact (POC) to ensure accuracy, consistency, and compliance with current policies and procedures. In-process review briefings were provided to the CAA Analysis Review Board (ARB) and to the study sponsor's representative to ensure utilization of sound techniques and study procedures and compliance with the study directive.

CHAPTER 4

METHODOLOGY/MODEL DESIGN

4-1. INTRODUCTION. The NAPM-JAG Study resulted in the development of two main products: a methodology and a model. The methodology is the conceptualization of the process whereby the JAG personnel system can be described graphically and analytically for that portion of the system which impacts on the progression of career JAG officers. The model puts the concepts of the methodology into operation. The model developed for this study is the JOPM. It was designed to allow ease of operation and flexibility in changing model parameters which will, in turn, give the OTJAG managers analytical results of policy decisions under consideration.

4-2. DESIGN CONSIDERATIONS. In the development of the methodology/model, many factors had to be considered. Most important were the desires of the study sponsor concerning the questions which must be answered by the model and the problems in the management of JAG personnel which the model/methodology should be able to assist in resolving. Additionally, there were technical considerations which impacted on the development.

a. Background. Interviews with personnel from the Personnel, Plans and Training Office, OTJAG, yielded the desires of the sponsor regarding the model/methodology output and capabilities. Currently, the Army reacts to changes in personnel policies rather than anticipating potential conflicts. Thus, it was necessary that the study products provide the capability to reflect changing trends due to policy actions. The sponsor also needed a capability to determine the distribution of officers over the various grade levels. This information would enable OTJAG personnel managers to make policy decisions that would prevent potential conflicts.

b. Technical Considerations. The study team's task of developing a system model led to several technical considerations. The system is a procedural system which is subject to change due to policy decisions. It therefore lends itself well to network-type modeling design. The JAG personnel system needed to be included in the design structure for those portions pertaining to the determination of officer careers. The overall system design had to be structured to load the current officer force, access new officers on a yearly basis, retain officers in the service, select officers for promotion, and select officers for the THS accounts. Further, the model is to be operated by personnel who are not trained analysts; therefore, the model must be relatively easy to operate.

c. Summary. The above considerations could all be applied using Q-GERT, which is a procedural networking technique modeling sequenced, time-phased activities in a stochastic manner. It has the capability to model diverse systems and act as a communication/information analysis tool which is extremely flexible to problem formulation. Q-GERT, therefore, was selected to be the tool with which the model/methodology development would be conducted.

4-3. Q-GERT. Q-GERT is an analytical tool that has been developed to provide a capability to model complex network systems and apply computer analysis to such systems. The name GERT is an acronym for Graphical Evaluation and Review Technique. The Q is appended to indicate that queuing systems can be graphically modeled. Components of Q-GERT modeling and analysis are shown in Figure 4-1. A further explanation of Q-GERT and JOPM is presented at Appendix D.

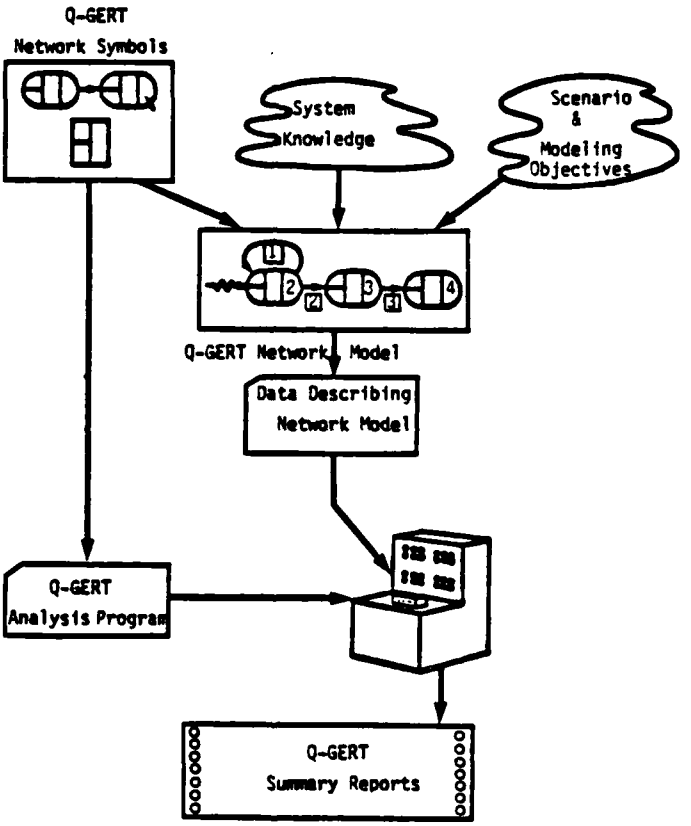

Figure 4-1. Components of Q-GERT Modeling and Analysis

4-4. THE JAG OFFICER PERSONNEL MODEL (JOPM)

a. General. The development of the procedural methodology and model for officer management was conducted with Q-GERT networking. The JAG personnel system and analytical methodology had to be graphically represented before the system could be modeled with Q-GERT.

b. Methodology Graphical Representation. The representation of the methodology for use in moving officers through the JAG personnel system is shown in Figure 4-2. The procedure is to generate a one-time current force of all officers representing steady state. It also generates yearly accessions of lieutenants and captains (new to the JAGC) and ages these officers for a one-time period. Each officer is then evaluated for continuing in service. The officer is checked for voluntarily leaving the service and for being removed from the service due to a maximum time-in-service (TIS) constraint or some policy constraint. The officer is checked for promotion as well as assignment to a THS status. If the officer does not qualify for advancement, another year in grade is served.

c. Summary. The preceding has discussed the considerations and structure of the methodology and model. A general representation of the JOPM is shown in Figure 4-3. Figure 4-4 shows the JOPM administrating the flow of officers through the personnel system. The explanation of this representation is in Appendix D.

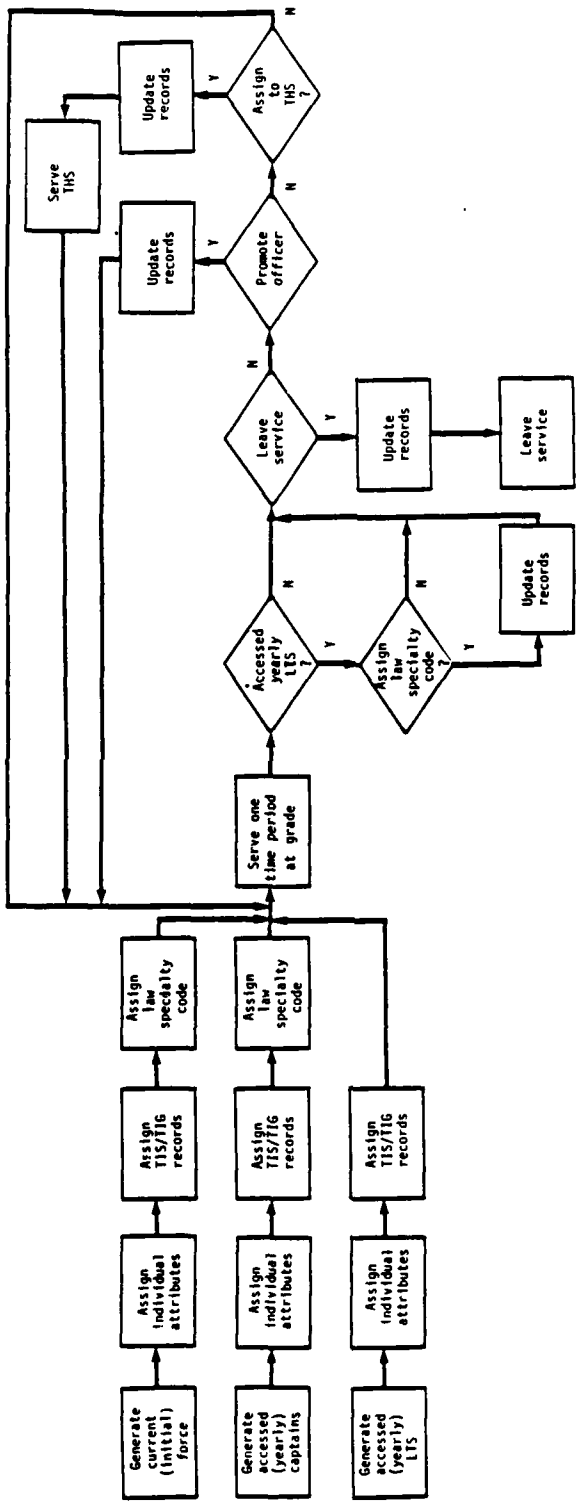

Figure 4-2. JAG Officer Management Methodology

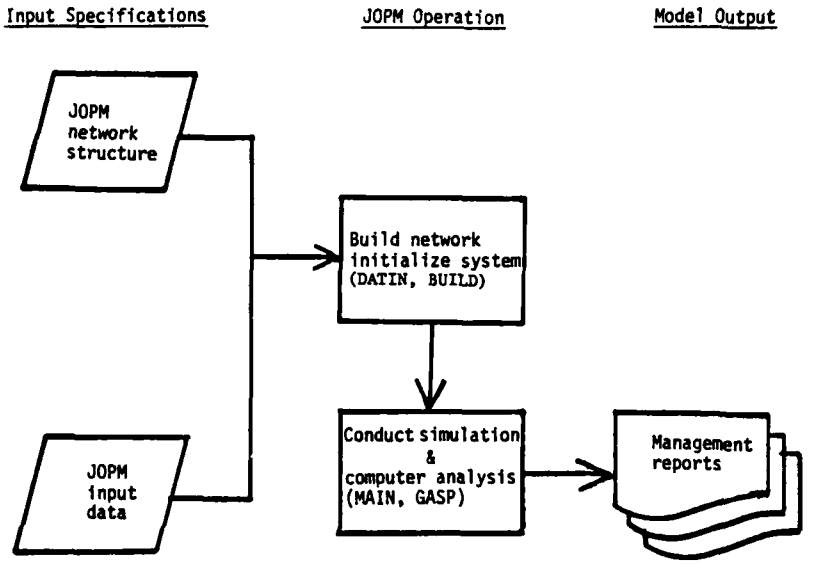

Figure 4-3. The JAG Officer Personnel Model

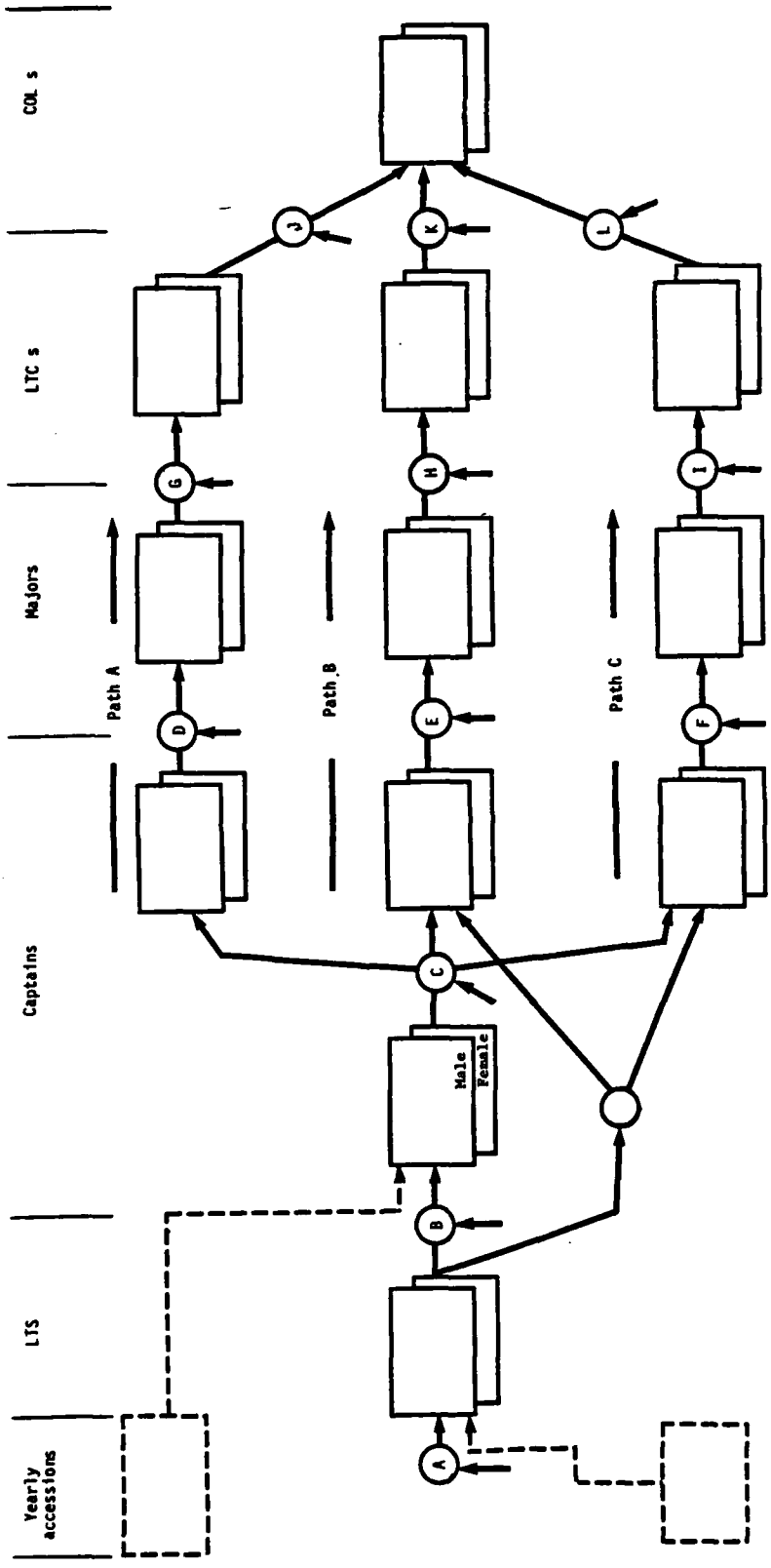

Figure 4-4. JOPM Presentation

4-5. INPUT DEVELOPMENT

a. General. Data was obtained from records maintained by OTJAG and by MILPERCEN for use in this study. When data was not available, or required construction, expert CAA military judgment and heuristic estimates were employed. DOPMA-established guidelines were used when developing promotion constraints.

b. Classes of Data. Data requirements for JOPM have been categorized into seven information groups as follows:

(1) Current force size.

(2) Accessed force size.

(3) Gender retention rates.

(4) Special skills distribution percentages.

(5) Promotion rates.

(6) Retention rates.

(7) Authorized force levels.

c. Data Limitations. Data limitations were mainly in the area of gender retention rates because of the lack of historical information on the length of time female officers elect to remain on active duty. The model input describing the retention rate of female officers, a function of TIS, was set equal to the rates utilized for male officers.

4-6. SUMMARY. This chapter has discussed the methodology/model design considerations, Q-GERT, the JOPM, and the development of the model input. A further explanation of Q-GERT and JOPM is provided at Appendix D, and the model user's manual is provided at Appendix E. Collection of better data will improve the capability of the model to more accurately forecast the impact of alternative JAG personnel policies.

CHAPTER 5

OPERATION AND VALIDATION

5-1. INTRODUCTION. This chapter presents procedures for operation of the JAG Officer Personnel Model (JOPM), describes the model validation effort performed by the study team, discusses inherent limitations to the model, and describes implementation procedures for installing the model at the user's computer facility.

5-2. MODEL OPERATION

a. In keeping with the model design considerations, the JOPM was designed to be relatively user-friendly and easy to operate. The Q-GERT software package is a self-contained computer package designed to operate on network systems specified by the modeler. It is necessary, however, for the user's computer facility to have the complete Q-GERT package installed on their system if the user desires to create new network systems or modify the existing JAG personnel network system. The model provided the user contains only the necessary machine language programs required for model operation. Copyright restraints prevent the transfer of Q-GERT technology to unlicensed users. The JOPM Q-GERT programs are maintained on the study agency's computer facility. Information on obtaining the JOPM Q-GERT software package is included in Appendix F.

b. Given that the user has the machine language JOPM programs, all that is necessary to operate the model is the addition of the network description cards and the data input cards; the specific data input necessary to exercise the model is presented in detail at Appendix E. General descriptions of those data that are key to model operation are:

(1) The accumulated TIS of first screening and accumulated TIS of second screening for cutting captains from the force.

(2) The initial force of all JAG officers that is loaded into the model at the start of the simulation.

(3) The probability of each initial force officer having accumulated a specific amount of TIS.

(4) The probability of each initial force officer having accumulated a specific amount of TIG.

(5) The yearly accession rates for all new lieutenants.

(6) The yearly accession rates for all new captains.

(7) The probability of any officer being promoted to the next grade based on accumulated TIG.

(8) The probability that any officer will remain in service based on accumulated TIS.

(9) The percentage of captains who will remain in the force at the first and second screening windows.

c. Output report types from the JOPM are presented below. Details are provided in Appendix E.

(1) Data Report: Provides a listing of the specific data being run in the simulation.

(2) Subroutine Reports (user controlled): Provide lists of the FORTRAN code containing JOPM logic.

(3) JOPM Network Report: Provides a listing of the Q-GERT network cards.

(4) JOPM-produced Reports: Provide JAG population tables reporting population distribution over a 30-year period, transaction tables (six tables) reporting status of individual officers over the 30-year period, histograms (six charts) showing distribution of TIG in which promotion occurs for all officers, and graphic plots (15 figures) displaying variations in population size over time.

(5) Post-simulation Q-GERT Reports: Provide statistics for transactions passing through the Q-GERT network, the numbers of transactions passing through each node of the network, and a listing of ongoing activities when the simulation ended.

d. The JOPM is extremely easy to operate. The only requirement for the user to operate the model is the input of the JOPM network data and the input data file. The model requires 150-155K words of Sperry computer memory and a single simulation run takes approximately 4 minutes. The program can be run from a terminal, in demand mode, or operated in batch mode.

e. JOPM was designed for ease of operation, speed of operation, and versatility for the OTJAG personnel managers. The model achieves all of these design considerations and produces output reports which will enhance the capacity of the OTJAG personnel managers to evaluate alternative policy decisions.

5-3. VALIDATION. The validation process of the JOPM consisted of simply calculating the data for the data input file from historical data provided by the listed data sources and operating the model. The output reports were then examined to evaluate the extent to which the actual population was duplicated by the simulation runs. Additional runs were made to assess the behavior of the model to increased and decreased accession rates, promotion rates, screening intervals, cut percentages, etc. The next series of paragraphs discuss these validation analyses.

a. Extreme Conditions Validation Analysis. Figure 5-1 describes the model's sensitivity to variations in initial force size and accession policy. Table 5-1 contains the description of each case presented in this figure. The base case represents the aging force over a 30-year period. This case is used as a reference throughout the analysis. It shows that stability is reached after 14 years of decline. Analysis of the input data reveals that a combination of the screening policy simulated and the distribution of initial force lieutenants and captains with TIG assignments influenced the size of the aging force. Excursion 0 represents the case where the force was allowed to grow from a zero base. Excursion N represents the case where the force was allowed to decay; no new accessions were provided. As expected, the force goes to the steady state and the accumulated results of both excursions add up to the base case condition.

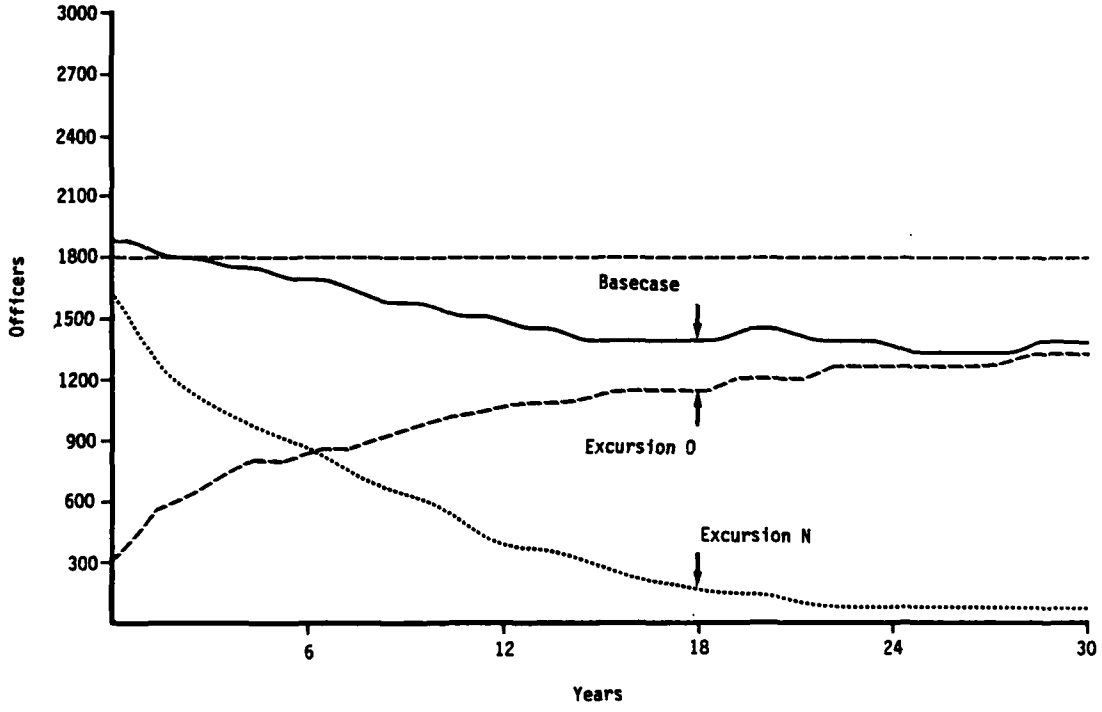

Figure 5-1. All Officer Distribution, Extreme Conditions Validation Analysis

Table 5-1. All Officer Distribution, Extreme Conditions Validation Analysis

Excursion	Validation Test
Base Case (A)	Simulation of aging process. Initial force officers and new accessions (LTs & CPTs) processed.
N	Simulation of aging process. Initial force officers only. No accessions processed.
O	Simulation of aging process. No initial force processed. New accessions (LTs & CPTs) only.

b. Captain Promotion and Initial Lieutenant Distribution Analysis. Figure 5-2 describes the model's sensitivity to variations in the captain promotion policy and the TIS distribution assigned lieutenants. Table 5-2 contains the description of each case presented in this figure. In this set of excursions, a single screening window was utilized and 60 percent of new accession officers were retained in the force. This differs from the base case simulation (Excursion A) in which two screening windows were utilized and only 30 percent of the accessed force was retained. Excursion F represents an improved force due to the fact that a larger pool of accessed officers remain on active duty. Excursion S provided another improvement due to the fact that new accession lieutenants were distributed with 1 or 2 years TIS. They were promoted to captain with 2, 3, or 4 years of TIS. Those promoted with 4-year TIS missed the screening window. In Excursion M, the promotion rates for captains were reduced uniformly by 25 percent. Since promotion is a function of TIG and screening is a function of TIS, this variation had the effect of screening those officers who were promoted to captain late in their careers as lieutenants. Initial force distribution of lieutenants allowed for TIS distribution over a 3-year period. Thus, those lieutenants who accumulate 3-year TIS missed the screening window when they were promoted to captain.

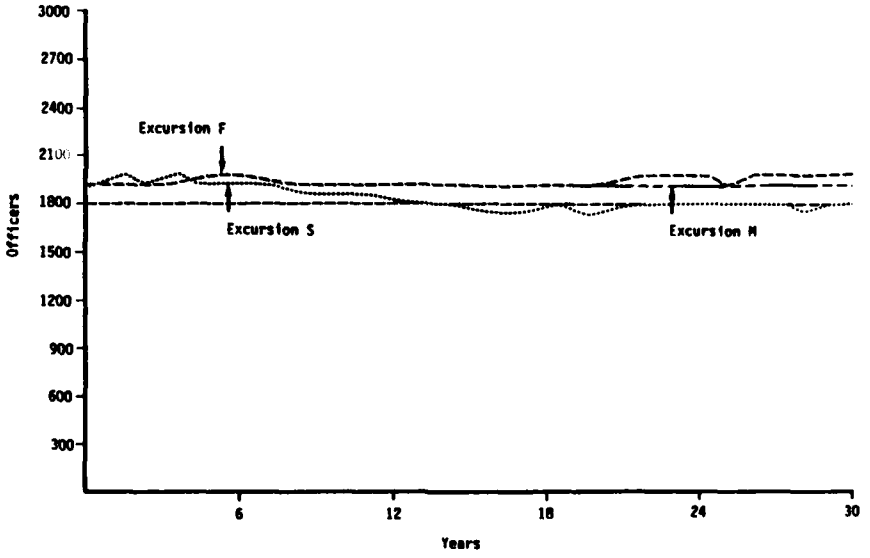

Figure 5-2. All Officers Distribution, Captain Promotion and Initial Lieutenant Validation Analysis

Table 5-2. All Officers Distribution, Captain Promotion and Initial Lieutenant Validation Analysis

Excursion	Validation test
(Reference)	(1) Initial force lieutenants' TIS distribution: equal distribution over 3 years.
	(2) Promotion probabilities: from captain to major same as base case.
F	(1) Initial force lieutenants' TIS distribution: equal distribution over 3 years
	(2) Promotion probabilities: captain to major, base case inputs reduced by 25 percent.
M	(1) Initial force lieutenants' TIS distribution: equal distribution over 2 years
	(2) Promotion probabilities: captain to major same as excursion M.
S	

c. Captain Screening Analysis. Figure 5-3 describes the model's sensitivity to variation in the percent of captains retained at each screening window (screening occurs between years three and four and between years five and six). Table 5-3 contains the description of each case represented in this figure. The base case (Excursion A) represents retaining 50 percent of the JAG captains at the first cut (year three to four) and retaining 60 percent at the second cut (year five to six). The objective was to reduce the assessed force from approximately 200 to 60 officers. Demonstrated in this case is the cutting of the initial force captains as they pass the 3- and 5-year windows, as well as the accessed lieutenants after they are promoted to captain and have accumulated 3 and 5 years of TIS. Excursion E demonstrates the impact of having performed all screening of captains at the 3-year window only. The accessed force was reduced to approximately 60 officers in a single cut. This exercise demonstrates the impact of initial force captains already in the system who miss the fifth year screening. Approximately 25 percent of the initial force captains had between 4 and 5 years of TIS and thus were never screened at the second screening window. Both the base case and Excursion E demonstrate that the impact of the initial force distribution is worn off after approximately 14 simulation years. Excursion F demonstrates what happens when 60 percent of the accessed force is retained (i.e., 120 officers). The force remains overstrength for the entire 30-year period. Growth occurs after 21 simulation years due to the fact that senior field grade officers have a very low rate of voluntary retirement.

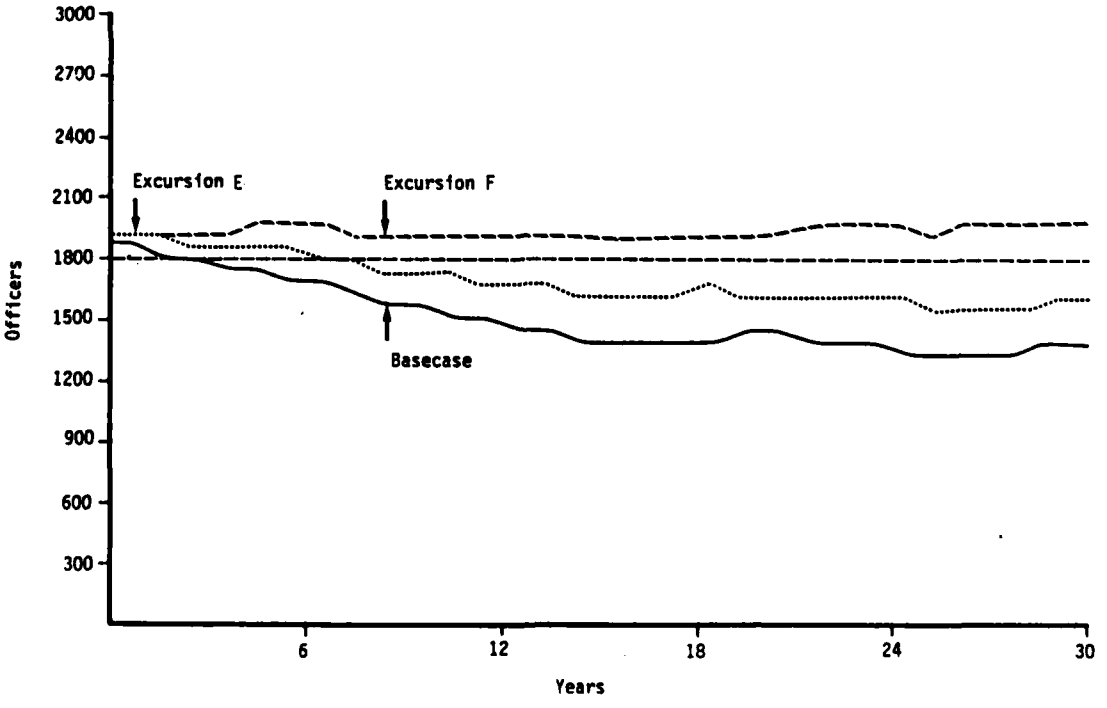

Figure 5-3. All Officers Distribution, Captain Screening Analysis, Percent Captains Retained

Table 5-3. All Officers Distribution, Captain Screening Analysis, Percent Captains Retained

Year of screen	Percent captains retained		
	Base case	Excursion E	Excursion F
3	50	30	60
5	60	100	100

d. Captain Screening Window Analysis. Figure 5-4 describes the model's sensitivity to variation in the placement of the screening windows. Table 5-4 contains the description of each case represented in this figure. Two screenings were played: the first screening retains 50 percent of the accessed captains and the second screening retains 60 percent of those remaining. The base case represents screening at the 3- and 5-year windows. Excursion I demonstrates the impact of the small number of initial force captains who are subject to screening in their sixth-year TIS. Only 4 percent of the initial force captains were identified in this TIS category; thus, very few were subject to screening. Excursion L demonstrates the impact of the approximately 62 percent initial force captains who had 2 to 4 years' TIS. Each of these year groups were subjected to the fourth-year screening; thus, the resulting force ends up being smaller than that of the base case.

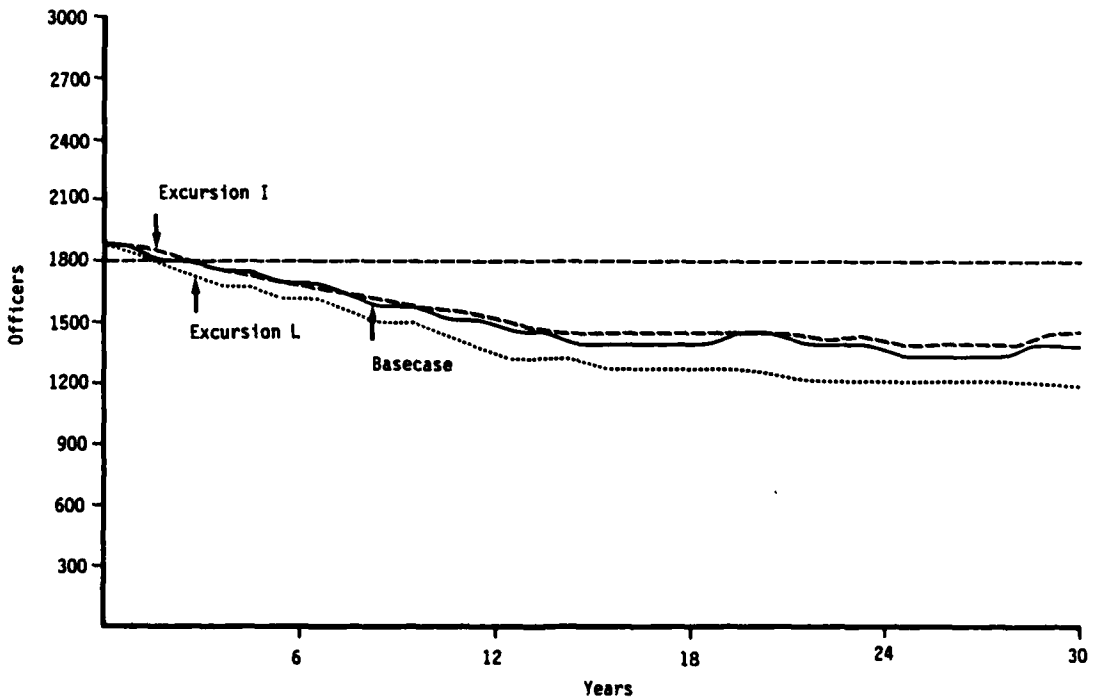

Figure 5-4. All Officers Distribution, Captain Screening Window Analysis

Table 5-4. All Officers Distribution, Captain Screening Window Analysis

Percent captains screened	Screening year		
	Base case	Excursion I	Excursion L
50 1st screening	3	3	4
60 2d screening	5	6	5

e. Excursion S Summary Report. The analysis performed by the study team reflects primary causes of fluctuations in the distribution of JAG officers over a 30-year time span. Although an analytical undertaking to establish the interrelationships between the various input parameters was beyond the scope of the study, Figure 5-5, a summary report of Excursion S results, exhibits the model's ability to track with the authorized force.

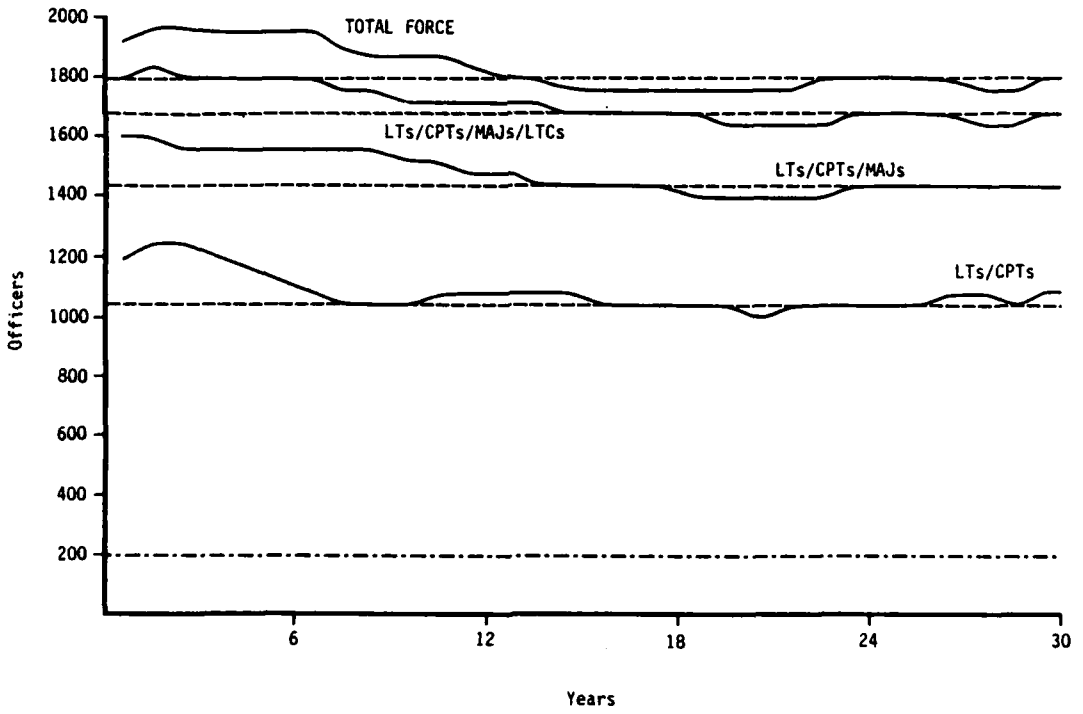

Figure 5-5. All Force Distributions, Superposition of Actual and Authorized Force, Excursion S

5-4. IMPLEMENTATION

a. The JOPM, as stated in paragraph 5-2, is designed within the context of the Q-GERT software package. Any computer facility which has the Q-GERT package installed can expand the capabilities of the model and modify the JOPM network. Some of the programs and routines that could require modification when expanding the JOPM capability are:

(1) Procedure PROC2

(2) Program MAIN

(3) Subroutine UF

(4) Subroutine UI

(5) Subroutine READIN

(6) Subroutine UO

These subroutines and programs are explained in Appendix E, the JOPM User Manual.

b. The Q-GERT software package is a proprietary software package copyrighted by Pritsker and Associates, Inc., West Lafayette, Indiana. The package is sold/leased on a computer facility basis only. Therefore, the user must have access to the Q-GERT package in order to modify or enhance the JOPM.

CHAPTER 6

SUMMARY AND OBSERVATIONS

6-1. INTRODUCTION. The purposes of this chapter are to summarize the study effort, to address the essential element of analysis (EEA), to state the key observations of the study, and to discuss the limitations of the model/methodology.

6-2. SUMMARY. The NAPM-JAG Study resulted in the development of JOPM, a methodology and model simulating the flow of officers through the JAG personnel system. The model was designed to provide an analytical management tool to the OJAG Personnel, Plans and Training Office in order that they have better capability to assess the effects of changes to personnel policies. The model/methodology developments are described in Chapter 4, while the operation and validation of the model are described in Chapter 5. Appendices have been added to further assist the model users. Using inputs derived from JAG personnel records, the model/methodology was successful in duplicating officer personnel strength objectives for the time periods for which it was tested. Changes in policy variables, such as captain retention policy and officer accession rates, were also tested. The model behaved in an appropriate manner when analyzing the effects of these changes.

6-3. ESSENTIAL ELEMENT OF ANALYSIS (EEA). The EEA which guided the conduct of the study is stated and discussed below.

a. Does the model reflect the current policies and procedures of the JAGC Officer Personnel Management System and permit changes to the policies? The JOPM was specifically designed to collect, analyze, and report information concerning the distribution of officers in the JAGC over time. Information is collected on the number of officers in each grade as a function of time. Histograms report the TIG distributions of promoted officers. Graphic displays plot the number of officers in each group as a function of time.

b. Although not an EEA, the question was often asked, **does the model provide expectation for the JAGC into the future?** JOPM is not a predictive model. The model user must prepare and input expected rates and probability distributions. The model will simulate up to 30 years of activity, but the results should only be used to project as far into the future as the model user has faith in the input data. The major benefit to the model design is that the user may input most-optimistic and most-pessimistic rates and probabilities to obtain a range of expected force distributions. Since the model is fast, it is quite responsive to this type of operation and does not, therefore, require extensive data preparation by the user.

6-4. OBSERVATIONS. The major observations resulting from the study are as follows:

a. The model, as developed, is successful in assessing the impact of policy decision changes on the JAGC officer distribution.

b. The most influencing factors which cause fluctuations in the distribution of the officer force are:

(1) Time period when captain screening occurs.

(2) Percent of captains cut at each screening window.

(3) Probability of promotion of each officer group.

(4) The voluntary resignation rates of officers.

c. The JOPM forte is in applications that measure relative differences between alternative policies. The model's fast running time and ease in operation provide the user with the ability to look at the changes that policy decisions have on the system.

6-5. LIMITATION. The major limitation in the use of the model is the data analysis and data preparation which may be required of the model user when establishing an absolute solution. The user must translate policy decision objectives into a numeric value of input data representing the culmination of the policy decision. As an example, a policy decision to increase the number of female JAG officers on active duty would require changes to the following data sets:

a. Probability that any new accession will be a male officer, based on accession year.

b. Probability of a female officer remaining in service, based on accumulated time in service.

APPENDIX A

STUDY CONTRIBUTORS

1. STUDY TEAM

a. Study Director

Mr. Stanley H. Miller, Force Systems Directorate

b. Other Contributors

CPT Larry Hicks
Mr. Mario Riggione
Mr. Myron C. Lawrence

2. PRODUCT REVIEW BOARD

Mr. Richard Modjeski, Chairman
Ms. Diane L. Buescher
Ms. Julianne Allison

3. EXTERNAL CONTRIBUTOR

MAJ Joe E. Ross, Office of The Judge Advocate General

APPENDIX B

STUDY DIRECTIVE

DEPARTMENT OF THE ARMY
OFFICE OF THE JUDGE ADVOCATE GENERAL
WASHINGTON, DC 20310-2200

REPLY TO
ATTENTION OF

DAJA-PT

19 JUN 1985

SUBJECT: Study Directive, the Network Analysis Planning Model for the Judge Advocate General (NAPM-JAG)

Director
US Army Concepts Analysis Agency
8120 Woodmont Avenue
Bethesda, MD 20814-2797

1. PURPOSE. This directive provides for the conduct of the subject study.

2. BACKGROUND.

a. The Judge Advocate General (TJAG) is concerned with the need for adequate planning and analysis of personnel policies that would directly affect officer manning levels, officer accessions, promotion opportunities, professional development, and specialty assignments. The current Network Analysis Planning Model (NAPM) is a generalized model that dynamically ages the force and simulates the policies and the procedures which reflect the annual accessions and assignments of officers as defined by the Army's Officer Personnel Management System (OPMS). Modifications to the current NAPM will be required in order the produce NAPM-JAG which will aid personnel managers to evaluate current and future Army and OTJAG personnel policies and to assess the impact of these policies on the Judge Advocate General Corps (JAGC) force structures as required by The Judge Advocate General.

b. NAPM-JAG will be designed to permit the JAGC personnel managers to change or to introduce different policy data in order to assure that their officer force can be managed to match a required force structure and budget end strength by grade.

3. STUDY SPONSOR. This study is sponsored by The Judge Advocate General.

4. STUDY AGENCY. US Army Concepts Analysis Agency (CAA) will perform the study.

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5. TERMS OF REFERENCE.

a. Scope

(1) NAPM currently is able to reflect different personnel policies and constraints which affect officer accessions and assignments, e.g., accession rates, percent of officers by gender, promotions, continuation rates by gender, specialty assignments from specific INSPEC and the training, holdees, and schooling (THS) account.

(2) NAPM and its associated data base will be modified to create NAPM-JAG. These model modifications will include the following changes:

(a) Captain accession will be included in the model.

(b) The unique JAGC policies and procedures that apply to retention and promotion of first lieutenants and captains will be included.

(c) The NAPM data base will be changed to reflect the JAGC force structure and policies.

(d) Output will reflect the annual numbers of officers at each grade level that leave the service and those that annually enter each grade.

(e) The model will simulate a JAGC officer corps of approximately 1800 officers.

b. Problem. The current collection of sub-models that comprise the Officer Force Management Model (OFMM) includes an extensive collection of large scale computer programs and data files. The OFMM program set and its associated data files do not readily lend themselves to use by JAG personnel planners and managers because of their size, variety, complexity, inflexibility, and quantity of information that must be processed for different personnel policy configurations. For this reason, a model that ages the force and readily simulates the JAG Officer Personnel Management System is needed in order to allow personnel managers to evaluate and to compare different policies so that they will be able to manage their officer force according to a required force structure and budget end strength.

c. Objective. Extend and modify the current NAPM to satisfy The Judge Advocate General's requirements which are:

To simulate the JAGC officer personnel management system policies and procedures by dynamically aging the officer force over 30 years, thereby enabling OTJAG to manage the JAGC officer force according to a required force structure and budget end strength.

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d. Assumptions

(1) The force structure and the personnel authorizations provided by OTJAG and by MILPERCEN will be a source of data for the steady state personnel of this study.

(2) Historical data (personnel distribution and continuation rates by year group, grade, and gender) are available through MILPERCEN and OTJAG.

e. Essential Element of Analysis (EEA). Does the model reflect the current policies and procedures of the JAGC Officer Personnel Management System and permit changes to the policies?

6. RESPONSIBILITIES. The model will be developed by the US Army Concepts Analysis Agency.

a. OTJAG will:

(1) Designate the proponent study coordinator.

(2) Provide the necessary data for the study accomplishment.

(3) Submit DD Form 1498 in accordance with DA PAM 5-5.

(4) Provide a critique of the study and its results.

b. CAA will:

(1) Designate a study director and establish a study team to modify the current NAPM.

(2) Communicate with appropriate agencies for data necessary for the study accomplishment.

(3) Provide ADP support as required for study accomplishment.

(4) Deliver on tape to the study proponent a working model, data, and runstreams.

(5) Complete the following tasks:

(a) Modify NAPM to reflect the JAGC officer personnel system.

(b) Load the JAGC personnel data and verify that NAPM-JAG is simulating current policies.

(c) Evaluate NAPM-JAG through a series of test excursions using different policies stipulated by the sponsor.

(d) Transfer the model to OTJAG in accordance with CAA policy.

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7. REFERENCES.

a. AR 5-5, Army Studies and Analysis, 15 Oct 81.

b. Study Report, CAA-512-85-4, Jan 85, Network Analysis Planning Model (NAPM).

c. CAA-D-84-16, Dec 84, NAPM User/Programmer Manual.

d. Chief of Staff Memorandum 83-5-3, Initiatives to Improve Readiness, 10 January 1983.

e. Chief of Staff Memorandum 85-1-10, Transfer of Models to other organizations by CAA, 10 Jan 85.

8. ADMINISTRATION.

a. Support. Secretarial support will be provided by CAA.

b. Milestones

(1)	Develop Study Directive	25 May 1985
(2)	Methodology Development and Testing	1 June 1985
	(a) Modify the Model	
	(b) Convert Data Base	
	(c) Test the Model	
(3)	Model Demonstration and Excursions for User	15 June 1985
(4)	Transfer the Model to OTJAG	30 June 1985
(5)	Train OTJAG personnel to use the model	15 July 1985
(6)	Documentation	30 August 1985

c. Control Procedures. Mr. Myron C. Lawrence, Force Systems Directorate, Personnel Division, will be the study director, telephone 295-0896.

d. Action Documents. Documentation will be provided in the form of addendums to reference-C.

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f. Coordination. This directive has been coordinated with CAA in accordance with AR 10-38.

FOR THE JUDGE ADVOCATE GENERAL:

RAYMOND C. RUPPERT
Lieutenant Colonel, JAGC
Acting Chief, Personnel, Plans, and
Training Office

APPENDIX C

BIBLIOGRAPHY

DEPARTMENT OF THE ARMY

Department of the Army Publications

DA PAM 600-3, Officer Professional Development and Utilization, September 1977

Officer Ranks Personnel Update, Issue Number 1, HQDA, 10 July 1984

US Army Concepts Analysis Agency

Network Analysis Planning Model (NAPM), CAA-SR-85-4, US Army Concepts Analysis Agency, Bethesda, MD, January 1985

Network Analysis Planning Model (NAPM) User/Programer Manual, CAA-D-84-16, US Army Concepts Analysis Agency, Bethesda, MD, December 1984

MISCELLANEOUS

Pritsker, A. Alan B., Modeling and Analysis Using Q-GERT Networks, 2d Edition, John Wiley and Sons, New York, 1979

Pritsker, A. Alan B., and PEGDEN, Co., Introduction to Simulation and SLAM, John Wiley and Sons, New York, 1979

APPENDIX D

INTRODUCTION TO Q-GERT AND JOPM

D-1. BACKGROUND. Some of the material in this appendix is extracted from Modeling and Analysis Using Q-GERT Networks (2nd ed), A. A. B. Pritsker, John Wiley and Sons, Inc., New York, 1979. It is highly recommended that the user of the JAG Officer Personnel Model (JOPM) refer to this book as supplementary material. The following has been taken from this source:

> "Q-GERT employs an activity-on-branch network philosophy in which a branch represents an activity that involves a processing time or a delay. Nodes are used to separate branches and are used to model milestones, decision points, and queues. A Q-GERT network consists of nodes and branches. Flowing through the network are items referred to as transactions. Transactions are directed through the network according to the branching characteristics of the nodes. Transactions can represent physical objects, information, or a combination of the two. Different types of nodes are included in Q-GERT to allow for the modeling of complex queuing situations and project management system. Activities can be used to represent servers of a queuing system and Q-GERT networks can be developed to model sequential and parallel service systems. The nodes and branches of a Q-GERT model describe the structural aspects of the system. A process approach is taken in which the flow of a transaction is modeled. Transactions originate at source nodes and travel along the branches of the network. Each branch has a start node and an end node as shown below (see Figure D-1). Transactions moving across a branch are delayed in reaching the end node associated with the branch by the time to perform the activity that the branch represents. When reaching the end node, the disposition of the transaction is determined by the node type, the status of the system, and the attributes associated with the transaction. The transaction continues through the network until no further routing can be performed. Typically, this occurs at sink nodes of the network but may occur at other nodes to allow for the destruction of information flow. Transactions have attribute values that allow different types of objects (or the same type of object with different attribute values) to flow through the network. Procedures are available to assign and change attribute values of transactions at the various nodes of the network. As transactions flow through the network model, statistics are collected on travel times, the status of servers and queues, and the times at which nodes are released. Thus, a statistical data collection scheme is embedded directly

in a Q-GERT network model. The Q-GERT Analysis Program employs a simulation procedure to analyze the network. The simulation procedure involves the generation of transactions, the processing of the transactions through the network, and the collection of statistics required to prepare automatically a summary report as dictated by the Q-GERT network model."

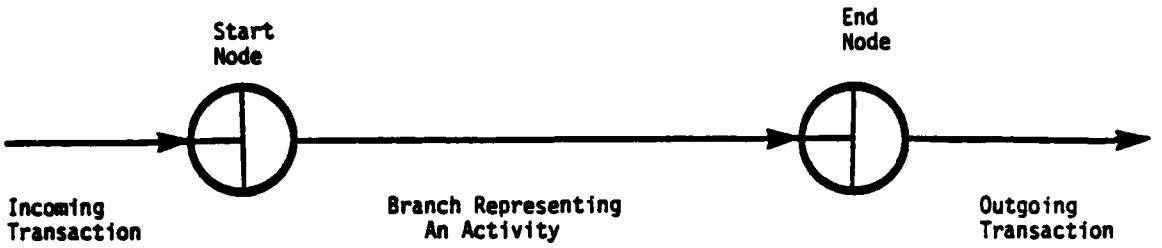

Figure D-1. Q-GERT Process

D-2. GENERAL. Q-GERT is an analytical tool that has been developed to provide a capability to model complex network systems and apply computer analysis to such systems. The name Q-GERT is an acronym for Queueing System-Graphical Evaluation and Review Technique. Q-GERT has been designed and developed to satisfy the need for a network approach to modeling systems that involve procedural, risk, and random elements. This appendix will explain the Q-GERT symbols used in the graphical development of the JOPM to allow the model user to more fully appreciate the capabilities of Q-GERT and the model.

D-3. Q-GERT TERMINOLOGY AND SYMBOLS

a. As discussed in Chapter 4, Q-GERT is an activity-on-branch network structure where a **branch** represents the **activity. Nodes** are used to separate branches and represent milestones, decision points, and queues. The items flowing through the network are referred to as **transactions.** A set of attributes is associated with each transaction. Specific attributes within each set are used to direct the transaction through the network and to maintain records of the transaction. The nine attribute records utilized in JOPM are described below:

(1) Gender. The gender of each officer in the force is determined by an input distribution that specifies, for each year, the probability that each accession is a male.

(2) Initial Assignment. Up to 24 assignments may be played, but since all officers assigned to the JAGC, only one assignment code is used.

(3) Time of Separation from Service. When decision logic dictates, a flag is set with this attribute to direct the officer to leave the service.

(4) THS Account. When decision logic dictates, a flag is set with this attribute to direct the officer into a THS holding account.

(5) Current Grade. As officers flow through the network, a record of their current grade is maintained by this attribute.

(6) Set Aside. Model logic has the capability to identify certain initial assignment categories as being set aside for men only. This option is not played in JOPM.

(7) Special Law Category. Model logic allows for three specialty assignments. They include the general law, contract law, and other law categories. The percentage of officers in each category is controlled by input data.

(8) Time When Assigned Present Grade. The time when an officer was promoted to his present grade is maintained in this attribute.

(9) Time-in-Service. The accumulated time in service for the officer is maintained in this attribute.

The remainder of this appendix will follow the graphical representation of JOPM, discussing each symbol used in the graphical model. The full block diagram of the model is depicted in later appearing Figure D-5.

b. The sequence of units/activities in JOPM, shown in Figure D-2, is typical for the aging process as an officer flows through the network. Figure D-2 represents the processing of lieutenants, the aging process consisting of accumulating 1 year of TIS and TIG, and finally the decision process that discharges the officer from service, promotes the officer to captain, assigns the officer to a THS status, or returns the officer to serve another year in grade.

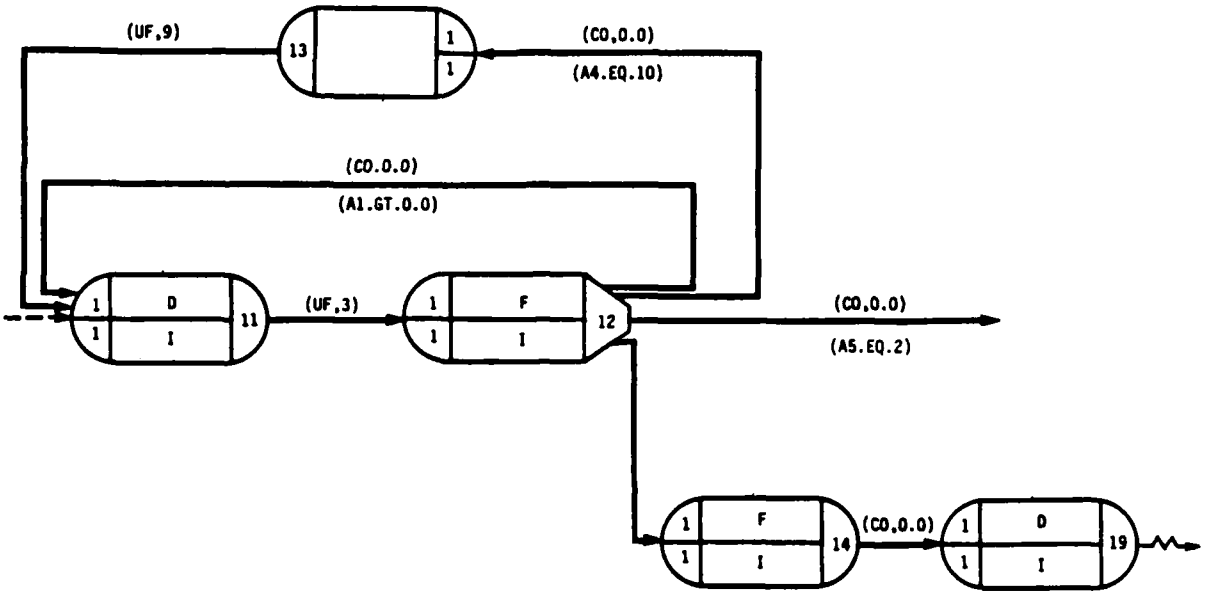

Figure D-2. Lieutenant Events Sequence

c. The process for handling lieutenants in the network, triggering the decision logic, is shown in Figure D-3. New accession lieutenants are delivered into Node 11 at the beginning of each time period, lieutenants returning to serve another year are returned to Node 11, and lieutenants returning from a THS status enter at Node 11. Also, a special group of lieutenants designated as current force officers is loaded into Node 11 at the start of the simulation. They represent the existing inventory of officers. As each officer transitions through the activity path emanating from Node 11, logic written into user function #3 (UF3) is evaluated to determine the officer's next step in the aging process.

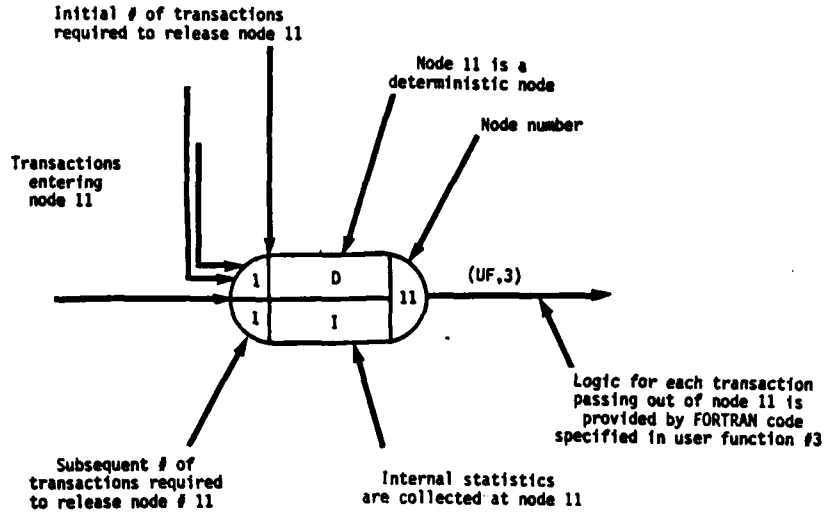

Figure D-3. Lieutenant Accession Node and Logic Activity

The following logic is contained in the UF3 code:

(1) The first check an officer must go through is the test of not having accumulated maximum TIS credits. Assuming the maximum TIS is not exceeded, the officer is checked for electing to voluntarily leave the service. Input data containing the probability of leaving the service for each officer by rank, TIS, and gender is checked. A random draw determines whether the officer is to leave. The attribute #3 flag for this officer is set, marking the officer for retirement, and no other action is taken.

(2) Assuming the officer passes the resignation test, a promotion test is conducted. Input data containing the probability of promotion for each officer by grade and TIG is checked. A random draw determines promotion. The attribute #5 flag for this officer is set, marking the officer for promotion to captain. No other action is taken.

(3) If the officer fails the promotion test, another check is made to determine whether assignment to the THS category is in order. Input data containing the probability of assignment to the THS account for each officer by grade and TIS is checked. A random draw determines acceptance into the THS status. The attribute #4 flag for this transaction is set, marking the officer for assignment into the THS account, and no other action is taken.

(4) When the officer fails each of the above tests, the return to serve another year option becomes the final decision.

d. The process in which lieutenants progress along the network is shown in Figure D-4.

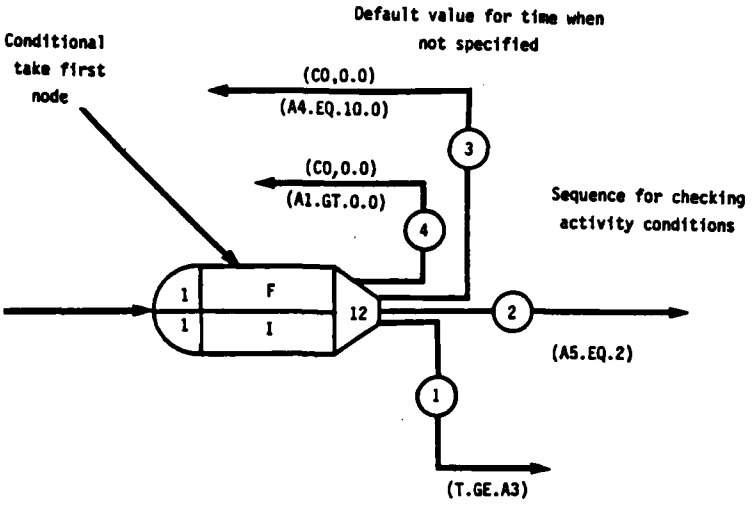

Figure D-4. Lieutenant Decision Node and Other Activities

(1) The four options for progress are retirement, promotion, training, or serving another year. Node 12 is a conditional take-first node in which all possible exits are examined in a specified sequence. When a "hit" is obtained, no other conditions are checked. The circled numbers in Figure D-4 indicate the order in which the conditions are examined.

(2) As discussed in paragraph D-3c above, the flags for each possible exit are set by the code specified in user function #3.

e. The full presentation of the Q-GERT network is represented in block format in Figure D-5. This figure describes the process of aging from lieutenant to colonel. The details of the specific Q-GERT symbols have been omitted for clarity. The solid line blocks and paths represent the events sequence for male and female officers as they progress in their career. The dashed line blocks and paths represent yearly accession of lieutenants and captains. Paths A through C on the figure represent field grade officer paths for general lawyer, contract specialist lawyer, and other special lawyer categories. The lettered nodes represent a location on the network where current force officers are initially loaded into the network at the start of the simulation. The user determines the quantities and types of this initial force. The solid line blocks represent a set of Q-GERT symbols such as that depicted in Figure D-2.

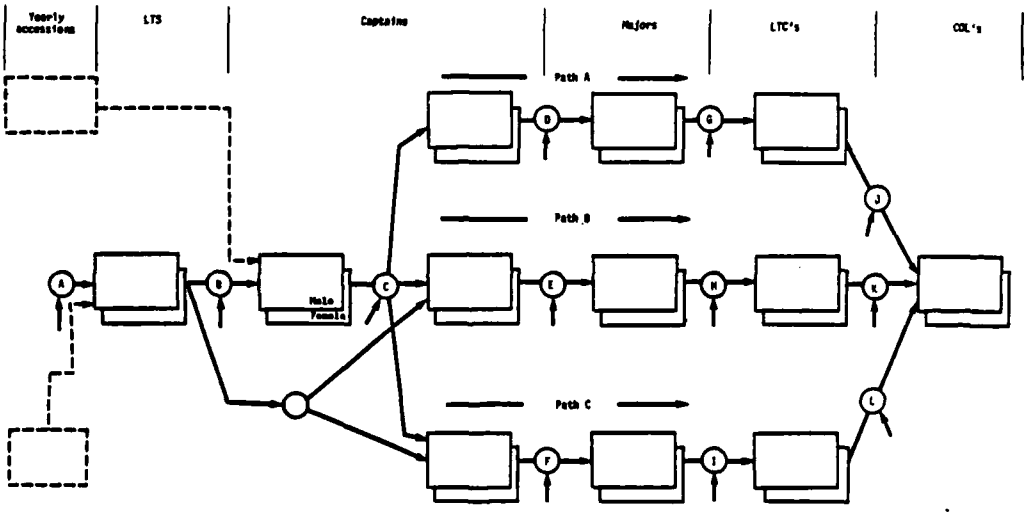

Figure D-5. JOPM Presentation

D-4. Q-GERT MODEL INPUT

a. To prepare the model, as represented by the Q-GERT graphical network for computer analysis, it is necessary to create a set of input records containing the network data. In general, a record is necessary to represent each node, activity, and assignment of an attribute. In addition, a header card with general information and a trailer card to indicate the end of the network are necessary.

b. Many types of inputs are generated automatically. It is sufficient to say that translation of a network model to input data is direct and that generation of output statistics is automatic. The JOPM also has output reports that have been developed specifically to satisfy the needs of the OJAG.

c. Annex I to this appendix is a listing of the JOPM Q-GERT input records. The input requirements for each type of record are provided in Annex II.

ANNEX I TO APPENDIX D

JOPM NETWORK INPUT RECORDS

```
GEN,MILLER,JUDG ADV GEN,7,1,1985,54,6,9999,30.6,1,C,(19)9*      GEN INFO
SOU,1/SOURC-LT,0,1*                          SOURCE NODE FOR LT'S TO BE GENERATED
VAS,1,1,UF,1*
SOU,3/SOURC-CP,0,1*                            SOURCE NODE FOR CAPTAIN ACCESSIONS
VAS,3,1,UF,2*
SOU,5/COUNTER,0,1*                                SOURCE NODE FOR TIMING NETWORK
REG,7,1,1*
VAS,7,1,UF,10*
ACT,5,7,CO,0.5*
ACT,7,7,CC,1.*
STA,11/LT'S-IN,1,1,D,I*                                    ALL LIEUTENANTS ENTER HERE
STA,12/LT'S OUT,1,1,F,I*     CONDITIONAL END NODE FOR ALL LT. ASSIGNMENTS
REG,13/LTS-THS,1,1,F*
STA,14/LTS-LEAV,1,1,F,I*                      LIEUTENANTS THAT LEAVE GO HERE
REG,18,1,1,F*
SIN,19/LTS-SINK,1,1,D,I*                  SINK OUT ALL LT'S WHO LEAVE SVC
STA,21/CAPTS-INS,1,1,D,I*                    ALL CAPTS(INITIAL) ENTER HERE
STA,22/CAPTS-OU,1,1,F,I*  COND'L END NODE FOR ALL CAPTS(INITIAL) ASG'MNT
REG,23/CPTS-THS,1,1,F*
STA,24/CPTS-LEA,1,1,D,I*       CAPTS(INITIAL) THAT LEAVE SERVICE GO HERE
REG,25,1,1,F*
REG,28,1,1,F*
SIN,29/CPTS-SIN,1,1,D,I*              SINK OUT ALL CAPT(I)'S WHO LEAVE SVC
STA,30/LAW-GEN,1,1,F,I*                                CAPTS W/GENERAL LAW
STA,31/MGCPT-IN,1,1,D,I*                    CAPTS(MALE-GENEREAL LAWYERS)
STA,32/MGCPT-OU,1,1,F,I*  COND'L NODE FOR ALL CAPTS(MALE-GENERAL LAWYERS
REG,33/MGCPT-TH,1,1,F*
STA,34/CPTSR-LE,1,1,D,I*     CAPTS(REMAINDER) THAT LEAVE SERVICE GO HERE
REG,37/FGCPT-TH,1,1,F*
STA,35/FGCPT-IN,1,1,D,I*                  CAPTS(FEMALE-GENERAL LAWYERS)
STA,36/FGCPT-OU,1,1,F,I*  COND'L NODE FOR ALL CAPTS(FEMALE-GENERAL LAW)
REG,38/MAJ,1,1,F*
STA,40/LAW-CONT,1,1,F,I*                              CAPT W/CONTRACT LAW
STA,41/MCCPT-IN,1,1,D,I*                    CAPTS(MALE-CONTRACT LAWYERS)
STA,42/MCCPT-OU,1,1,F,I*                    CAPTS(MALE-CONTRACT LAWYERS)
REG,43/MCCPT-TH,1,1,F*
STA,45/FCCPT-IN,1,1,D,I*                  CAPTS(FEMALE-CONTRACT LAWYERS)
STA,46/FCCPT-OU,1,1,F,I*                  CAPTS(FEMALE-CONTRACT LAWYERS)
REG,47/FCCPT-TH,1,1,F*
REG,48/MAJ,1,1,F*
STA,50/LAW-OTH,1,1,F,I*                               CAPTS W/OTHER LAW
STA,51/MOCPT-IN,1,1,D,I*                  CAPTS(MALE-OTHER LAWYERS)
STA,52/MOCPT-OU,1,1,F,I*                  CAPTS(MALE-OTHER LAWYERS)
REG,53/MOCPT-TH,1,1,F*
STA,55/FOCPT-IN,1,1,D,I*                  CAPTS(FEMALE-OTHER LAWYERS)
STA,56/FOCPT-OU,1,1,F,I*                  CAPTS(FEMALE-OTHER LAWYERS)
REG,57/FOCPT-TH,1,1,F*
REG,58/MAJ,1,1,F*
SIN,59/CPTSR-SI,1,1,D,I*              SINK OUT ALL CAPT(A)'S WHO LEAVE SVC
STA,61/MGMAJ-IN,1,1,D,I*                    MAJS(MALE-GENERAL LAWYERS)
STA,62/MGMAJ-OU,1,1,F,I*                    MAJS(MALE-GENERAL LAWYERS)
REG,63/MGMAJ-TH,1,1,F*
STA,64/MAJS-LEA,1,1,D,I*          MAJORS THAT LEAVE SERVICE GO HERE
REG,68/LTC,1,1,F*
STA,65/FGMAJ-IN,1,1,D,I*                  MAJS(FEMALE-GENERAL LAWYERS)
STA,66/FGMAJ-OU,1,1,F,I*                  MAJS(FEMALE-GENERAL LAWYERS)
REG,67/FGMAJ-TH,1,1,F*
STA,71/MCMAJ-IN,1,1,D,I*                  MAJS(MALE-CONTRACT LAWYERS)
STA,72/MCMAJ-OU,1,1,F,I*                  MAJS(MALE-CONTRACT LAWYERS)
REG,73/MCMAJ-TH,1,1,F*
REG,78/LTC,1,1,F*
STA,75/FCMAJ-IN,1,1,D,I*                MAJS(FEMALE-CONTRACT LAWYERS)
STA,76/FCMAJ-OU,1,1,F,I*                MAJS(FEMALE-CONTRACT LAWYERS)
REG,77/FCMAJ-TH,1,1,F*
STA,81/MOMAJ-IN,1,1,D,I*                    MAJS(MALE-OTHER LAWYERS)
STA,82/MOMAJ-OU,1,1,F,I*                    MAJS(MALE-OTHER LAWYERS)
REG,83/MOMAJ-TH,1,1,F*
REG,88/LTC,1,1,F*
STA,85/FOMAJ-IN,1,1,D,I*                  MAJS(FEMALE-OTHER LAWYERS)
STA,86/FOMAJ-OU,1,1,F,I*                  MAJS(FEMALE-OTHER LAWYERS)
REG,87/FOMAJ-TH,1,1,F*
SIN,89/MAJS-SIN,1,1,D,I*              SINK OUT ALL MAJ'S WHO LEAVE SVC
STA,91/MGLTC-IN,1,1,D,I*                    LTC'S(MALE-GENERAL LAWYERS)
STA,92/MGLTC-OU,1,1,F,I*                    LTC'S(MALE-GENERAL LAWYERS)
REG,93/MGLTC-TH,1,1,F*
STA,94/LTC'S-LEA,1,1,D,I*          LT-COLS THAT LEAVE SERVICE GO HERE
REG,98/COL,1,1,F*
STA,95/FGLTC-IN,1,1,D,I*                  LTC'S(FEMALE-GENERAL LAWYERS)
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STA,96/FGLTC-OU,1,1,F,I*                                  LTC'S(FEMALE-GENERAL LAWYERS)
REG,97/FGLTC-TH,1,1,F*
STA,101/MCLTC-IN,1,1,D,I*                                 LTC'S(MALE-CONTRACT LAWYERS)
STA,102/MCLTC-OU,1,1,F,I*                                 LTC'S(MALE-CONTRACT LAWYERS)
REG,103/MCLTC-TH,1,1,F*
STA,105/FCLTC-IN,1,1,D,I*                                 LTC'S(FEMALE-CONTRACT LAWYERS)
STA,106/FCLTC-OU,1,1,F,I*                                 LTC'S(FEMALE-CONTRACT LAWYERS)
REG,107/FCLTC-TH,1,1,F*
REG,108/CCL,1,1,F*
STA,111/MOLTC-IN,1,1,D,I*                                 LTC'S(MALE-OTHER LAWYERS)
STA,112/MOLTC-OU,1,1,F,I*                                 LTC'S(MALE-OTHER LAWYERS)
REG,113/MOLTC-TH,1,1,F*
REG,118/CCL,1,1,F*
STA,115/FOLTC-IN,1,1,D,I*                                 LTC'S(FEMALE-OTHER LAWYERS)
STA,116/FOLTC-OU,1,1,F,I*                                 LTC'S(FEMALE-OTHER LAWYERS)
REG,117/FOLTC-TH,1,1,F*
SIN,119/LTC'S-SIN,1,1,D,I*                                SINK OUT ALL LTC'S WHO LEAVE SVC
STA,121/MCOLS-IN,1,1,D,I*                                 COL'S(MALE-ALL LAWYERS)
STA,122/MCOLS-OU,1,1,F,I*                                 COL'S(MALE-ALL LAWYERS)
REG,123/MCOLS-TH,1,1,F*
STA,124/COLS-LEA,1,1,D,I*                                 COL'S THAT LEAVE SERVICE GO HERE
STA,125/FCOLS-IN,1,1,D,I*                                 COLS(FEMALE-ALL LAWYERS)
STA,126/FCOLS-OU,1,1,F,I*                                 COLS(FEMALE-ALL LAWYERS)
REG,127/FCOLS-TH,1,1,F*
STA,128/GENERALS,1,1,D,I*
SIN,129/COLS-SIN,1,1,D,I*                                 SINK OUT ALL COL'S WHO LEAVE SVC
ACT,1,1,CO,1.*
ACT,3,3,CC,1.*
ACT,11,12,UF,7,(9)A1.GE.0.*
ACT,12,14,(6)2/QUIT-I,(9)T.GE.A3*
ACT,14,19,CO,0.0*
ACT,12,18,(6)4/LT-CAPT,(9)A5.EQ.2.*
ACT,12,13,(9)A4.EQ.10.0*                                                    THS ACCT
ACT,12,11,(6)3/RETAIN-1,(9)A1.GT.0.*
ACT,13,11,UF,9*                                           TRANSIT TIME FOR LIEUTENANTS
ACT,18,21,(9)A7.EQ.10.0*
ACT,18,28,(9)A7.GT.10.0*
ACT,21,22,UF,4,(9)A7.GE.0.*
ACT,22,24,(6)11/QUIT-2,(9)T.GE.A3*
ACT,22,25,(9)A5.EQ.3.*                                    PROMOTING CAPTAINS W/INSPEC
ACT,22,28,(6)10/CAPT-ADS,(9)A7.GT.0.*                                       THS ACCT
ACT,22,23,(9)A4.EQ.21.0*                                  TRANSIT TIME FOR CAPT(INS)'S
ACT,23,21,UF,9*
ACT,22,21,(6)9/RETAIN-2,(9)A1.GT.0.*
ACT,24,29,CO,0.0*
ACT,25,48,(9)A7.EQ.41*
ACT,25,38,(9)A7.EQ.10*
ACT,25,58,(9)A7.EQ.49*                                                      OTHERS
ACT,28,30,(9)A7.EQ.10.*
ACT,28,40,(6)5/ADSPEC-1,(9)A7.EQ.41.*
ACT,28,50,(6)6/ADSPEC-2,(9)A7.EQ.49.*
ACT,30,31,(9)A1.EQ.1.*                                                      MALE OTHERS
ACT,31,32,UF,5*
ACT,32,34,(9)T.GE.A3*                                     CAPT GENERAL LAWYERS
ACT,32,38,(9)A5.EQ.3.*
ACT,32,33,(9)A4.EQ.22.0*
ACT,32,31,(6)12/CPT-10R,(9)A1.GT.0.*
ACT,33,31,UF,9*          TRANSIT TIME FOR MALE CAP(A)'S GENERAL LAWYERS
ACT,30,35,(9)A1.EQ.2.*                                                      FEMALE OTHERS
ACT,35,36,UF,5*
ACT,36,34,(9)T.GE.A3*                                     FEMALE CAPT GENERAL LAWYERS
ACT,36,38,(9)A5.EQ.3.*
ACT,36,37,(9)A4.EQ.22.0*
ACT,36,35,(6)12/CPT-10R,(9)A1.GT.0.*
ACT,37,35,UF,9*        TRANSIT TIME FOR FEMALE CAP(A)'S GENERAL LAWYERS
ACT,40,45,(9)A1.EQ.2.*                                                      FEMALE CONTRACT LAWYERS
ACT,45,46,UF,5*
ACT,46,34,(9)T.GE.A3*                                     FEMALE CAPT CONTRACT LAWYERS
ACT,46,48,(9)A5.EQ.3.*
ACT,46,47,(9)A4.EQ.22.0*
ACT,46,45,(6)7/CPT-1STM,(9)A1.GT.0.*
ACT,47,45,UF,9*          TRANSIT TIME FOR FEMALE CAP(A)'S CONTRACT LAWYERS
ACT,40,41,(9)A1.EQ.1.*                                                      MALE CONTRACT LAWYERS
ACT,41,42,UF,5*
ACT,42,34,(9)T.GE.A3*                                     MALE CAPT CONTRACT LAWYERS
ACT,42,48,(9)A5.EQ.3.*
ACT,42,43,(9)A4.EQ.22.0*
ACT,42,41,(6)9/CPT-1STM,(9)A1.GT.0.*
ACT,43,41,UF,9*          TRANSIT TIME FOR MALE CAP(A)'S CONTRACT LAWYERS
ACT,50,51,(9)A1.EQ.1.*                                                      MALE CAPTAINS OTHER LAWYERS
ACT,51,52,UF,5*
ACT,52,34,(9)T.GE.A3*                                                       MALE
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ACT,52,58,(9)A5.EQ.3.*                          MALE CAPT OTHER  LAWYERS
ACT,52,53,(9)A4.EQ.22.0*
ACT,52,51,(9)A1.GT.0.*
ACT,53,51,UF,9*                  TRANSIT TIME FOR MALE CAP(A)'S OTHER  LAWYERS
ACT,50,55,(9)A1.EQ.2.*                    FEMALE CAPTAINS OTHER  LAWYERS
ACT,55,56,UF,5*
ACT,56,34,(9)T.GE.A3*
ACT,56,58,(9)A5.EQ.3.*                    FEMALE CAPTAINS OTHER  LAWYERS
ACT,56,57,(9)A4.EQ.22.0*
ACT,56,55,(6)8/CAPT-2ST,(9)A1.GT.0.*
ACT,57,55,UF,9*                  TRANSIT TIME FOR FEMALE CAP(A)'S OTHER LAWYERS
ACT,34,59,CO,0.0*
ACT,38,61,(9)A1.EQ.1.*                      MALE MAJORS GENERAL LAWYERS
ACT,61,62,UF,6*
ACT,62,64,(9)T.GE.A3*                       MALE MAJORS GENERAL LAWYERS
ACT,62,68,(9)A5.EQ.4.*                                  PROMOTE TO LTC
ACT,62,63,(9)A4.EQ.30.0*
ACT,62,61,(9)A1.GT.0.*
ACT,63,61,UF,9*                TRANSIT TIME FOR MALE MAJ'S GENERAL LAWYERS
ACT,48,71,(9)A1.EQ.1.*                    MALE MAJORS CONTRACT LAWYERS
ACT,71,72,UF,6*
ACT,72,64,(9)T.GE.A3*                       MALE MAJORS CONTRACT LAWYERS
ACT,72,78,(9)A5.EQ.4.*                                  PROMOTE TO LTC
ACT,72,73,(9)A4.EQ.30.0*
ACT,72,71,(9)A1.GT.0.*
ACT,73,71,UF,9*                 TRANSIT TIME FOR MALE MAJ'S CONTRACT LAWYERS
ACT,58,81,(9)A1.EQ.1.*                      MALE MAJORS OTHER LAWYERS
ACT,81,82,UF,6*
ACT,82,64,(9)T.GE.A3*                       MALE MAJORS OTHER LAWYERS
ACT,82,88,(9)A5.EQ.4.*                                  PROMOTE TO LTC
ACT,82,83,(9)A4.EQ.30.0*
ACT,82,81,(9)A1.GT.0.*
ACT,83,81,UF,9*                   TRANSIT TIME FOR MALE MAJ'S OTHER LAWYERS
ACT,38,65,(9)A1.EQ.2.*                    FEMALE MAJORS GENERAL LAWYERS
ACT,65,66,UF,6*
ACT,66,64,(9)T.GE.A3*                       FEMALE MAJORS GENERAL LAWYERS
ACT,66,68,(9)A5.EQ.4.*                                  PROMOTE TO LTC
ACT,66,67,(9)A4.EQ.30.0*
ACT,66,65,(9)A1.GT.0.*
ACT,67,65,UF,9*                TRANSIT TIME FOR FEMALE MAJ'S GENERAL LAWYERS
ACT,48,75,(9)A1.EQ.2.*                    FEMALE MAJORS CONTRACT LAWYERS
ACT,75,76,UF,6*
ACT,76,64,(9)T.GE.A3*                       FEMALE MAJORS CONTRACT LAWYERS
ACT,76,78,(9)A5.EQ.4.*                                  PROMOTE TO LTC
ACT,76,77,(9)A4.EQ.30.0*
ACT,76,75,(9)A1.GT.0.*
ACT,77,75,UF,9*                 TRANSIT TIME FOR FEMALE MAJ'S CONTRACT LAWYERS
ACT,58,85,(9)A1.EQ.2.*                    FEMALE MAJORS OTHER LAWYERS
ACT,85,86,UF,6*
ACT,86,64,(9)T.GE.A3*                       FEMALE MAJORS OTHER LAWYERS
ACT,86,88,(9)A5.EQ.4.*                                  PROMOTE TO LTC
ACT,86,87,(9)A4.EQ.30.0*
ACT,86,85,(9)A1.GT.0.*
ACT,87,85,UF,9*                   TRANSIT TIME FOR FEMALE MAJ'S OTHER LAWYERS
ACT,64,89,CO,0.0*
ACT,68,91,(9)A1.EQ.1.*                       MALE LTC'S GENERAL LAWYERS
ACT,91,92,UF,7*
ACT,92,94,(9)T.GE.A3*                        MALE LTC'S GENERAL LAWYERS
ACT,92,98,(9)A5.EQ.5.*                                  PROMOTE TO COL
ACT,92,93,(9)A4.EQ.40.0*
ACT,92,91,(9)A1.GT.0.*
ACT,93,91,UF,9*                    TRANSIT TIME FOR MALE LTC'S GENERAL LAWYERS
ACT,68,95,(9)A1.EQ.2.*                     FEMALE LTC'S GENERAL LAWYERS
ACT,95,96,UF,7*
ACT,96,94,(9)T.GE.A3*                      FEMALE LTC'S GENERAL LAWYERS
ACT,96,98,(9)A5.EQ.5.*                                  PROMOTE TO COLONEL
ACT,96,97,(9)A4.EQ.40.0*
ACT,96,95,(9)A1.GT.0.*
ACT,97,95,UF,9*                  TRANSIT TIME FOR FEMALE LTC'S GENERAL LAWYERS
ACT,78,101,(9)A1.EQ.1.*                    MALE LTC'S CONTRACT LAWYERS
ACT,101,102,UF,7*
ACT,102,94,(9)T.GE.A3*             MALE CONTRACT LAWYERS LEAVE SERVICE
ACT,102,108,(9)A5.EQ.5.*                                PROMOTE TO COLONEL
ACT,102,103,(9)A4.EQ.40.0*                                        THS ACCT
ACT,102,101,(9)A1.GT.0.*                                    REMAIN FOR 1YR
ACT,103,101,UF,9*                TRANSIT TIME FOR MALE LTC'S CONTRACT LAWYERS
ACT,78,105,(9)A1.EQ.2.*                    FEMALE LTC'S CONTRACT LAWYERS
ACT,105,106,UF,7*
ACT,106,94,(9)T.GE.A3*           FEMALE CONTRACT LAWYERS LTC'S LEAVE SERVICE
ACT,106,108,(9)A5.EQ.5.*                                PROMOTE TO COLONEL
ACT,106,107,(9)A4.EQ.40.0*                                        THS ACCT
ACT,106,105,(9)A1.GT.0.*                                    REMAIN FOR 1YR
```

```
ACT,107,105,UF,9*          TRANSIT TIME FOR FEMALE LTC'S CONTRACT LAWYERS
ACT,88,111,(9)A1.EQ.1.*                        MALE LTC'S OTHER LAWYERS
ACT,111,112,UF,7*
ACT,112,99,(9)T.GE.A3*          MALE LTC'S OTHER LAWYERS LEAVE SERVICE
ACT,112,118,(9)A5.EQ.5.*                          PROMOTE TO COLONEL
ACT,112,113,(9)A4.EQ.40.0*                                 THIS ACCT
ACT,112,111,(9)A1.GT.0.*                              REMAIN FOR 1YR
ACT,113,111,UF,9*       TRANSIT TIME FOR MALE LTC'S OTHER LAWYERS
ACT,88,115,(9)A1.EQ.2.*                      FEMALE LTC'S OTHER LAWYERS
ACT,115,116,UF,7*
ACT,116,99,(9)T.GE.A3*               FEMALE LTC'S  LEAVE SERVICE
ACT,116,118,(9)A5.EQ.5.*                          PROMOTE TO COLONEL
ACT,116,117,(9)A4.EQ.40.0*                                 THIS ACCT
ACT,116,115,(9)A1.GT.0.*                              REMAIN FOR 1YR
ACT,117,115,UF,9*       TRANSIT TIME FOR FEMALE LTC'S OTHER LAWYERS
ACT,99,119,CO,0.0*
ACT,98,121,(9)A1.EQ.1.*                                 MALE COLONELS
ACT,108,121,(9)A1.EQ.1.*                                MALE COLONELS
ACT,118,121,(9)A1.EQ.1.*                                MALE COLONELS
ACT,121,122,UF,8*
ACT,122,124,(9)T.GE.A3*
ACT,122,128,(9)A5.EQ.6.*                          PROMOTE TO GENERAL
ACT,122,123,(9)A4.EQ.50.0*
ACT,122,121,(9)A1.GT.0.*
ACT,123,121,UF,9*          TRANSIT TIME FOR ALL MALE COLONELS
ACT,98,125,(9)A1.EQ.2.*                               FEMALE COLONELS
ACT,108,125,(9)A1.EQ.2.*                              FEMALE COLONELS
ACT,118,125,(9)A1.EQ.2.*                              FEMALE COLONELS
ACT,125,126,UF,8*
ACT,126,124,(9)T.GE.A3*
ACT,126,128,(9)A5.EQ.6.*                          PROMOTE TO GENERAL
ACT,126,127,(9)A4.EQ.50.0*
ACT,126,125,(9)A1.GT.0.*
ACT,127,125,UF,9*          TRANSIT TIME FOR ALL FEMALE COLONELS
ACT,129,129,CO,0.0*
FIN*
```

ANNEX II TO APPENDIX D

DATA INPUT DESCRIPTIONS FOR Q-GERT NETWORK CARDS

GEN - general project information

Field Number	Description	Value	Default	Editing	Associated Errors
1	Card type	GEN	(Required)	= 'GEN'	8101
2	Analyst name	Alpha field (up 12 significant characters)	12 blanks	If present, first character must be alphabetic (only first 12 characters are processed)	102
3	Project name or number	Alpha field	12 blanks	(see previous field)	103
4	Month	Integer	1	Integer between 0 and 12	104
5	Day	Integer	1	Integer between 0 and 31	105
6	Year	Integer	2001	Integer between 1970 and 2001	106
7	Number of STAtistics nodes	Integer	0	Integer between 0 and maximum number of nodes	107
8	Number of SINk nodes	Integer	0	Integer between 0 and maximum number of nodes	108
9	Number of SINk node releases to end a run	Integer	value in Field 8	Integer	109
10	Time to end one run of the network	Real	1.E20	Positive real	110
11	Number of runs of the network	Integer	1	Positive integer	111
12	Indicator for output reports in addition to the final summary report	First Run, Each Run, Cumulative & Each Run, Summary Only	First	= 'F' or 'E' or 'C' or 'S'	112
13	Time from which statistics will be kept on each run	Real	0	Non-negative real	113
14	Maximum number of attributes with each transaction flowing through the network	Integer	0	Non-negative integer	114
15	Run number for beginning of event tracing	Integer	0→no tracing	Integer between 0 and value of Field 11	115
16	Run number for ending of event tracing (this run will be traced)	Integer	Value of Field 15	Integer between value of Field 15 and value of Field 11	116
17	Run number for beginning of nodal tracing	Integer	0→no tracing	Integer between 0 and value in Field 11	115
18	Run number for ending of nodal trace (this run is traced)	Integer	Value in Field 17	Integer between value in Field 17 and value in Field 11	116
19	Indicator that only input cards with errors are to be listed	Errors only All cards	All input cards listed	= 'E'	119
20	Execution option	E1 — No execution E2 — No execution if any input discrepancies E3 — No execution if fatal input discrepancy	E3	= 'E1', 'E2', 'E3', or 'E4' (E4 — Echo suppressed)	120
21	Largest node number defined by user. (Specify only when including subnetworks.)	Integer	MXNOD	Integer	
22	Largest activity number defined by user. (Specify only when including subnetworks).	Integer	MXNPO	Integer	

2. *REG-reg*ular node description or *SOU-sou*rce node description

Field Number	Description	Value	Default	Editing	Associated Errors
1	Card type	*REG* or *SOU*	(Required)	= 'REG' or 'SOU'	8000
2	Node number	Integer	(Required)	Integer between 1 and maximum number of nodes	8002
3	Initial number of incoming transactions to release the node.	Integer	1 if *REG* 0 if *SOU*	Non-negative integer (0 if and only if *SOU*)	8003
4	Subsequent number of incoming transactions to release the node (after the first release)	Integer (to specify infinite, use default)	Infinite	Positive integer	8003
5	Output characteristics of node	*P*robabilistic *D*eterministic *F*irst (conditional, take first) *A*ll (conditional, take all)	Deterministic	= 'P', 'D', 'F', or 'A'	205
6	Indicator that this node is to mark	*M*ark	M if SOU No M if REG	= 'M'	206
7	Criterion for associating an attribute set with a transaction passing through a node/	Hold the attribute set of the transaction arriving *F*irst *L*ast or hold attribute set of the transaction with the *S*mallest value in a given attribute *B*iggest value in a given attribute	*L*ast	= 'F', 'L', 'S', or 'B'	207
	If *S*mall or *B*ig specified, the number of the attribute to be used or 'M' for mark time	Integer or 'M'	*M*ark Time	Integer between 1 and maximum number of attributes specified for a transaction or 'M'	7207

VAS - value assignments to attributes of transactions

Field Number	Description	Value	Default	Editing	Associated Errors
1	Card type	VAS	(Required)	= 'VAS'	8000
2	Node number at which assignment is to be made	Integer	(Required)	Integer between 1 and maximum number of nodes	8802 8812
3	Number of the attribute to which the assignment is to be made	Integer	1	Integer between 1 and maximum number of attributes	8803
4	Distribution or function type for the assignment	2 character ID chosen from list of distribution types (Table A1)	*CO*	= 2 character ID from Table A1	804
5	Parameter set number for the assignment	Integer or Real	0.0	Integer or Real	805
6-26	(Repeat Fields 3, 4, and 5 to specify up to 7 additional assignments. Use only 1 *VAS* input card for each node at which assignments take place)				806 8807

ACT - *Activity description*

Field Number	Description	Value	Default	Editing	Associated Errors
1	Card Type	ACT	(Required)	= 'ACT'	8000
2	Start node	Integer	(Required)	Number of an existing node	9002
3	End node	Integer	(Required)	Number of an existing node (not an assembly node)	9003
4	Distribution or function type	2 character ID chosen from list of *distribution* types (Table A1)	*CO*	= 2 character ID from Table A1	1004
5	Parameter set number or value of constant	Integer or Real	0.0		1005
6	Activity number/	Integer	System-assigned	Integer between 0 and maximum number of activity numbers	1006 9006 9105
	Label for server identification	8 characters	Blank		
7	The number of servers represented by this branch	Integer	1	Non-negative integer	1007 9007
8 or	Probability (only applicable if start node has 'P' branching or start node is a SELector using *RFS* rule)	Real number between 0. and 1. or attribute number where probability is stored	0.5	Real number between 0. and 1. or non-negative integer	1008 9008
8	Order of testing conditions (only applicable if start node has 'F' branching* or start node is a SELector using POR rule**)	Non-negative number (integer or real)	0 (= conditions tested in order of input	Non-negative number	9008
9	Condition code (only applicable if start node has 'F' or 'A' branching)	See Condition Codes List***	Start node released (Ni.R).		1009 9009 9010 9011

* For each activity emanating from a start node with F (conditional, take first) output, an order value should be specified. When the start node is released, conditions on associated branches will be tested in ascending order (low values first) based on this value.

** The "preferred order" for selection from free servers is ascending order (low value first) based on this value.

*** Condition codes allowed are:

T.*A*.V Time .*A*. Value
T.*A*.Ak Time .*A*. Attribute k
Aj.*A*.V Attribute j.*A*.Value
Aj.*A*.Ak Attribute j.*A*.Attribute k

where *A*=[LT;LE;EQ;NE;GT; or GE]

Ni.R Node i Released
Ni.N Node i Not Released
NAj.R Node Aj Released
NAj.N Node Aj Not Released

SIN - *sink* node description or *STA* - *statistics* node description

Field Number	Description	Value	Default	Editing	Associated Errors
1	Card type	SIN or STA	(Required)	= *'SIN' or 'STA'*	*8000*
2	Node number/Label for output identification	Integer/8 characters	(Required)/ Blanks	Integer between 1 and maximum number of nodes	8002
3	Initial number of incoming transactions to release the node	Integer	1	Positive integer	8003
4	Subsequent number of incoming transactions to release the node (after the first release)	Integer (to specify infinite, use default)	Infinite	Positive integer	8003
5	Output characteristics of node	*P*robabilistic *D*eterministic *F*irst (conditional, take *first)* *A*ll (conditional, take all)	*D*eterministic	= 'P', 'D', 'F', or 'A'	205
6	Statistical quantities to be collected	*F*irst (time of first release) *A*ll (time of all releases) *B*etween (time between *releases)* *I*nterval (time interval from *most recent marking of transaction to release of this node)* *D*elay (delay from first arriving transaction until *the node is released)*	*F*irst	= 'F', 'A', 'B', 'I', or 'D'	306

Field Number	Description	Value	Default	Editing	Associated Errors
7	The upper limit of the first cell for the histogram to be obtained for this node. The first cell of the histogram will contain the number of times the statistic of interest at this node had a value less than *or equal to* the value given in this field.	Real or 'N'	N → no reporting of statistics	Real or 'N'	
8	The width of each cell of the histogram. Each histogram contains 20 cells. The last cell will contain the number of times the statistic of interest at this node had a value *greater* than the upper limit of the first cell (Field 7) plus 18 x cell width (Field 8).	Real or 'N'	N → no reporting of statistics	Positive real or 'N'	
9	Criterion for associating an attribute set with a transaction passing through a node /	Hold the attribute set of the transaction arriving *F*irst *L*ast or hold attribute set of the transaction with the *S*mallest value in a given attribute *B*iggest value in a given attribute	*L*ast	= 'F', 'L', 'S', or 'B'	206
	If *S*mall or *B*ig specified, the number of the attribute to be used or 'M' for mark time	Integer or *M*ark Time	*M*ark Time	Integer between 1 and maximum number of attributes specified for a transaction or 'M'	7207

FIN - *finish* of all networks

Field Number	Description	Value	Default	Editing	Associated Errors
1	Card type	*FIN*	(A blank card may be used in lieu of *FIN* card)	Blank card or = 'FIN'	1301 8000

APPENDIX E

USER MANUAL FOR THE JAG OFFICER PERSONNEL MODEL (JOPM)

E-1. GENERAL. This appendix provides the user a handbook for a better understanding of the operation of the model. This appendix can be used as a user/programer manual, or in conjunction with other chapters to gain a thorough appreciation of the model operation.

E-2. INTRODUCTION. JOPM was constructed using the Q-GERT software package and FORTRAN programs to perform specific functions. Those interested in modifying JOPM code or input network should become familiar with the reference cited in Appendix D. This appendix will deal with: (1) the links between various FORTRAN subroutines that supplement Q-GERT; (2) the necessary procedures and runstreams to run the model; (3) a description of user input requirements; and (4) a discussion and explanation of the output reports.

E-3. SUBROUTINE SUPPLEMENTS. The subroutine MAIN sets constraints which are used by the Q-GERT software and calls the Q-GERT routines DATIN and GASP to process input data and handle the operation of the simulation, respectively. The supplemental subroutines, using FORTRAN code, provide the logic necessary to simulate officer flow through the OJAG. The three subroutines recognized by Q-GERT are user input (UI), user function (UF), and user output (UO) (see Figure E-1). These programer provided routines will be referred to as JAG subroutines. To inspect the code in these subroutines see paragraph E-4(d).

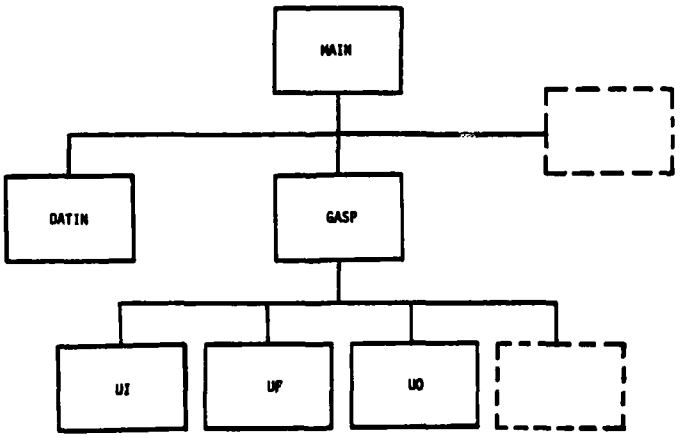

Figure E-1. JAG Subroutines

a. User Input (UI). UI is called only at the very beginning of a simulation. Through the UI subroutine, the user can tailor JOPM to policies under consideration through user-defined input. The hierarchical structure of UI can be seen in Figure E-2.

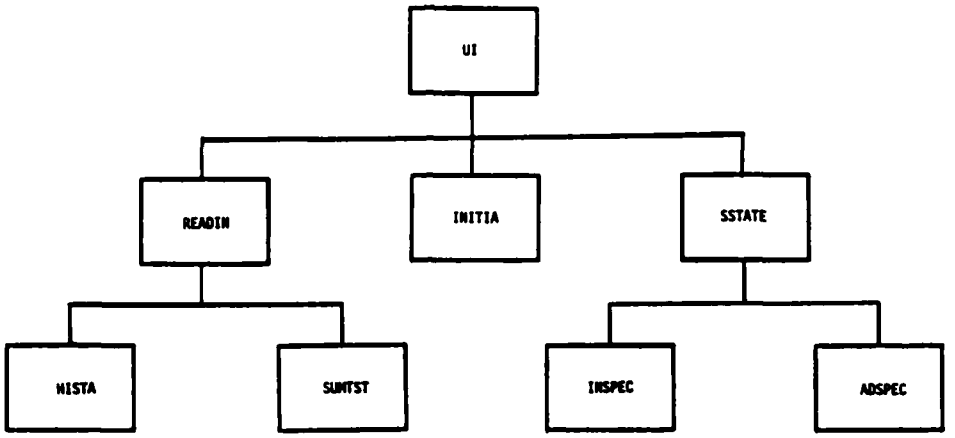

Figure E-2. UI Subroutine

(1) READIN. The first call of UI is made to READIN. It is here that specific parameters and input data are read into the model. READIN then calls HISTA to initialize values that will later be used to chart histograms. READIN also calls SUMTST, a subroutine that ensures that cumulative probability distributions sum to 1.00. For a detailed description of the input data see paragraph E-5.

(2) INITIA. The subroutine called INITIA is next called by UI. INITIA initializes values that will later be used by JOPM.

(3) SSTATE. The subroutine called SSTATE determines the current force distribution and represents the initial force. SSTATE also calls INSPEC and ADSPEC to randomly assign specialties to appropriate officers.

b. User Function. UF is the busiest of the JAG subroutines. UF is called throughout the simulation and is used to make decisions to determine the Q-GERT network paths. There are 10 user functions, known to Q-GERT as UF 1, UF 2, ..., UF 10. For a hierarchical structure see Figure E-3.

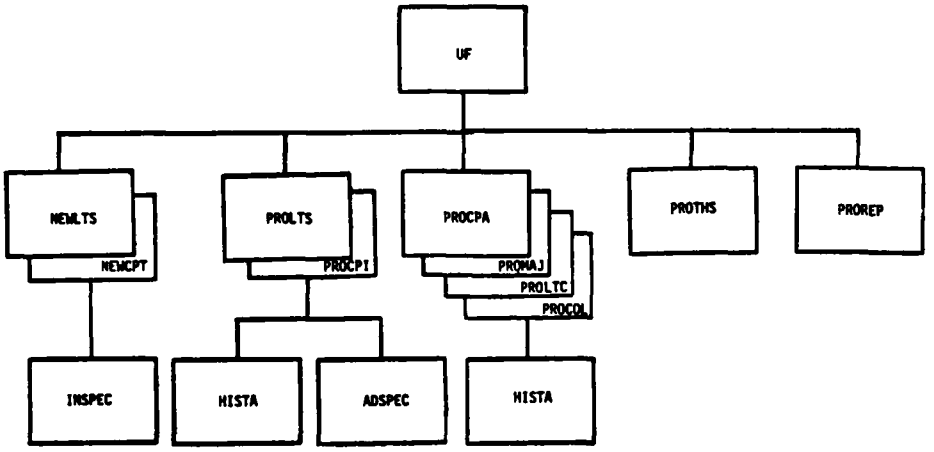

Figure E-3. UF Subroutines

(1) NEWLTS. In this subroutine, attributes for new lieutenant accessions are determined. These attributes are time-in-service, time-in-grade, and initial and additional specialties.

(2) NEWCPT. UF 2 is virtually identical to UF 1, except it is used for new captains.

(3) PROLTS. The processing of lieutenants occurs in UF 3. In this user function it is determined whether a lieutenant will resign from the service, be removed from the service, get promoted, go to school, or serve another year at the same grade. If a lieutenant is promoted, HISTA is called if a promotion occurs collecting data for use in output reports. A flow chart depicting the decision logic for each of the steps in this subroutine is presented in Figure E-4.

(4) PROCPI. This is a special routine for captains who are newly promoted or newly accessed. Captains serve one year in this status. Processing occurs in UF 4. The subroutine determines whether these new captains will resign, get fired, get promoted or choose a specialty. The subroutine ADSPEC is used to determine the law specialty, and the subroutine HISTA is called if a promotion occurs. A flow chart depicting the decision logic for each of the steps in this subroutine is presented in Figure E-5.

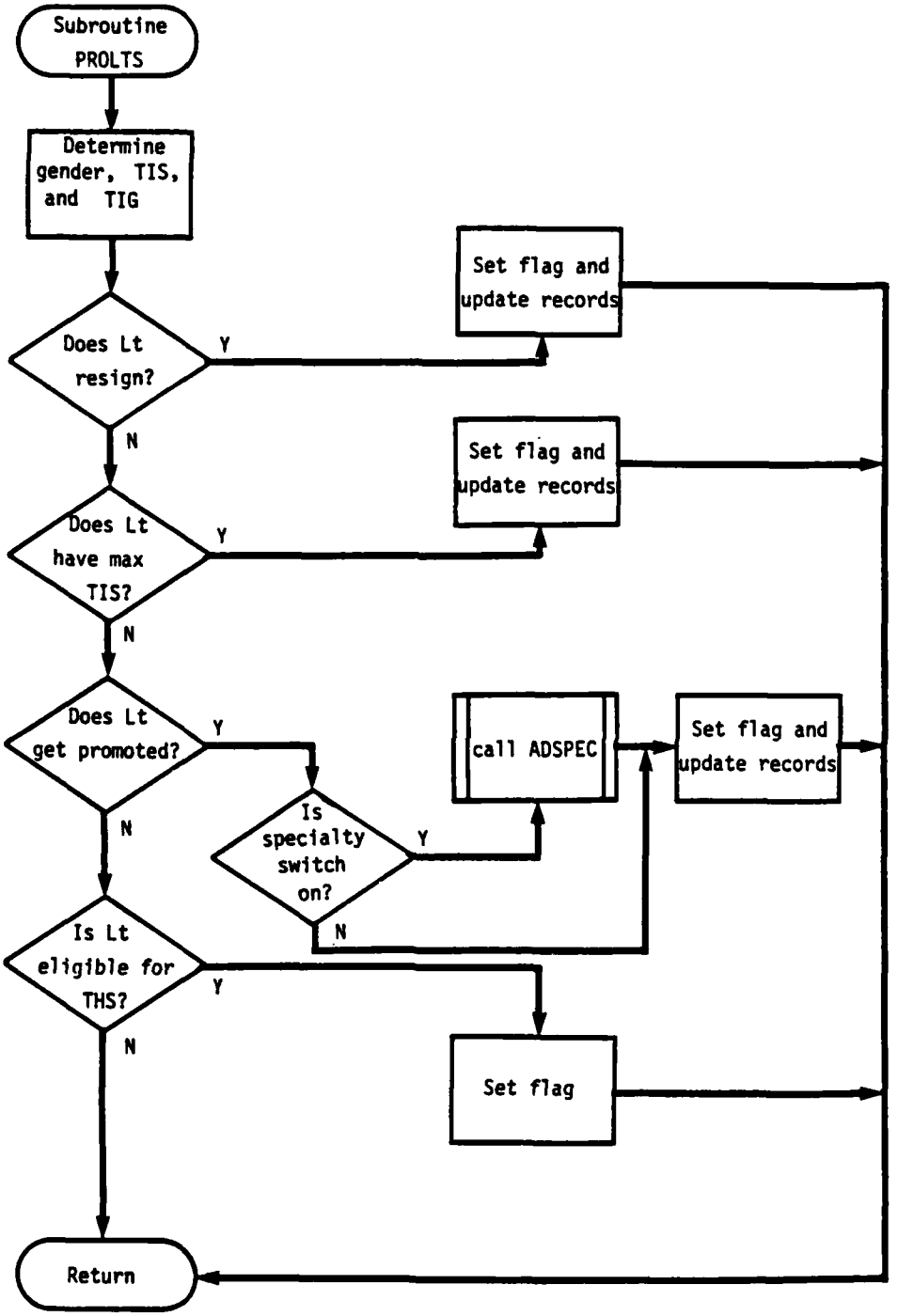

Figure E-4. PROLTS Logic Flow Chart

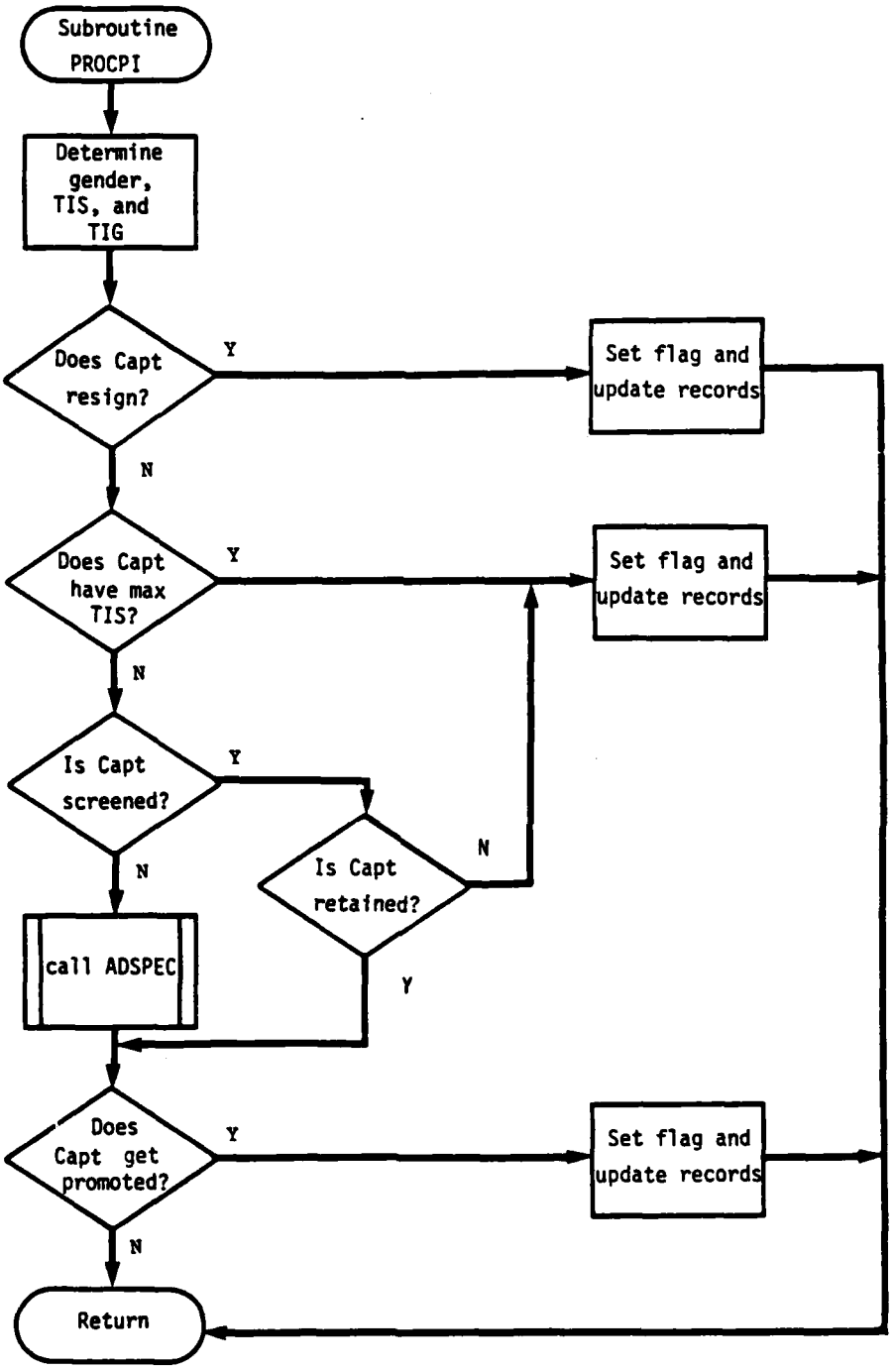

Figure E-5. PROCPI Logic Flow Chart

(5) PROCPA. UF 5 processes captains who have chosen career paths. They have an opportunity to resign, be removed, get promoted, go to school, or return for another year in grade. If an officer is promoted, HISTA is called for preparation of output reports. A flow chart depicting the decision logic for each of the steps in this subroutine is presented at Figure E-6.

(6) PROMAJ. UF 6 is essentially the same as UF 5 except that it is for majors. A flow chart depicting the decision logic for each of the steps in subroutine PROMAJ is presented at Figure E-7. This same logic is utilized in processing other field grade officers, thus the flow charts for these other processes are not presented.

(7) PROLTC. UF 7 processes lieutenant colonels in a similar manner to UF 5 and 6.

(8) PROCOL. UF 8 is similar to UF 5, 6, and 7 but is for full colonels.

(9) PROTHS. UF 9 determines the amount of time an officer will remain in a THS status.

(10) PROREP. UF 10 keeps records of populations while the simulation is in progress.

c. User Output (UO). The UO routine is used to produce reports when the simulation is terminated. UO has three subroutine calls. For a graphic representation, see Figure E-8.

(1) HISTA. HISTA is also called during other phases of the simulation. HISTA determines limits and points to be plotted in a histogram. At the end of the simulation the charts are produced.

(2) PLOT. PLOT uses information gathered in PROREP to call another routine called USPLO. USPLO uses the information in PLOT to produce graphs.

(3) USPLO. To produce a graph of the final information gathered, UO calls USPLO directly.

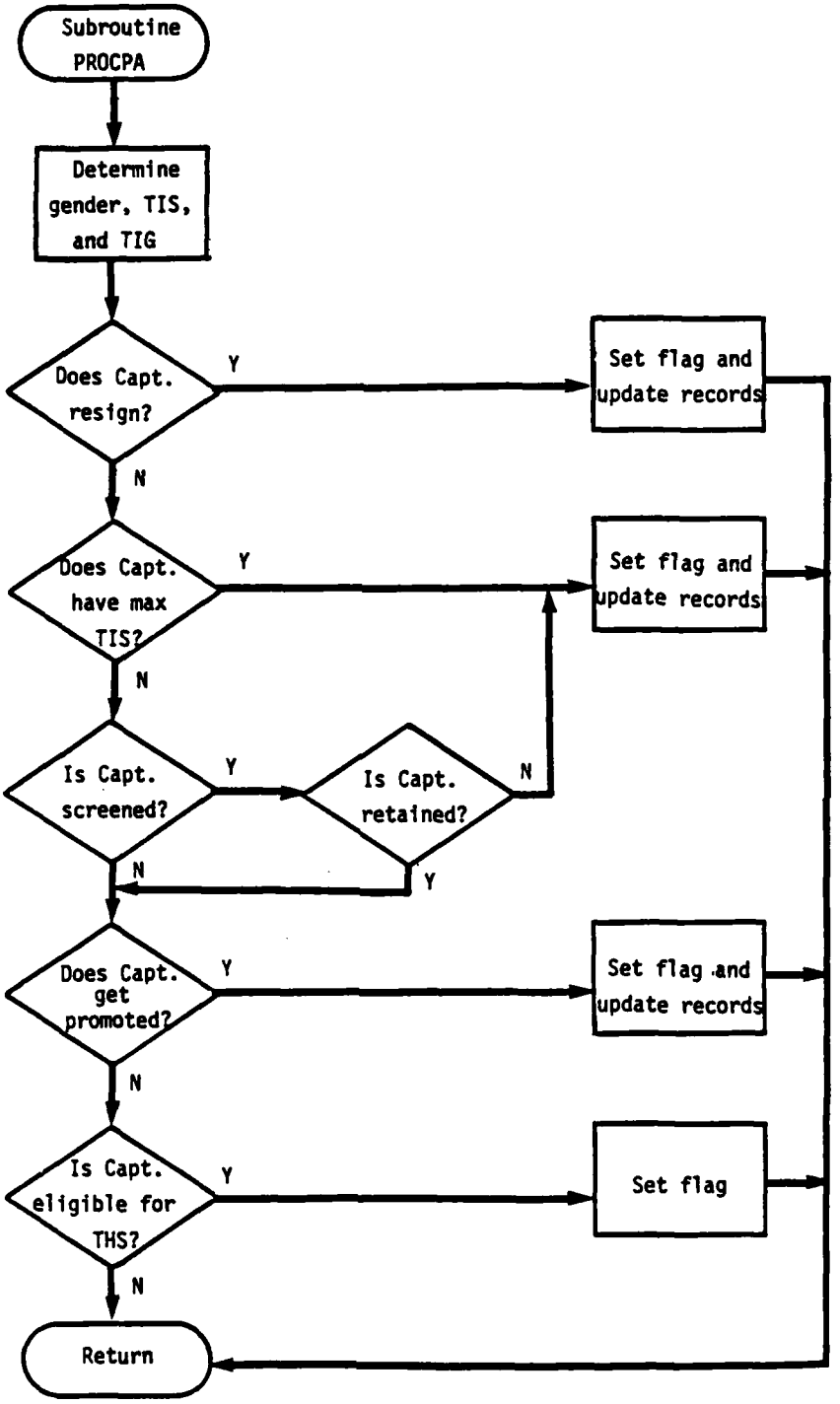

Figure E-6. PROCPA Logic Flow Chart

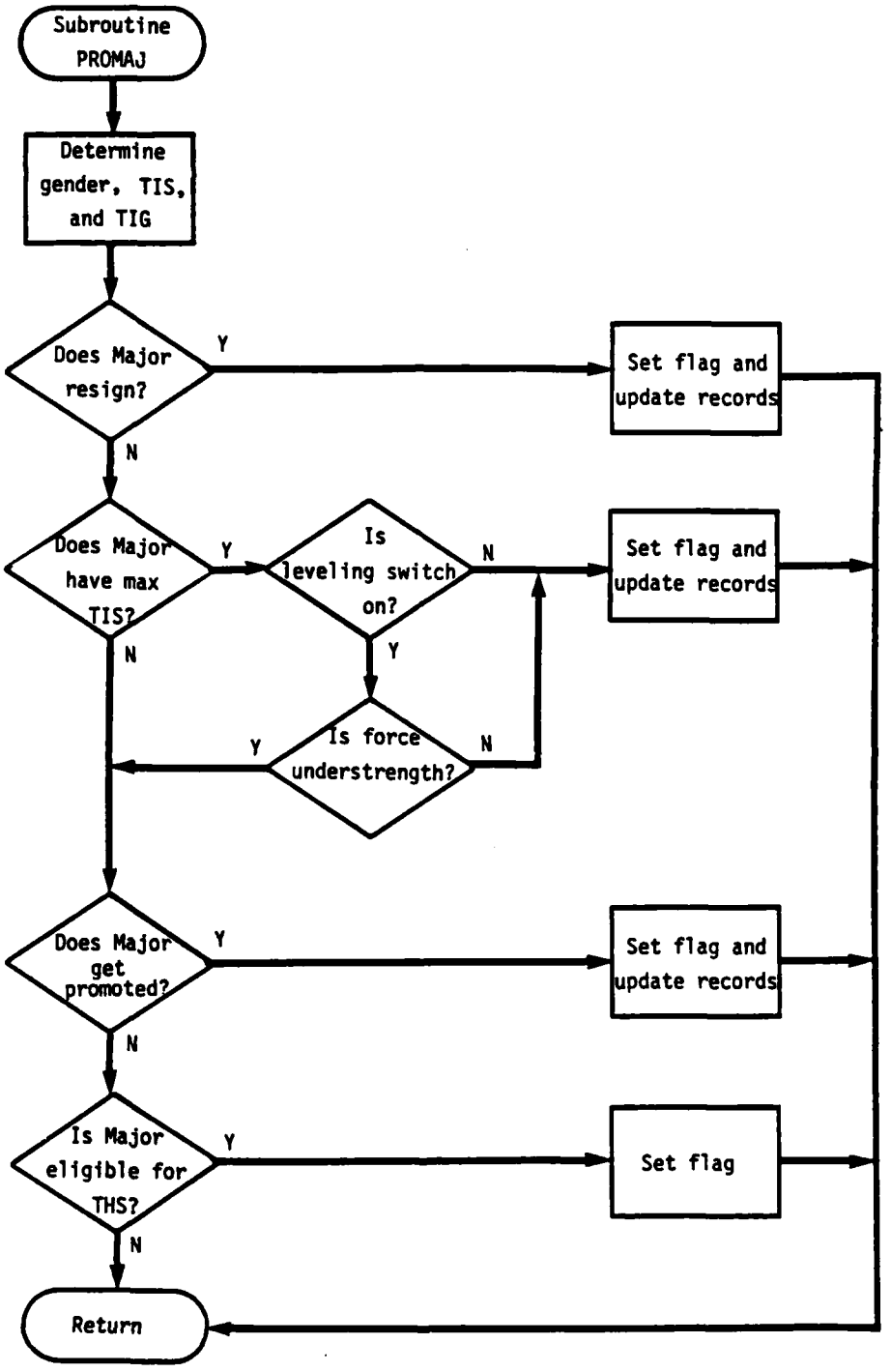

Figure E-7. PROMAJ Logic Flow Chart

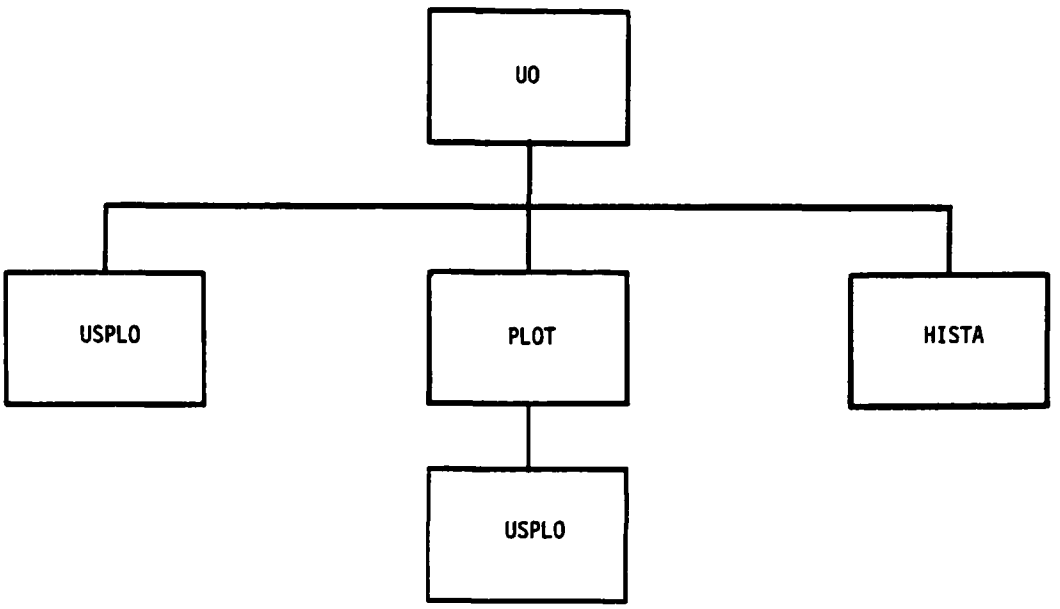

Figure E-8. UO Subroutines

E-4. MODEL OPERATION PROCEDURE. There are certain preliminary procedures that must be done to prepare the JOPM for use. The model must be compiled and mapped before model execution can take place. If no changes are to be made to the subroutines these procedures only have to be executed once. Every time the subroutines are updated, however, these procedures must be executed. It is unlikely, though, that changes will be made to the software. The runstreams of these procedures can be seen in Annex I to Appendix E.

a. Compilation. In order for the computer to execute the model it must be able to understand the code. Compilation converts the FORTRAN code into machine language elements called relocatable elements. There are three types of subroutine areas that must be compiled.

(1) Procedures. Any FORTRAN procedures that are to be used in the various subroutines must be processed with the @PDP processor prior to any other compilation. The Q-GERT subroutines use a procedure called PROC1. This procedure is also used in the JOPM subroutines along with a second procedure called PROC2. The PROC1 procedure in the Q-GERT subroutines and the JAG subroutines must be identical. To execute the compilation of the procedures, use the command @ADD FILENAME.COMPILE/PROCEDURE.

(2) Q-GERT Routines. The Q-GERT subroutines must also be compiled initially. If any changes are made to PROC1, all the Q-GERT subroutines must be recompiled. There are 104 subroutines in Q-GERT to be compiled. The command to compile the Q-GERT subroutines is @ADD FILENAME.COMPILE/ALL.

(3) JOPM Subroutines. After the Q-GERT subroutines are compiled, the specific JAG routines must be compiled. There are 22 subroutines compiled when the command @ADD FILENAME.COMPILE/JAG is used.

b. Mapping. After the relocatable elements are produced, they are collected into an executable module. To map (collect) the relocatables, use the command @ADD FILENAME.RUN-MAP.

c. Execution. When the above procedures have been completed, the model is ready for execution. The file FILENAME.DATA contains the input data that can be changed without having to execute any of the preliminary procedures. A detailed discussion on the input data is in paragraph E-5 and a copy of the data file is in Annex II to Appendix E. When the data is satisfactory, the model can be executed using the command @ADD FILENAME.RUN-JAG. The model will run for approximately 3-5 minutes before output can be received.

d. Printouts. The runstream for execution of the model has the ability to list the JAG subroutines used in the model. If these printouts are desired, the runstream must be edited. Changing all or some of the "@ . " to "@" will provide the user with hardcopies of the subroutines. Some of these subroutines have been included in Appendix F.

E-5. USER INPUT FILE. This paragraph deals with the various elements of the input data. The input data can be changed by the user to simulate specific needs. A sample data file is included at Annex II to Appendix E.

a. Introduction and Format. All entries must be right justified in the field. If a number is a whole number of a real type, it must have a decimal in the right-most column.

(1) Definitions

(a) Integer - any whole number.

(b) Real - any number, whole or decimal. Real numbers must include decimal points.

(2) Notes

(a) Asterisks. Data categories marked with an (*) are general categories. These data are not played in this simulation, but the model calls for values. These data could have been eliminated, but they were included to keep the model general. Values must be included to run the model, but changing these values will not change the output.

(b) t. All initial specialties in this case will be the same, so a 1.00 must be entered in one of the 24 fields.

(c) tt. Because only one INSPEC is played, only one probability in the same field as above is necessary.

(d) Comment - Any references to ADSPEC are general references. In the context of JOPM it refers to lawyers who maintain an expertise in a special law area such as contract law.

b. Specific Data Elements. In general, each data set is preceded by a 4-row heading section describing the data. See Annex II.

(1) Lieutenant Additional Specialty Switch. This is an option that allows lieutenants, upon promotion to captain, to choose an additional specialty.

Number of fields: 1
Number of records: 1
Line: 5
Format: integer

Record	Field	Column	Description	Variable
1	1	15	LT additional specialty switch 1-allows LTs to choose an additional specialty 0-does not allow LTs to choose an additional specialty	LTADSW

(2) Years to Check Captains. This is the time in service attained by captains when screening is to take place.

Number of fields: 2
Number of records: 2
Line: 6-7
Format: real

Record	Field	Column	Description	Variable
1	1	13-15	Year in service at which first screening will take place	TIS1CK
2	1	13-15	Year in service at which second screening will take place (must be TIS1CK)	TIS2CK

(3) Automatic Force Leveling Switch. This is an option to allow field officers to remain in the system if the force is below authorized strength, even though the officer has attained maximum time in service.

Number of fields: 3
Number of records: 1
Line: 12
Format: integer

Record	Field	Column	Description	Variable
1	1	5	0-switch is off for MAJ 1-switch is on for MAJ	NREP3
	2	10	0-switch is off for LTC 1-switch is on for LTC	NREP4
	3	15	0-switch is off for COL 1-switch is on for COL	NREP5

(4) Lieutenants. Number of lieutenants in the initial force and the fraction who are male.

Number of fields: 2
Number of records: 1
Line: 17
Format:

Record	Field	Column	Description	Variable
1	1	15-20	Number of LTs; integer type	NUMB(1)
1	2	47-50	Fraction of LTs which is male; real type	PMALE(1)

(5) Captains. Number of captains in the initial force who have just been promoted/accessed and the fraction who are male.

Number of fields: 2
Number of records: 1
Line: 22
Format:

Record	Field	Column	Description	Variable
1	1	15-20	Number of CPTs without additional specialties; integer type	NUMB(2)
1	2	47-50	Fraction of CPTs without additional specialties who are male; real type	PMALE(2)

(6) Captains - Established Paths. Number of captains in the initial force who have chosen career paths and the fraction who are male.

Number of fields: 2
Number of records: 1
Line: 27
Format:

Record	Field	Column	Description	Variable
1	1	15-20	Same as (7), except for CPTs with additional specialties	NUMB(3)
1	2	47-50	Same as (7), except for CPTs with additional specialties	PMALE(3)

(7) Majors. Number of majors in the initial force and the fraction who are male.

Number of fields: 2
Number of records: 1
Line: 32
Format:

Record	Field	Column	Description	Variable
1	1	15-20	Same as (7), except for MAJs	NUMB(4)
1	2	47-50	Same as (7), except for MAJs	PMALE(4)

(8) Lieutenant Colonels. Number of lieutenant colonels in the initial force, and the fraction who are male.

Number of fields: 2
Number of records: 1
Line: 37
Format:

Record	Field	Column	Description	Variable
1	1	15-20	Same as (7), except for LTC	NUMB(5)
1	2	47-50	Same as (7), except for LTC	PMALE(5)

(9) Colonels. Number of colonels in the initial force, and the fraction who are male.

Number of fields: 2
Number of records: 1
Line: 42
Format:

Record	Field	Column	Description	Variable
1	1	15-20	Same as (7), except for COLs	NUMB(6)
1	2	47-50	Same as (7), except for COLs	PMALE(6)

(10) Initial Years (TIS) - Lieutenants. Probability distribution for number of years already served by initial force and newly accessed lieutenants. Entries must sum to 1.00.

Number of fields: 15
Number of records: 1
Line: 47
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of 1 year of service	PTM1(1)
1	2	7-10	Probability of 2 years of service	PTM1(2)
1	15	72-75	Probability of 15 years of service	PTM1(15)

(11) Initial Years (TIS) - Accessed Captains. Probability distribution for number of years already served by newly accessed captains. Entries must sum to 1.00.

Number of fields: 15
Number of records: 1
Line: 52
Format: Same as (10) except variable array = PTM2(year)

(12) Initial Years (TIS) - Initial Force Captains. Probability distribution for number of years already served by initial force captains with established career paths. Entries must sum to 1.00.

Number of fields: 30
Number of records: 2
Line: 57-58
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of 1 year of service	PTM3(1)
1	2	7-10	Probability of 2 years of service	PTM3(2)
1	15	72-75	Probability of 15 years of service	PTM3(15)
2			Same as Record 1 for years 16-30	

(13) Initial Years (TIS) - Majors. Probability distribution for number of years already served by initial force majors. Entries must sum to 1.00.

Number of fields: 30
Number of records: 2
Line: 63-64
Format: Same as (12) except variable array = PTM46(1, year)

(14) Initial Years (TIS)- Lieutenant Colonels. Probability distribution for number of years already served by initial force lieutenant colonels. Entries must sum to 1.00.

Number of fields: 30
Number of records: 2
Line: 69-70
Format: Same as (12) except variable array = PTM46(2, year)

(15) Initial Years (TIS) - Colonels. Probability distribution for number of years already served by initial force colonels. Entries must sum to 1.00.

Number of fields: 30
Number of records: 2
Line: 75-76
Format: Same as (12) except variable array = PTM46(3, year)

(16) Time-in-Grade - Newly Accessed Captains. Probability distribution for number of years already served in grade by newly accessed captains. Entries must sum to 1.00.

Number of fields: 15
Number of records: 1
Line: 81
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of 1 year in grade	PTIG2(1)
1	2	7-10	Probability of 2 years in grade	PTIG2(2)
1	15	72-75	Probability of 15 years in grade	PTIG2(15)

(17) Time-in-Grade - Captains. Probability distribution for number of years already served in grade by initial force captains with established career paths. Entries must sum to 1.00.

Number of fields: 15
Number of records: 1
Line: 86
Format: Same as (16) except variable array = PTIG3(year)

(18) Time-in-Grade - Major. Probability distribution for number of years already served in grade by initial force majors. Entries must sum to 1.00.

Number of fields: 15
Number of records: 1
Line: 91
Format: Same as (16) except variable array = PTIG46(1,year)

(19) Time-in-Grade - Lieutenant Colonel. Probability distribution for number of years already served in grade by initial force lieutenant colonels. Entries must sum to 1.00.

Number of fields: 15
Number of records: 1
Line: 96
Format: Same as (16) except variable array = PTIG46(2, year)

(20) Time-in-Grade - Colonels. Probability distribution for number of years already served in grade by initial force colonels. Entries must sum to 1.00.

Number of fields: 15
Number of records: 1
Line: 101
Format: Same as (16) except variable array = PTIG46(3, year)

(21) Yearly Accessions - Lieutenants. The number of new lieutenants to enter the force each year.

Number of fields: 30
Number of records: 3
Line: 106-108
Format: integer

Record	Field	Column	Description	Variable
1	1	1-5	Number of new entries - year 1	NALT(1)
	2	6-10	Number of new entries - year 2	NALT(2)
	10	46-50	Number of new entries - year 10	NALT(10)
2			Same as Record 1 for years 11-20	
3			Same as Record 1 for years 21-30	

(22) Yearly Accessions - Captains. The number of new captains to enter the force each year.

Number of fields: 30
Number of records: 3
Line: 113-115
Format: Same as (21) except variable array - NACP(year)

(23) New Accession Gender. Probability that a new accession will be male. This is used in conjunction with inputs (21) and (22).

Number of fields: 30
Number of records: 2
Line: 120-121
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability that a new accession will be male for year 1	PMO(1)
1	2	7-10	Probability that a new accession will be male for year 2	PMO(2)
1	15	72-75	Probability that a new accession will be male for year 15	PMO(15)
2			Same as Record 1 for years 16-30	

(24) Continuation Rates. Probability of remaining in the service, based on gender, grade, and years in service.

Number of fields: 300
Number of records: 20
Line: 126-157
Format: real

Line	Field	Column	Description	Variable
126	1	2-5	Probability of continuation for a male LT with 1 year of service	PSTAY(1,1,1)
126	15	72-75	Probability of continuation for a male LT with 15 years of service	PSTAY(1,1,15)
127			Same as 126 for 16-30 years of service	
128			Comment	
129-130			Same as lines 126-127 for CPTs	PSTAY(1,2,year)
131			Comment	
132-133			Same as lines 126-127 for MAJs	PSTAY(1,3,year)
134			Comment	
135-136			Same as lines 126-127 for LTCs	PSTAY(1,4,year)
137			Comment	
138-139			Same as lines 126-127 for COLs	PSTAY(1,5,year)
140			Comment	
144-157			Same as lines 126-139 for females	PSTAY(2,grade,year)

(25) Maximum Years. The maximum number of years an officer will be allowed to remain in the service, by grade.

Number of fields: 6
Number of records: 1
Line: 162
Format: real

Record	Field	Column	Description	Variable
1	1	6-10	Maximum years for LT	SVCMAX(1)
	2	16-20	Maximum years for CPT newly accessed/promoted	SVCMAX(2)
	3	26-30	Maximum years for CPT with established career path	SVCMAX(3)
	4	36-40	Maximum years for MAJ	SVCMAX(4)
	5	46-50	Maximum years for LTC	SVCMAX(5)
	6	56-60	Maximum years for COL	SVCMAX(6)

(26) Captain Retention Rates. Percentage of captains to be retained during the T1S1CK variable year of service or T1S2CK variable year of service.

Number of fields: 2
Number of records: 1
Line: 167
Format: real

Record	Field	Column	Description	Variable
1	1	17-20	Percentage of CPTs at the T1S1CK years of service window who are to be retained	CMAX1
	2	47-50	Percentage of CPTs at the T1S2CK years of service window who are to be retained	CMAX2

(27) INSPEC Assignment(t). Probability of assigning any one of 24 initial specialties, based on gender.

Number of fields: 48
Number of records: 4
Line: 172-179
Format: real

Line	Field	Column	Description	Variable
172	1	2-5	Probability of assigning the first INSPEC, male	PINPS(1,1)
	2	7-10	Probability of assigning the second INSPEC, male	PINPS(1,2)
	12	57-60	Probability of assigning the 12th INSPEC, male	PINPS(1,12)
173			Same as line 165 for INSPEC 13-24	
174-177			Comment	
178-179			Same as lines 172-173 for female	PINPS(2,INSPEC)

(28) Promotion to Captain. Probability of being promoted to captain based on time-in-grade.

Number of fields: 15
Number of records: 1
Line: 184
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of being promoted to CPT given one year in grade	PPROMO(1,1)
	15	72-75	Probability of being promoted to CPT given 15 years in grade	PPROMO(1,15)

(29) Promotion to Major. Probability of being promoted to major based on time-in-grade.

Number of fields: 15
Number of records: 1
Line: 189
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of being promoted to MAJ given one year in grade	PPROMO(2,1)
	15	72-75	Probability of being promoted to MAJ given 15 years in grade	PPROMO(2,15)

(30) Promotion to LTC. Probability of being promoted to LTC based on time-in-grade.

Number of fields: 15
Number of records: 1
Line: 194
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of being promoted to LTC given one year in grade	PPROMO(3,1)
	15	72-75	Probability of being promoted to LTC given 15 years in grade	PPROMO(3,15)

(31) Promotion to Colonel. Probability of being promoted to colonel based on time-in-grade.

Number of fields: 15
Number of records: 1
Line: 199
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of being promoted to COL given 1 year in grade	PPROMO(4,1)
	15	72-75	Probability of being promoted to COL given 15 years in grade	PPROMO(4,15)

(32) Promotion to General. Probability of being promoted to general based on time-in-grade.

Number of fields: 15
Number of records: 1
Line: 204
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of being promoted to GEN given 1 year in grade	PPROMO(5,1)
	15	72-75	Probability of being promoted to GEN given 15 years in grade	PPROMO(5,15)

(33) Specialty Assignment(tt). Probability of choosing a specialty based on a given initial specialty.

Number of fields: 24
Number of records: 2
Line: 209-210
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of choosing a specialty given the first INSPEC	PADS1(1)
	12	57-60	Probability of choosing a specialty given the 12th INSPEC	PADS1(12)
2			Same as record 1 for INSPEC 13-24	

(34) Specific (Contract Law) Specialty(tt). Probability of choosing this specialty based on a given initial specialty.

Number of fields: 24
Number of records: 2
Line: 215-216
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability of choosing contract law specialty given the first INSPEC	PADS2(1)
	12	57-60	Probability of choosing contract law specialty given the 12th INSPEC	PADS2(12)
2			Same as Record 1 for INSPEC 13-24	

(35) THS Status. Probability of an officer being assigned into a THS status based on grade and time-in-service.

Number of fields: 180
Number of records: 12
Line: 221-237
Format: real

Line	Field	Column	Description	Variable
221	1	2-5	Probability of a LT with 1 year in service being assigned to a THS status	PTHS(1,1)
	15	72-75	Probability of a LT with 15 years in service being assigned to a THS status	PTHS(1,15)
222			Same as line 221 for years in service 16-30	
216-223			Comment	
224-225			Same as 221-222 for CPTs in first year of JAG system	PTHS(2,TIS)
226			Comment	
227-228			Same as 221-222 for all other CPTs	PTHS(3,TIS)
229			Comment	
230-231			Same as 221-222 for MAJs	PTHS(4,TIS)
232			Comment	
233-234			Same as 221-222 for LTC	PTHS(5,TIS)
235			Comment	
236-237			Same as 221-222 for COL	PTHS(6,TIS)

(36) THS Time. Length of time, in years, an officer will remain in THS status, by grade.

Number of fields: 6
Number of records: 1
Line: 242
Format: real

Record	Field	Column	Description	Variable
1	2	6-10	Time in years a LT will serve in a THS status	TIMTHS(1)
	2	16-20	Time in years a CPT in his first year in JAG system will serve in a THS status	TIMTHS(2)
	3	26-30	Time in years all other CPTs will serve in a THS status	TIMTHS(3)
	4	36-40	Time in years a MAJ will serve in a THS status	TIMTHS(4)
	5	46-50	Time in years a LTC will serve in a THS status	TIMTHS(5)
	6	56-60	Time in years a COL will serve in a THS status	TIMTHS(6)

(37) INSPEC*. Identifies the INSPECs being played.

Number of fields: 24
Number of records: 2
Line: 247-248
Format: integer

Record	Field	Column	Description	Variable
1	1	1-5	First INSPEC code	IODE(1)
	12	56-60	12th INSPEC code	IODE(12)
2			Same as Record 1 for codes 13-24	

(38) MALE Only*. Probability that a position is slotted as male only based on INSPEC code.

Number of fields: 24
Number of records: 2
Line: 253-254
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability that a position is male only based on first INSPEC code	PSA1(1)
	12	57-60	Probability that a position is male only based on the 12th INSPEC code	PSA1(12)
2			Same as Record 1 for INSPECs 13-24	

(39) Set Aside*. Probability that an interchangeable position is set aside as male only, based on INSPEC.

Number of fields: 24
Number of records: 2
Line: 259-260
Format: real

Record	Field	Column	Description	Variable
1	1	2-5	Probability that an interchangeable position is set aside as male only, based on the first INSPEC	PSA2(1)
	2	7-10	Probability that an interchangeable position is set aside as male only, based on the second INSPEC	PSA2(2)
	12	57-60	Probability that an interchangeable position is set aside as male only, based on the 12th INSPEC	PSA3(12)
2			Same as Record 1 for INSPECs 13-24	

(40) Authorized Levels. Authorized strength figures are input to the model for plotting purposes and comparisons with actual strength levels.

Number of fields: 450
Number of records: 30
Line: 265-350
Format: integer

Line	Field	Column	Description	Variable
265	1	1-5	LT authorized strength - year 1	YY2(2,1)
	2	6-10	LT authorized strength - year 2	YY2(2,2)
	15	71-75	LT authorized strength - year 15	YY2(2,15)
266			Same as 265 for years 16-30	
267-270			Comment	
271-272			Same as 265-266 for first year and newly accessed CPTs	YY7(2,year)
273-276			Comment	
277-278			Same as 265-266 for male CPTs with general law specialties	YY140(2,year)
279-282			Comment	
283-284			Same as 277-278 for females	YY145(2,year)
285-288			Comment	
289-296			Same as 277-284 for male and female CPTs with contract law specialties	YY16(2,year) YY20(2,year)
297-300			Comment	

Line	Field	Column	Description	Variable
301-308			Same as 277-284 for male and female CPTs with misc. law specialties	YY17(2,year) YY30(2,year)
309-312			Comment	
313-314			Same as 265-266 for total CPTs	YYCP(2,year)
315-318			Comment	
319-326			Same as 277-284 for male and female MAJs with general law specialties	YY36(2,year) YY32(2,year)
327-330			Comment	
331-332			Same as 265-266 for total MAJs	YYMTOT(2,year)
333-336			Comment	
337-338			Same as 265-266 for total LTCs	YY51(2,year)
339-342			Comment	
343-344			Same as 265-266 for total COLs	YY60(2,year)
345-348			Comment	
349-350			Same as 265-266 for total JAG force	YYTOT(2,year)

E-6. OUTPUT REPORTS. Upon completion of a run, JOPM produces three types of output. The first type of output is a copy of all of the JAG subroutines used (see subparagraph E-4d). The other two types of output are Q-GERT produced and JOPM subroutine-produced. The JOPM subroutine-produced reports will prove to be the most useful. Sample outputs from JOPM are at Annex III of Appendix E. What follows is a description of what may be output at completion of a simulation run.

a. Subroutine Copies. If this option is desired, approximately the first 38 pages of output will be listings of subroutines. All the FORTRAN code can be viewed using this option.

b. Pre-simulation Q-GERT Output. Before the simulation begins, Q-GERT provides information pertaining to the nodes and links of the Q-GERT network and lists the actual network cards.

c. JAG Subroutine Produced Reports. After the Q-GERT preliminary reports, the actual output from the simulation is seen (samples of this output can be seen in Annex III of Appendix E). The reports are as follows:

(1) JAG Population. The first report shows the JAG population for 30 years. The population is broken down by lieutenants, newly accessed/promoted captains, male general law captains, female general captains, male contract law captains, female contract captains, male other law captains, female other captains, total captains, male general majors, female general majors,

total majors, total lieutenant colonels, total colonels, total that left system, and total population.

(2) Transaction Tables. The next six tables chart transactions between years. These tables report number of officers who (1) voluntarily leave the service, (2) are removed, (3) are promoted, (4) attend school in any given year interval, or (5) stay in the service because the leveling switch is on (see paragraph E-5b(3)). The last table reports the number of field officers below (-) or above (+) authorized strength in a given year interval.

(3) Histograms. The next six plots are histograms. These charts show the distribution of time-in-grade in which promotions occur. The six histograms are for lieutenants, newly promoted/accessed captains, established captains, majors, lieutenant colonels, and colonels.

(4) Plots. The 15 plots that follow the histograms are graphic representations of the columns in the population table described in paragraph E-6c(1). The actual strengths (*) are plotted against authorized strength. An 'M' means that the two functions match. The last plot is a superposition of cumulative authorized and actual strengths. The following is a key for the final chart:

- 2 = actual strengths of LTs
- 3 = actual strengths of LTs and CPTs
- 4 = actual strengths of LTs, CPTs, and MAJs
- 5 = actual strengths of LTs, CPTs, MAJs, and LTCs
- 6 = actual strengths of LTs, CPTs, MAJs, LTCs, and COLs (the function is the same as "Total Officers vs Time")
- '-' = authorized strengths

d. Post-simulation Q-GERT Output. Twenty-two pages of output are produced by Q-GERT. These are printouts of mode statistics, transactions, and activities. These outputs are basically unrelated to the JOPM subroutine-produced reports.

ANNEX I TO APPENDIX E

MODEL OPERATION

COMPILE/ALL

```
1     @F IN,F0 38NAPM-QGERT.ACTMAC
2     @F IN,F0 38NAPM-QGERT.APACK
3     @F IN,F0 38NAPM-QGERT.ASSIGN
4     @F IN,F0 38NAPM-QGERT.AVEWT
5     @F IN,F0 38NAPM-QGERT.BE
6     @F IN,F0 38NAPM-QGERT.BLOCK
7     @F IN,F0 38NAPM-QGERT.BLOCKDATA
8     @F IN,F0 38NAPM-QGERT.BP
9     @F IN,F0 38NAPM-QGERT.BUILD
10    @F IN,F0 38NAPM-QGERT.CAPQ
11    @F IN,F0 38NAPM-QGERT.CLEAR
12    @F IN,F0 38NAPM-QGERT.COL
13    @F IN,F0 38NAPM-QGERT.COLC
14    @F IN,F0 38NAPM-QGERT.COLCT
15    @F IN,F0 38NAPM-QGERT.COLP
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21    @F IN,F0 38NAPM-QGERT.DATIN
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23    @F IN,F0 38NAPM-QGERT.DATNG
24    @F IN,F0 38NAPM-QGERT.DATNR
25    @F IN,F0 38NAPM-QGERT.DPROB
26    @F IN,F0 38NAPM-QGERT.ER
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32    @F IN,F0 38NAPM-QGERT.FREED
33    @F IN,F0 38NAPM-QGERT.GA
34    @F IN,F0 38NAPM-QGERT.GAM
35    @F IN,F0 38NAPM-QGERT.GASP
36    @F IN,F0 38NAPM-QGERT.GATRB
37    @F IN,F0 38NAPM-QGERT.GETAT
38    @F IN,F0 38NAPM-QGERT.GINIT
39    @F IN,F0 38NAPM-QGERT.HALTA
40    @F IN,F0 38NAPM-QGERT.HIS
41    @F IN,F0 38NAPM-QGERT.HISC
42    @F IN,F0 38NAPM-QGERT.HISP
43    @F IN,F0 38NAPM-QGERT.HISTO
44    @F IN,F0 38NAPM-QGERT.HISTW
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47    @F IN,F0 38NAPM-QGERT.ICSRU
48    @F IN,F0 38NAPM-QGERT.INITA
49    @F IN,F0 38NAPM-QGERT.INPERR
50    @F IN,F0 38NAPM-QGERT.IPACK
51    @F IN,F0 38NAPM-QGERT.ISTUS
52    @F IN,F0 38NAPM-QGERT.ITRANS
53    @F IN,F0 38NAPM-QGERT.LO
54    @F IN,F0 38NAPM-QGERT.NACTY
55    @F IN,F0 38NAPM-QGERT.NATCV
56    @F IN,F0 38NAPM-QGERT.NO
57    @F IN,F0 38NAPM-QGERT.NODCV
58    @F IN,F0 38NAPM-QGERT.NODMAC
59    @F IN,F0 38NAPM-QGERT.NODMOD
60    @F IN,F0 38NAPM-QGERT.NOFQ
61    @F IN,F0 38NAPM-QGERT.NPACK
62    @F IN,F0 38NAPM-QGERT.PACTY
63    @F IN,F0 38NAPM-QGERT.PATRB
64    @F IN,F0 38NAPM-QGERT.PO
65    @F IN,F0 38NAPM-QGERT.PRMOD
66    @F IN,F0 38NAPM-QGERT.PTIN
67    @F IN,F0 38NAPM-QGERT.PUTAT
68    @F IN,F0 38NAPM-QGERT.QGERT
69    @F IN,F0 38NAPM-QGERT.RCAPQ
70    @F IN,F0 38NAPM-QGERT.REDIT
71    @F IN,F0 38NAPM-QGERT.REMST
72    @F IN,F0 38NAPM-QGERT.REVNT
73    @F IN,F0 38NAPM-QGERT.RMOVE
74    @F IN,F0 38NAPM-QGERT.RSMRY
75    @F IN,F0 38NAPM-QGERT.SAMPL
76    @F IN,F0 38NAPM-QGERT.SAMP2
77    @F IN,F0 38NAPM-QGERT.SCHAT
78    @F IN,F0 38NAPM-QGERT.SCHATT
```

```
 79      @F IN,FO  38NAPM-OGERT.SCHAT2
 80      @F IN,FO  38NAPM-OGERT.SEVNT
 81      @F IN,FO  38NAPM-OGERT.SLECO
 82      @F IN,FO  38NAPM-OGERT.SLECS
 83      @F IN,FO  38NAPM-OGERT.SNACT
 84      @F IN,FO  38NAPM-OGERT.STAGO
 85      @F IN,FO  38NAPM-OGERT.STARTA
 86      @F IN,FO  38NAPM-OGERT.STORA
 87      @F IN,FO  38NAPM-OGERT.STRCE
 88      @F IN,FO  38NAPM-OGERT.STSER
 89      @F IN,FO  38NAPM-OGERT.SUMRY
 90      @F IN,FO  38NAPM-OGERT.TIM
 91      @F IN,FO  38NAPM-OGERT.TIMC
 92      @F IN,FO  38NAPM-OGERT.TIMP
 93      @F IN,FO  38NAPM-OGERT.TINIO
 94      @F IN,FO  38NAPM-OGERT.TIRA
 95      @F IN,FO  38NAPM-OGERT.TIRU
 96      @F IN,FO  38NAPM-OGERT.TISS
 97      @F IN,FO  38NAPM-OGERT.TMARK
 98      @F IN,FO  38NAPM-OGERT.TR
 99      @F IN,FO  38NAPM-OGERT.UN
100      @F IN,FO  38NAPM-OGERT.UNBLK
101      @F IN,FO  38NAPM-OGERT.UPDATE
102      @F IN,FO  38NAPM-OGERT.US
103      @F IN,FO  38NAPM-OGERT.XWING
104      @F IN,FO  38NAPM-OGERT.XYEND
```

COMPILE/JAG

```
 1      @  . XQT  38NAPM-JAG.INUSERUN
 2      @    BK1  U
 3      @F IN,FO  38NAPM-JAG.MAIN
 4      @F IN,FO  38NAPM-JAG.INSPEC
 5      @F IN,FO  38NAPM-JAG.ADSPEC
 6      @F IN,FO  38NAPM-JAG.HISTA
 7      @F IN,FO  38NAPM-JAG.SUMTST
 8      @F IN,FO  38NAPM-JAG.PLOT
 9      @F IN,FO  38NAPM-JAG.UI
10      @F IN,FO  38NAPM-JAG.READIN
11      @F IN,FO  38NAPM-JAG.INITIA
12      @F IN,FO  38NAPM-JAG.SSTATE
13      @F IN,FO  38NAPM-JAG.UF
14      @F IN,FO  38NAPM-JAG.UO
15      @F IN,FO  38NAPM-JAG.NEWLTS
16      @F IN,FO  38NAPM-JAG.NEWCPT
17      @F IN,FO  38NAPM-JAG.PROLTS
18      @F IN,FO  38NAPM-JAG.PROCPI
19      @F IN,FO  38NAPM-JAG.PROCPA
20      @F IN,FO  38NAPM-JAG.PROMAJ
21      @F IN,FO  38NAPM-JAG.PROLTC
22      @F IN,FO  38NAPM-JAG.PROCOL
23      @F IN,FO  38NAPM-JAG.PROTHS
24      @F IN,FO  38NAPM-JAG.PROREP
25      @  . BK2,E
26      LC END FTN
```

COMPILE/PROCEDURE

```
1       @PDP,UF  38NAPM-QGERT.PROC1
2       @CCP,S   38NAPM-QGERT.PROC1,38NAPM-JAG.PROC1
3       @PCP,UF  38NAPM-JAG.PROC1
4       @PDP,UF  38NAPM-JAG.PROC2
5       @ECF
```

RUN - MAP/MILPERCENØ1

```
1       @XQT 38NAPM-JAG.INUSERUN
2       @ASG,CP 38PRINT.,///500
3       @BKPT PRINTS/38PRINT
4       @HOG,UP      **MAPPING OF ** JAGBAT STUDY MODEL  **UNCLASSIFIED**
5       @ASG,A 38NAPM-JAG.
6       @ ASG,A  38NAPM-QGERT.
7       @ .USE 38NAPM-JAG,*38NAPM-JAG.
8       @MAP,ES  38NAPM-JAG.MAPABS221/MILPERCENØ1,38NAPM-JAG.ABS221JAG/MILPERCENØ1
9       @BKPT PRINTS
10      @FREE 38PRINT.
11      @EOR 38PRINT.
12      LC END MAP
```

MAPABS221/MILPERCENØ1

```
1       LIB 38NAPM-QGERT.
2       LIB UNIVAC*FIN11.
3       FRSTIN PARM
4       IN 38NAPM-JAG.MAIN
5       IN 38NAPM-JAG.INSPEC
6       IN 38NAPM-JAG.ADSPEC
7       IN 38NAPM-JAG.HISTA
8       IN 38NAPM-JAG.READIN
9       IN 38NAPM-JAG.INITIA
10      IN 38NAPM-JAG.SSTATE
11      IN 38NAPM-JAG.UF
12      IN 38NAPM-JAG.SUMTST
13      IN 38NAPM-JAG.NEWLTS
14      IN 38NAPM-JAG.NEWCPT
15      IN 38NAPM-JAG.PROLTS
16      IN 38NAPM-JAG.PROCPI
17      IN 38NAPM-JAG.PROCPA
18      IN 38NAPM-JAG.PROMAJ
19      IN 38NAPM-JAG.PROLTC
20      IN 38NAPM-JAG.PROCOL
21      IN 38NAPM-JAG.PROTHS
22      IN 38NAPM-JAG.PROREP
23      IN 38NAPM-JAG.PLOT
24      IN 38NAPM-JAG.UO
25      IN 38NAPM-JAG.UI
26      IN 38NAPM-JAG.MAINPLOT
27      IN 38NAPM-JAG.SUBIO
28      IN 38NAPM-JAG.SUBKD
29      IN 38NAPM-JAG.SUBTST
30      END
```

RUN - JAG

```
1   @ . RUN,/TPS A238JG,G3221P5435C,UNCLASSIFIED,20,2000
2   @38NAPM-JAG.INUSERUN
3   @MSG,N
4   @HOG,U  100 PERCENT JAG FORCE ---- UNCLASSIFIED
5   @CAT,P 38HOLD(+1).,///500
6   @SETC
7   @USE 38PFILE.,38HOLD.
8   @ASG,A 38PFILE.
9   @BRKPT PRINTS/38PFILE
10  @USE N.,38NAPM-JAG.
11  @ASG,T 7
12  @ASG,T 8
13  @ASG,I 9
14  @ASG,T 10
15  @PRT,S 38JAGDATA.DATA/RUNSTREAM
16  @ . PRT,S N.UI
17  @ . PRT,S N.READIN
18  @ . PRT,S N.INITIA
19  @ . PRT,S N.SSTATE
20  @ . PRT,S N.UF
21  @ . PRT,S N.NEWLIS
22  @ . PRT,S N.NEW-PT
23  @ . PRT,S N.PROCTS
24  @ . PRT,S N.PROCPI
25  @ . PRT,S N.PROCPA
26  @ . PRT,S N.PROMAJ
27  @ . PRT,S N.PROLTC
28  @ . PRT,S N.PROCOL
29  @ . PRT,S N.PROTHS
30  @ . PRT,S N.PROREP
31  @ . PRT,S N.UO
32  @ . PRT,S N.PLOT
33  @ . PRT,S N.SUMIST
34  @ . PRT,S N.ADSPEC
35  @ . PRT,S N.INSPEC
36  @ . PRT,S N.PROC1
37  @ . PRT,S N.PROC2
38  @ . PRT,S N.HISTA
39  @XCT N.ABS221JAG/MILPERCENT01
40  @ACD,P N.NETWORK
41  @ACD,P  38JAGDATA.DATA/RUNSTREAM
42  @BRKPT PRINTS
43  @ . FREE,R  38PFILE.
44  @ED,R 38PFILE.
```

ANNEX II TO APPENDIX E

DATA INPUT

```
*****************************************************************************
*                  SPECIAL CONTROL OPTIONS FOR SIMULATION                   *
*     OPTION: ON = 1, OFF = 0      TIS CHECK: YEAR THAT CPT CUTS ARE MADE   *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
LTADSW = :    1
TIS1CK = :   3.
TIS2CK = :   5.
*****************************************************************************
*                  AUTOMATIC FORCE LEVELING OPTION  SWITCH                  *
*        OPTION ON: SWITCH = 1                OPTION OFF: SWITCH = 0        *
*--MAJ--LTC--COL-------------------------------------------------------------*
   0    0    0
*****************************************************************************
*                  INITIALIZED FORCE OF LIEUTENANTS                         *
*        FIELD 1 = QUANTITY                FIELD 2 = FRACTION THAT ARE MALE *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
                    008                          .800
*---------------------------------------------------------------------------*
*        INITIALIZED FORCE OF CAPTAINS NEWLY PROMOTED UP FROM LIEUTENANT    *
*        FIELD 1 = QUANTITY                FIELD 2 = FRACTION THAT ARE MALE *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
                    170                          .900
*---------------------------------------------------------------------------*
*        INITIALIZED FORCE OF CAPTAINS WITH ESTABLISHED CARREER PATHS       *
*        FIELD 1 = QUANTITY                FIELD 2 = FRACTION THAT ARE MALE *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
                    800                          .900
*---------------------------------------------------------------------------*
*                  INITIALIZED FORCE OF MAJORS                              *
*        FIELD 1 = QUANTITY                FIELD 2 = FRACTION THAT ARE MALE *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
                    414                          .960
*---------------------------------------------------------------------------*
*                  INITIALIZED FORCE OF LIEUTENANT COLONELS                 *
*        FIELD 1 = QUANTITY                FIELD 2 = FRACTION THAT ARE MALE *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
                    223                          .980
*---------------------------------------------------------------------------*
*                  INITIALIZED FORCE OF COLONELS                            *
*        FIELD 1 = QUANTITY                FIELD 2 = FRACTION THAT ARE MALE *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
                    119                          .990
*****************************************************************************
*           PROBABILITY DISTRIBUTION OF TIS THAT INITIAL FORCE              *
*                 LIEUTENANTS HAVE ALREADY SERVED                           *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .334 .333 .333 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
*****************************************************************************
*           PROBABILITY DISTRIBUTION OF TIS THAT ACCESSED                   *
*              CAPTAINS HAVE ALREADY SERVED                                 *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .000 .250 .250 .250 .250 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
*****************************************************************************
*           PROBABILITY DISTRIBUTION OF TIS THAT INITIAL FORCE              *
*              CAPTAINS HAVE ALREADY SERVED                                 *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .000 .225 .275 .125 .125 .040 .040 .040 .040 .040 .030 .020 .000 .000 .000
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
*****************************************************************************
*           PROBABILITY DISTRIBUTION OF TIS THAT INITIAL FORCE              *
*                 MAJORS HAVE ALREADY SERVED                                *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .001 .004 .091 .156 .205 .187
 .170 .119 .028 .015 .013 .006 .005 .000 .000 .000 .000 .000 .000 .000 .000
*---------------------------------------------------------------------------*
*           PROBABILITY DISTRIBUTION OF TIS THAT INITIAL FORCE              *
*              LIEUTENANT COLONELS HAVE ALREADY SERVED                      *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .002 .003
 .014 .138 .186 .149 .159 .133 .099 .047 .022 .018 .012 .009 .007 .002 .000
*---------------------------------------------------------------------------*
*           PROBABILITY DISTRIBUTION OF TIS THAT INITIAL FORCE              *
*                 COLONELS HAVE ALREADY SERVED                              *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .002 .002 .009 .021 .085 .171 .156 .137 .116 .115 .079 .061 .046
*****************************************************************************
*           PROBABILITY DISTRIBUTION OF TIG THAT ASSESSED                   *
*              CAPTAINS HAVE ALREADY SERVED                                 *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .250 .250 .250 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
*****************************************************************************
*           PROBABILITY DISTRIBUTION OF TIG THAT INITIAL FORCE              *
*              CAPTAINS (WITH ADSPECS) HAVE ALREADY SERVED                  *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .101 .103 .196 .190 .124 .123 .101 .000 .000 .000 .000 .000 .000 .000 .000
*****************************************************************************
*           PROBABILITY DISTRIBUTION OF TIG THAT INITIAL FORCE              *
*                 MAJORS HAVE ALREADY SERVED                                *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .110 .115 .133 .272 .297 .033 .015 .010 .008 .007 .000 .000 .000 .000 .000
*---------------------------------------------------------------------------*
*           PROBABILITY DISTRIBUTION OF TIG THAT INITIAL FORCE              *
*              LIEUTENANT COLONELS HAVE ALREADY SERVED                      *
*---1----2----3----4----5----6----7----8----9----10---11---12---13---14---15-*
 .184 .241 .274 .118 .076 .057 .010 .010 .010 .004 .004 .004 .004 .004 .000
```

```
97        *-------------------------------------------------------------------------------*
98        *          PROBABILITY DISTRIBUTION OF TIG THAT INITIAL FORCE                   *
99        *                    COLONELS HAVE ALREADY SERVED                               *
100       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
101        .104 .191 .148 .148 .130 .096 .052 .044 .044 .022 .014 .007 .000 .000 .000
102       *********************************************************************************
103       *                YEARLY ACCESSION RATES FOR LIEUTENANTS                         *
104       *            NUMBER OF LIEUTENANTS PER YEAR FOR 30 YEARS                        *
105       *---1----2----3----4----5----6----7----8----9---10-------------------------*
106         190  190  190  190  190  190  190  190  190  190
107         190  190  190  190  190  190  190  190  190  190
108         190  190  190  190  190  190  190  190  190  190
109       *********************************************************************************
110       *                YEARLY ACCESSION RATES FOR CAPTAINS                            *
111       *            NUMBER OF CAPTAINS PER YEAR FOR 30 YEARS                           *
112       *---1----2----3----4----5----6----7----8----9---10-------------------------*
113          10   10   10   10   10   10   10   10   10   10
114          10   10   10   10   10   10   10   10   10   10
115          10   10   10   10   10   10   10   10   10   10
116       *********************************************************************************
117       *        PROBABILITY THAT ANY NEW ACCESSION WILL BE A MALE OFFICER              *
118       *                      BASED ON ACCESSION YEAR                                  *
119       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
120        .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800
121        .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800 .800
122       *********************************************************************************
123       *        PROBABILITY OF A MALE OFFICER REMAINING IN SERVICE BASE ON             *
124       *                ACCUMULATED TIME IN SERVICE BY TIS                             *
125       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
126        .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910
127        .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910
128       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
129        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
130        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
131       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
132        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
133        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
134       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
135        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
136        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
137       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
138        .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990
139        .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990
140       *-------------------------------------------------------------------------------*
141       *        PROBABILITY OF A FEMALE OFFICER REMAINING IN SERVICE BASE ON           *
142       *                ACCUMULATED TIME IN SERVICE BY TIS                             *
143       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
144        .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910
145        .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910 .910
146       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
147        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
148        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
149       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
150        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
151        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
152       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
153        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
154        .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940 .940
155       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
156        .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990
157        .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990 .990
158       *********************************************************************************
159       *        MAXIMUM NUMBER OF SERVICE YEARS ALLOWABLE FOR OFFICERS BY GRADE        *
160       *      LTS        CPTS(INS)  CPTS(ADS)  MAJ'S      LTC'        COL'S           *
161       *-------1--------2--------3--------4--------5--------6-------------------------*
162                7.         15.        20.        24.        28.        30.
163       *********************************************************************************
164       *CAPTAIN RETENTION CONSTRAINT (MAX NUMBER RETAINED BASED ON TIME IN SERVICE)    *
165       *        TIS = 3 TO 4 YRS                    TIS = 5 TO 6 YRS                   *
166       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
167                          .600                        .500
168       *********************************************************************************
169       *          PROBABILITY DISTRIBUTION OF A MALE RECEIVING ANY ONE OF              *
170       *                        24 INSPEC CODES                                        *
171       *---1----2----3----4----5----6----7----8----9---10---11---12-----------------*
172        1.000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
173        .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
174       *********************************************************************************
175       *          PROBABILITY DISTRIBUTION OF A FEMALE RECEIVING ANY ONE OF            *
176       *                        24 INSPEC CODES                                        *
177       *---1----2----3----4----5----6----7----8----9---10---11---12-----------------*
178        1.000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
179        .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
180       *********************************************************************************
181       *          PROBABILITY OF A LIEUTENANT BEING PROMOTED TO CAPTAIN                *
182       *                      BASED ON TIME IN GRADE                                   *
183       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
184        .990 .990 .990 .990 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
185       *-------------------------------------------------------------------------------*
186       *          PROBABILITY OF A CAPTAIN BEING PROMOTED TO MAJOR                     *
187       *                      BASED ON TIME IN GRADE                                   *
188       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
189        .000 .000 .000 .000 .138 .588 .388 .248 .218 .123 .083 .023 .003 .000 .000
190       *-------------------------------------------------------------------------------*
191       *        PROBABILITY OF A MAJOR BEING PROMOTED TO LIEUTENANT COLONEL            *
192       *                      BASED ON TIME IN GRADE                                   *
193       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
194        .000 .000 .000 .000 .140 .450 .300 .200 .161 .100 .061 .081 .001 .000 .000
195       *-------------------------------------------------------------------------------*
196       *        PROBABILITY OF A LIEUTENANT COLONEL BEING PROMOTED TO COLONEL         *
197       *                      BASED ON TIME IN GRADE                                   *
198       *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
199        .000 .000 .000 .138 .228 .195 .124 .065 .018 .015 .001 .000 .000 .000 .000
```

```
*----------------------------------------------------------------------*
*       PROBABILITY OF A COLONEL BEING PROMOTED TO GENERAL              *
*                  BASED ON TIME IN GRADE                              *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
 .000 .000 .000 .001 .004 .002 .001 .000 .000 .000 .000 .000 .000 .000 .000
*----------------------------------------------------------------------*
*       PROBABILITY OF AN OFFICER BEING ASSIGNED ANY ONE OF A SET       *
*                  OF ADDITIONAL SPECIALTY CODES                       *
*---1----2----3----4----5----6----7----8----9---10---11---12-----------*
 .300 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
*----------------------------------------------------------------------*
*       PROBABILITY OF AN OFFICER BEING ASSIGNED A SPECIFIC ADSPEC      *
*                  WITHIN THE SET OF ADSPECS                           *
*---1----2----3----4----5----6----7----8----9---10---11---12-----------*
 .150 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000
*----------------------------------------------------------------------*
*    PROBABILITY OF AN OFFICER BEING ASSIGNED INTO A THS STATUS  PY TIS *
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
 .005 .010 .015 .002 .002 .002 .002 .001 .001 .001 .001 .001 .001 .001 .001
 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
 .001 .050 .010 .015 .150 .300 .200 .100 .050 .002 .002 .002 .002 .002 .002
 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
 .001 .001 .001 .001 .015 .150 .300 .200 .100 .050 .002 .002 .002 .002 .002
 .002 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
 .001 .001 .001 .001 .001 .001 .001 .001 .001 .050 .100 .200 .300 .200 .100
 .050 .002 .002 .002 .002 .002 .002 .001 .001 .001 .001 .001 .001 .001 .001
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .002 .010
 .100 .200 .250 .150 .100 .050 .002 .002 .002 .002 .002 .001 .001 .001 .001
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001 .001
 .001 .001 .010 .150 .200 .150 .100 .050 .002 .002 .002 .002 .002 .002 .001
*----------------------------------------------------------------------*
*       LENGTH OF TIME AN OFFICER IS IN THE THS STATUS                  *
*    LTS      CPTS(INS) CPTS(ADS) MAJ'S     LTC'      COL'S           *
*--------1--------2--------3--------4--------5--------6---------------*
    .25       .50       .50       .75      1.00      1.00
*----------------------------------------------------------------------*
*                  INSPEC CODE IDENTITY TABLE                          *
*                                                                      *
*---1----2----3----4----5----6----7----8----9---10---11---12----------*
  11   12   13   14   15   21   25   27   31   35   36   37
  41   44   71   72   73   74   75   81   82   91   92   95
*----------------------------------------------------------------------*
*       PROBABILITY THAT A POSITON IS SLOTTED AS MALE ONLY             *
*                  BASED ON INSPEC CODE                                *
*---1----2----3----4----5----6----7----8----9---10---11---12-----------*
 .666 .666 .666 .666 .666 .666 .666 .666 .666 .666 .666 .666
 .666 .666 .666 .666 .666 .666 .666 .666 .666 .666 .666 .666
*----------------------------------------------------------------------*
*       PROBABILITY THAT AN INTERCHANGEABLE POSITION IS                 *
*            SET-ASIDE AS MALE ONLY, BASE ON INSPEC                    *
*---1----2----3----4----5----6----7----8----9---10---11---12-----------*
 .999 .999 .999 .999 .999 .500 .570 .500 .590 .560 .530 .590
 .570 .560 .530 .590 .540 .500 .540 .570 .510 .540 .590 .540
*----------------------------------------------------------------------*
*            AUTHORIZED STRENGTH LEVELS FOR LIEUTENANTS                 *
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
  190  190  190  190  190  190  190  190  190  190  190  190  190  190  190
  190  190  190  190  190  190  190  190  190  190  190  190  190  190  190
*----------------------------------------------------------------------*
*       AUTHORIZED STRENGTH LEVELS FOR CAPTS(NEW) AND LTS(NEW)          *
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
  200  200  200  200  200  200  200  200  200  200  200  200  200  200  200
  200  200  200  200  200  200  200  200  200  200  200  200  200  200  200
*----------------------------------------------------------------------*
*       AUTHORIZED STRENGTH LEVELS FOR MALE CAPTAINS WITH GENERAL LAW   *
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
  478  478  478  478  478  478  478  478  478  478  478  478  478  478  478
  478  478  478  478  478  478  478  478  478  478  478  478  478  478  478
*----------------------------------------------------------------------*
*       AUTHORIZED STRENGTH LEVELS FOR FEMALE CAPTAINS WITH GENERAL LAW *
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
  120  120  120  120  120  120  120  120  120  120  120  120  120  120  120
  120  120  120  120  120  120  120  120  120  120  120  120  120  120  120
*----------------------------------------------------------------------*
*       AUTHORIZED STRENGTH LEVELS FOR MALE CAPTAINS WITH CONTRACT LAW  *
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
  102  102  102  102  102  102  102  102  102  102  102  102  102  102  102
  102  102  102  102  102  102  102  102  102  102  102  102  102  102  102
*----------------------------------------------------------------------*
*       AUTHORIZED STRENGTH LEVELS FOR FEMALE CAPTAINS WITH CONTRACT LAW*
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
   26   26   26   26   26   26   26   26   26   26   26   26   26   26   26
   26   26   26   26   26   26   26   26   26   26   26   26   26   26   26
*----------------------------------------------------------------------*
*       AUTHORIZED STRENGTH LEVELS FOR MALE CAPTAINS WITH MISCELL LAW   *
*                  30 YEAR CYCLE                                       *
*---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
  102  102  102  102  102  102  102  102  102  102  102  102  102  102  102
  102  102  102  102  102  102  102  102  102  102  102  102  102  102  102
```

```
303  ********************************************************************************
304  *       AUTHORIZED STRENGTH LEVELS FOR FEMALE CAPTAINS WITH MISCELL LAW        *
305  *                                30 YEAR CYCLE                                 *
306  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
307     26   26   26   26   26   26   26   26   26   26   26   26   26   26   26
308     26   26   26   26   26   26   26   26   26   26   26   26   26   26   26
309  ********************************************************************************
310  *                    AUTHORIZED STRENGTH FOR TOTAL CAPTAINS                    *
311  *                                30 YEAR CYCLE                                 *
312  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
313    854  854  854  854  854  854  854  854  854  854  854  854  854  854  854
314    854  854  854  854  854  854  854  854  854  854  854  854  854  854  854
315  ********************************************************************************
316  *       AUTHORIZED STRENGTH LEVELS FOR MALE MAJORS WITH GENERAL LAW            *
317  *                                30 YEAR CYCLE                                 *
318  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
319    232  232  232  232  232  232  232  232  232  232  232  232  232  232  232
320    232  232  232  232  232  232  232  232  232  232  232  232  232  232  232
321  ********************************************************************************
322  *       AUTHORIZED STRENGTH LEVELS FOR FEMALE MAJORS WITH GENERAL LAW          *
323  *                                30 YEAR CYCLE                                 *
324  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
325     58   58   58   58   58   58   58   58   58   58   58   58   58   58   58
326     58   58   58   58   58   58   58   58   58   58   58   58   58   58   58
327  ********************************************************************************
328  *                    AUTHORIZED STRENGTH FOR TOTAL MAJORS                      *
329  *                                30 YEAR CYCLE                                 *
330  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
331    414  414  414  414  414  414  414  414  414  414  414  414  414  414  414
332    414  414  414  414  414  414  414  414  414  414  414  414  414  414  414
333  ********************************************************************************
334  *       AUTHORIZED STRENGTH LEVELS FOR LIEUTENANT COLONELS                     *
335  *                                30 YEAR CYCLE                                 *
336  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
337    223  223  223  223  223  223  223  223  223  223  223  223  223  223  223
338    223  223  223  223  223  223  223  223  223  223  223  223  223  223  223
339  ********************************************************************************
340  *                    AUTHORIZED STRENGTH LEVELS FOR COLONELS                   *
341  *                                30 YEAR CYCLE                                 *
342  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
343    119  119  119  119  119  119  119  119  119  119  119  119  119  119  119
344    119  119  119  119  119  119  119  119  119  119  119  119  119  119  119
345  ********************************************************************************
346  *                    AUTHORIZED STRENGTH FOR TOTAL FORCE                       *
347  *                                30 YEAR CYCLE                                 *
348  *---1----2----3----4----5----6----7----8----9---10---11---12---13---14---15-*
349   1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800
350   1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800 1800
351  ********************************************************************************
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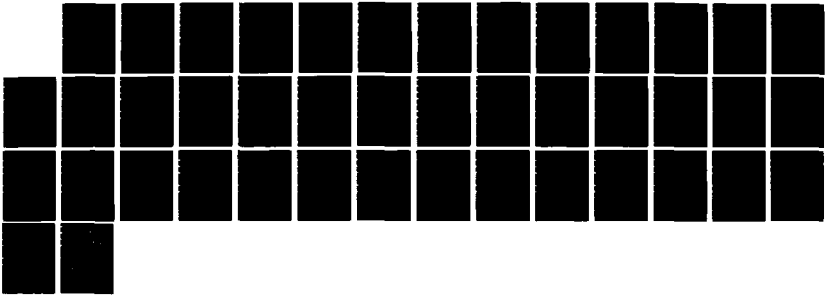
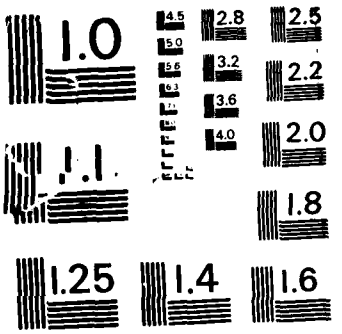
AD-A167 382 NETWORK ANALYSIS PLANNING MODEL FOR THE JUDGE ADVOCATE GENERAL (NAPM-JAG)(U) ARMY CONCEPTS ANALYSIS AGENCY BETHESDA MD S H MILLER ET AL. SEP 85 CAA-SR-85-19 2/2

UNCLASSIFIED F/G 5/9 NL





ANNEX III TO APPENDIX E

OUTPUT REPORTS

**** AVERAGE NUMBER OF JAG OFFICERS IN FORCE BY YEAR ****

YEAR	LT-S	CAPTSI	MGCAPT	FGCAPT	MCCAPT	FCCAPT	MOCAPT	FOCAPT	TOTCPT	MGMAJS	FGMAJS	TOTMAJ	TOTLTC	TOTCOL	TLVSVC	TOTJAG
1	191.0	143.0	493.0	47.0	118.0	16.0	117.0	17.0	951.0	274.0	10.0	397.0	211.0	119.0	265.0	1869.0
2	192.0	129.0	443.0	45.0	122.0	23.0	126.0	19.0	909.0	243.0	11.0	362.0	224.0	130.0	252.0	1817.0
3	191.0	137.0	383.0	43.0	129.0	24.0	118.0	21.0	855.0	220.0	12.0	331.0	209.0	133.0	251.0	1766.0
4	191.0	126.0	322.0	41.0	126.0	32.0	112.0	20.0	779.0	229.0	17.0	356.0	254.0	146.0	238.0	1728.0
5	191.0	134.0	267.0	40.0	117.0	27.0	112.0	24.0	721.0	259.0	19.0	407.0	260.0	137.0	212.0	1716.0
6	192.0	141.0	212.0	38.0	122.0	29.0	107.0	27.0	676.0	287.0	25.0	442.0	253.0	132.0	221.0	1695.0
7	193.0	131.0	207.0	41.0	114.0	31.0	110.0	26.0	660.0	267.0	25.0	426.0	243.0	133.0	240.0	1655.0
8	192.0	134.0	197.0	44.0	121.0	31.0	110.0	23.0	660.0	248.0	21.0	406.0	227.0	128.0	242.0	1613.0
9	193.0	120.0	208.0	45.0	120.0	29.0	109.0	24.0	655.0	222.0	20.0	376.0	216.0	129.0	242.0	1571.0
10	193.0	126.0	183.0	45.0	116.0	23.0	113.0	32.0	640.0	195.0	17.0	339.0	213.0	130.0	256.0	1515.0
11	190.0	122.0	173.0	48.0	124.0	20.0	107.0	27.0	631.0	160.0	16.0	301.0	237.0	120.0	236.0	1479.0
12	191.0	125.0	168.0	45.0	116.0	27.0	106.0	22.0	609.0	141.0	19.0	293.0	228.0	120.0	238.0	1441.0
13	192.0	119.0	164.0	46.0	117.0	25.0	111.0	26.0	607.0	136.0	17.0	283.0	218.0	107.0	234.0	1407.0
14	191.0	129.0	151.0	40.0	120.0	21.0	116.0	31.0	610.0	132.0	25.0	289.0	189.0	99.0	229.0	1378.0
15	191.0	127.0	158.0	43.0	119.0	27.0	112.0	26.0	612.0	130.0	20.0	279.0	182.0	102.0	212.0	1366.0
16	192.0	133.0	186.0	48.0	123.0	24.0	111.0	21.0	646.0	120.0	21.0	274.0	159.0	104.0	191.0	1375.0
17	190.0	129.0	192.0	50.0	121.0	26.0	120.0	20.0	648.0	116.0	17.0	262.0	157.0	99.0	219.0	1356.0
18	192.0	134.0	171.0	50.0	118.0	32.0	114.0	25.0	644.0	106.0	18.0	250.0	159.0	91.0	220.0	1336.0
19	191.0	131.0	193.0	42.0	112.0	32.0	114.0	24.0	648.0	108.0	22.0	255.0	158.0	92.0	192.0	1344.0
20	192.0	144.0	180.0	50.0	120.0	28.0	105.0	21.0	648.0	102.0	24.0	244.0	176.0	95.0	189.0	1355.0
21	190.0	135.0	193.0	51.0	109.0	32.0	96.0	20.0	636.0	98.0	23.0	245.0	171.0	97.0	216.0	1339.0
22	191.0	133.0	193.0	55.0	110.0	31.0	102.0	23.0	647.0	99.0	25.0	246.0	157.0	100.0	198.0	1341.0
23	192.0	136.0	201.0	56.0	99.0	38.0	83.0	23.0	636.0	92.0	25.0	244.0	156.0	99.0	212.0	1329.0
24	194.0	132.0	180.0	55.0	99.0	34.0	93.0	19.0	612.0	100.0	25.0	247.0	139.0	98.0	239.0	1290.0
25	190.0	126.0	184.0	48.0	113.0	39.0	82.0	19.0	613.0	99.0	29.0	252.0	134.0	97.0	204.0	1286.0
26	192.0	119.0	180.0	48.0	117.0	37.0	105.0	18.0	619.0	105.0	26.0	254.0	141.0	77.0	203.0	1283.0
27	192.0	127.0	168.0	46.0	126.0	35.0	108.0	22.0	634.0	108.0	29.0	255.0	142.0	73.0	187.0	1296.0
28	190.0	131.0	173.0	49.0	119.0	41.0	113.0	23.0	649.0	106.0	26.0	245.0	143.0	72.0	197.0	1299.0
29	191.0	135.0	186.0	58.0	120.0	39.0	110.0	22.0	670.0	110.0	27.0	249.0	139.0	76.0	174.0	1325.0
30	193.0	129.0	180.0	47.0	116.0	43.0	130.0	20.0	673.0	120.0	35.0	275.0	139.0	74.0	171.0	1354.0

**** NUMBER OF OFFICERS WHO VOLUNTARILY LEAVE THE SERVICE ****

YEAR INTERVAL	GRADES					
	LTS	CPT-NEW	CPT-ESTD	MAJORS	LT-COLS	COLONELS
0- 1	21	10	46	27	17	1
1- 2	16	3	40	25	20	1
2- 3	12	13	52	19	14	1
3- 4	21	7	46	20	17	0
4- 5	11	5	50	16	10	2
5- 6	10	6	36	30	18	4
6- 7	19	9	33	30	12	0
7- 8	14	6	43	28	15	1
8- 9	14	14	37	22	11	0
9-10	25	8	32	28	15	1
10-11	23	9	35	10	8	1
11-12	25	10	25	14	12	2
12-13	21	12	27	18	17	3
13-14	18	7	27	14	13	0
14-15	14	5	33	18	11	2
15-16	16	7	31	16	11	0
16-17	20	6	29	17	9	0
17-18	9	7	25	18	11	2
18-19	19	4	38	11	6	1
19-20	13	15	24	15	6	1
20-21	22	11	31	11	12	2
21-22	14	10	30	12	9	1
22-23	21	3	25	14	10	1
23-24	24	11	35	11	14	1
24-25	16	11	27	15	11	1
25-26	24	8	25	18	11	3
26-27	21	9	32	16	8	0
27-28	21	9	26	20	9	0
28-29	13	4	35	10	8	0
29-30	11	10	19	9	11	1

**** NUMBER OF OFFICERS REMOVED DUE TO MAX TIS AND OTHER POLICY CRITERIA ****

YEAR INTERVAL	GRADES					
	LTS	CPT-NEW	CPT-ESTD	MAJORS	LT-COLS	COLONELS
0- 1	0	24	110	0	8	5
1- 2	0	19	123	0	2	4
2- 3	0	14	107	2	3	14
3- 4	0	20	92	1	1	13
4- 5	0	16	81	0	2	19
5- 6	0	16	81	0	4	16
6- 7	0	14	99	1	6	17
7- 8	0	19	72	10	12	22
8- 9	0	11	91	11	11	20
9-10	0	20	87	7	16	17
10-11	0	19	91	12	10	18
11-12	0	19	99	5	15	12
12-13	0	13	86	5	12	20
13-14	0	15	92	2	22	19
14-15	0	24	85	2	7	11
15-16	0	16	67	2	9	16
16-17	0	20	90	3	5	20
17-18	0	25	97	5	4	17
18-19	0	16	78	4	6	9
19-20	0	15	90	6	2	2
20-21	0	19	92	6	6	4
21-22	0	25	72	9	7	8
22-23	0	24	88	6	8	7
23-24	0	19	95	2	11	16
24-25	0	17	83	5	5	13
25-26	0	17	71	2	6	18
26-27	0	15	74	2	2	9
27-28	0	16	80	3	3	10
28-29	0	15	78	3	3	5
29-30	0	16	83	0	3	8

**** NUMBER OF OFFICERS PROMOTED TO THE NEXT GRADE ****

YEAR INTERVAL	GRADES					
	LTS	CPT-NEW	CPT-ESTD	MAJORS	LT-COLS	COLONELS
0- 1	176	0	25	15	6	0
1- 2	173	0	40	50	15	0
2- 3	179	0	57	60	18	0
3- 4	169	0	90	49	26	0
4- 5	179	0	95	30	12	0
5- 6	179	0	95	30	15	0
6- 7	170	0	41	26	18	0
7- 8	177	0	47	29	18	0
8- 9	175	0	37	32	21	0
9-10	165	0	43	47	19	0
10-11	170	0	35	51	9	0
11-12	164	0	43	32	14	0
12-13	168	0	42	29	10	0
13-14	173	0	39	17	11	0
14-15	176	0	37	27	16	0
15-16	173	0	28	15	18	0
16-17	172	0	35	27	15	0
17-18	179	0	39	28	11	0
18-19	172	0	42	22	11	0
19-20	176	0	42	32	6	0
20-21	170	0	39	21	8	0
21-22	175	0	36	14	12	0
22-23	168	0	44	26	7	0
23-24	164	0	38	22	16	0
24-25	178	0	49	24	13	0
25-26	164	0	47	25	1	0
26-27	169	0	35	16	5	0
27-28	171	0	35	22	9	0
28-29	176	0	33	16	9	0
29-30	177	0	56	21	7	0

****NUMBER OF OFFICERS ATTENDING SCHOOL ****

YEAR INTERVAL	GRADES					
	LTS	CPT-NEW	CPT-ESTD	MAJORS	LT-COLS	COLONELS
0- 1	0	0	66	53	17	1
1- 2	1	0	68	28	15	1
2- 3	0	0	45	10	11	2
3- 4	0	0	35	10	13	0
4- 5	0	0	30	13	18	3
5- 6	0	0	23	23	18	0
6- 7	0	0	39	25	10	2
7- 8	0	0	30	41	8	3
8- 9	0	0	30	32	7	4
9-10	0	0	28	28	3	1
10-11	0	0	30	15	9	0
11-12	0	0	33	19	9	1
12-13	0	0	22	10	17	0
13-14	0	0	31	23	16	2
14-15	0	0	22	12	17	0
15-16	0	0	26	17	9	6
16-17	0	0	33	18	10	2
17-18	0	0	33	18	8	6
18-19	0	0	34	22	9	5
19-20	0	0	32	18	10	1
20-21	0	0	22	18	5	2
21-22	0	0	38	16	9	3
22-23	0	0	31	20	8	0
23-24	0	0	28	18	6	2
24-25	0	0	25	21	8	2
25-26	0	0	29	15	18	1
26-27	0	0	39	21	5	2
27-28	0	0	36	19	8	0
28-29	0	0	26	18	5	1
29-30	0	0	29	26	7	2

**** NUMBER OF OFFICERS WHO STAY IN SERVICE BECAUSE LEVELING SWITCH IS ON ****

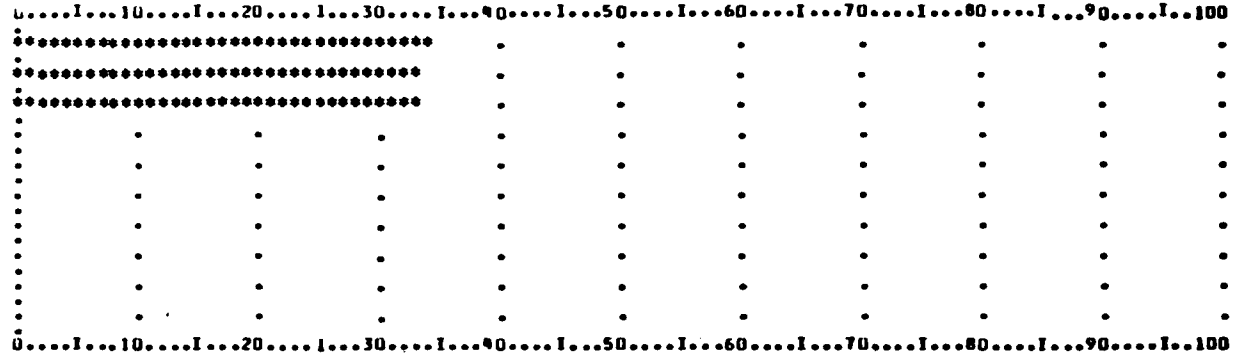
YEAR INTERVAL	GRADES		
	MAJORS	LT-COLS	COLONELS
0- 1	0	0	0
1- 2	0	0	0
2- 3	0	0	0
3- 4	0	0	0
4- 5	0	0	0
5- 6	0	0	0
6- 7	0	0	0
7- 8	0	0	0
8- 9	0	0	0
9-10	0	0	0
10-11	0	0	0
11-12	0	0	0
12-13	0	0	0
13-14	0	0	0
14-15	0	0	0
15-16	0	0	0
16-17	0	0	0
17-18	0	0	0
18-19	0	0	0
19-20	0	0	0
20-21	0	0	0
21-22	0	0	0
22-23	0	0	0
23-24	0	0	0
24-25	0	0	0
25-26	0	0	0
26-27	0	0	0
27-28	0	0	0
28-29	0	0	0
29-30	0	0	0

**** NUMBER OF OFFICERS ABOVE OR BELOW AUTHORIZED STRENGTH ****

YEAR INTERVAL	GRADES		
	MAJORS	LT-COLS	COLONELS
0- 1	-17	-12	0
1- 2	-52	1	11
2- 3	-76	26	14
3- 4	-56	31	27
4- 5	-7	37	18
5- 6	28	30	13
6- 7	12	20	14
7- 8	-8	4	9
8- 9	-36	-7	10
9-10	-75	-10	11
10-11	-113	14	1
11-12	-121	5	1
12-13	-131	-5	-12
13-14	-125	-34	-20
14-15	-135	-41	-17
15-16	-140	-64	-15
16-17	-152	-66	-20
17-18	-164	-64	-28
18-19	-159	-65	-27
19-20	-170	-47	-24
20-21	-169	-52	-22
21-22	-168	-66	-19
22-23	-170	-65	-20
23-24	-167	-64	-21
24-25	-162	-89	-22
25-26	-160	-82	-42
26-27	-159	-81	-46
27-28	-169	-80	-47
28-29	-165	-84	-43
29-30	-139	-84	-45

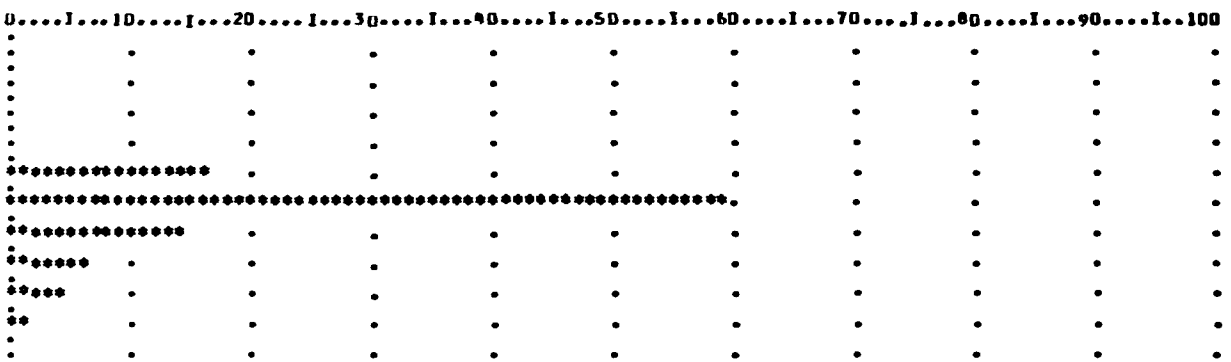
HISTOGRAM PLOT - 1 TIME IN GRADE - PROMOTE TO CPT

CELL	LIMITS	FREQ	%
	-INF		
1	1.00	1825.	.341
2	2.00	1760.	.329
3	3.00	1752.	.327
4	4.00	15.	.003
5	5.00	0.	.000
6	6.00	0.	.000
7	7.00	0.	.000
8	8.00	0.	.000
9	9.00	0.	.000
10	+INF	0.	.000



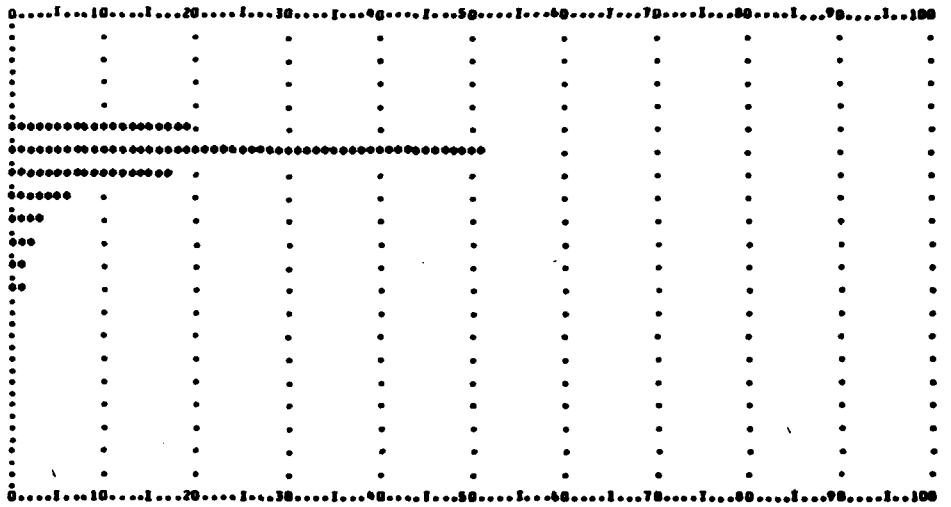
HISTOGRAM PLOT - 3 TIME IN GRADE - PROMOTE TO MAJ

CELL	LIMITS	FREQ	%
	-INF		
1	1.00	0.	.000
2	2.00	0.	.000
3	3.00	0.	.000
4	4.00	0.	.000
5	5.00	231.	.164
6	6.00	823.	.585
7	7.00	200.	.142
8	8.00	79.	.056
9	9.00	53.	.038
10	10.00	15.	.011
11	11.00	3.	.002
12	12.00	2.	.001
13	13.00	0.	.000
14	14.00	0.	.000
15	15.00	0.	.000
16	16.00	0.	.000
17	17.00	0.	.000
18	18.00	0.	.000
19	19.00	0.	.000
20	+INF	0.	.000



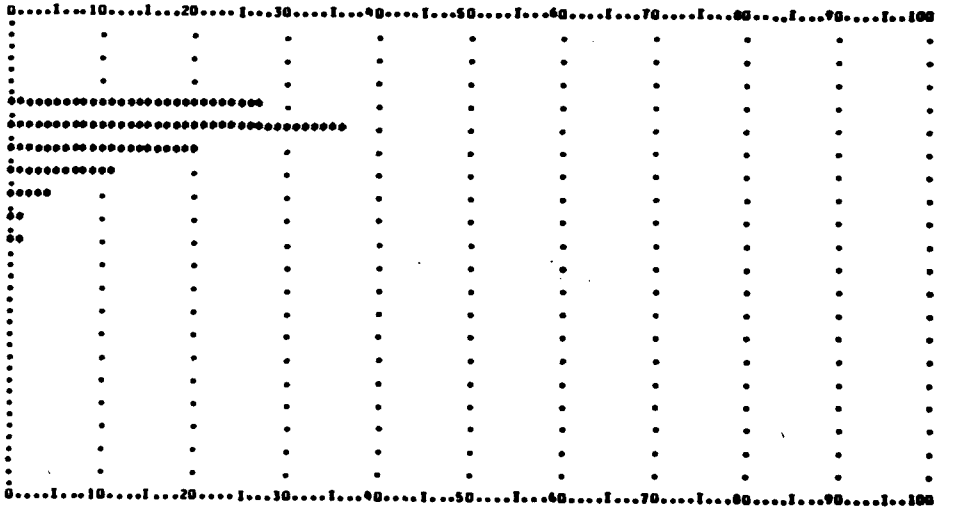
HISTOGRAM PLOT - 4 TIME IN GRADE - PROMOTE TO LTC

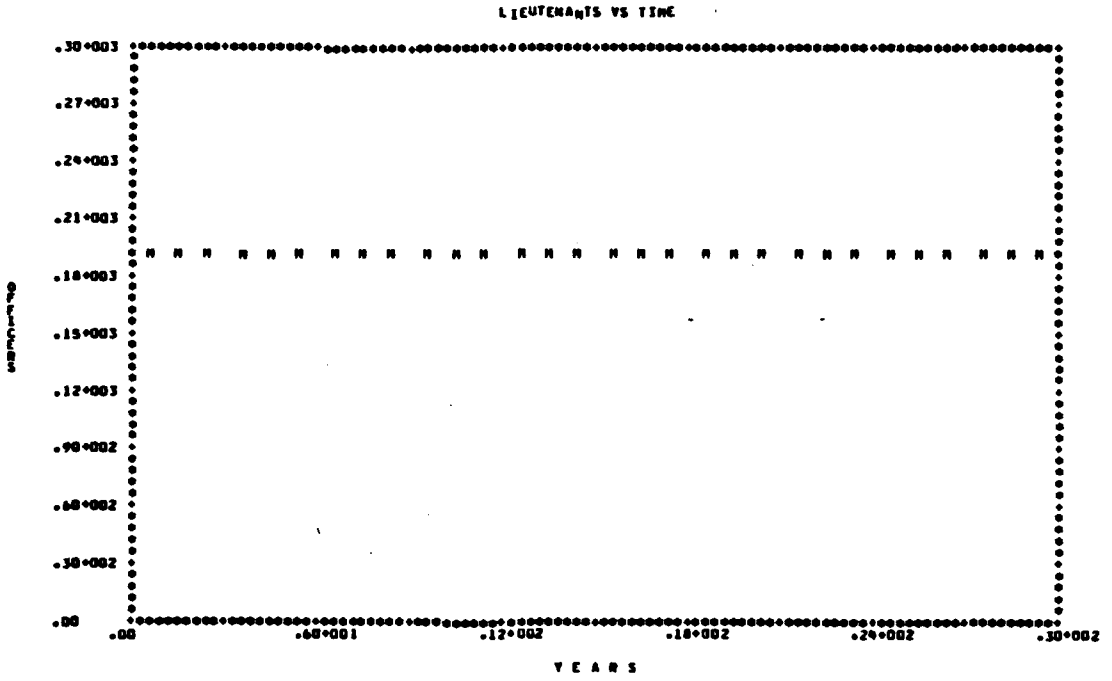
CELL	LIMITS	FREQ	%
1	-INF	0.	.000
2	1.00	0.	.000
3	2.00	0.	.000
4	3.00	0.	.000
5	4.00	167.	.189
6	5.00	449.	.508
7	6.00	151.	.171
8	7.00	56.	.063
9	8.00	28.	.032
10	9.00	19.	.021
11	10.00	8.	.009
12	11.00	6.	.007
13	12.00	0.	.000
14	13.00	0.	.000
15	14.00	0.	.000
16	15.00	0.	.000
17	16.00	0.	.000
18	17.00	0.	.000
19	18.00	0.	.000
20	19.00	0.	.000
	+INF		

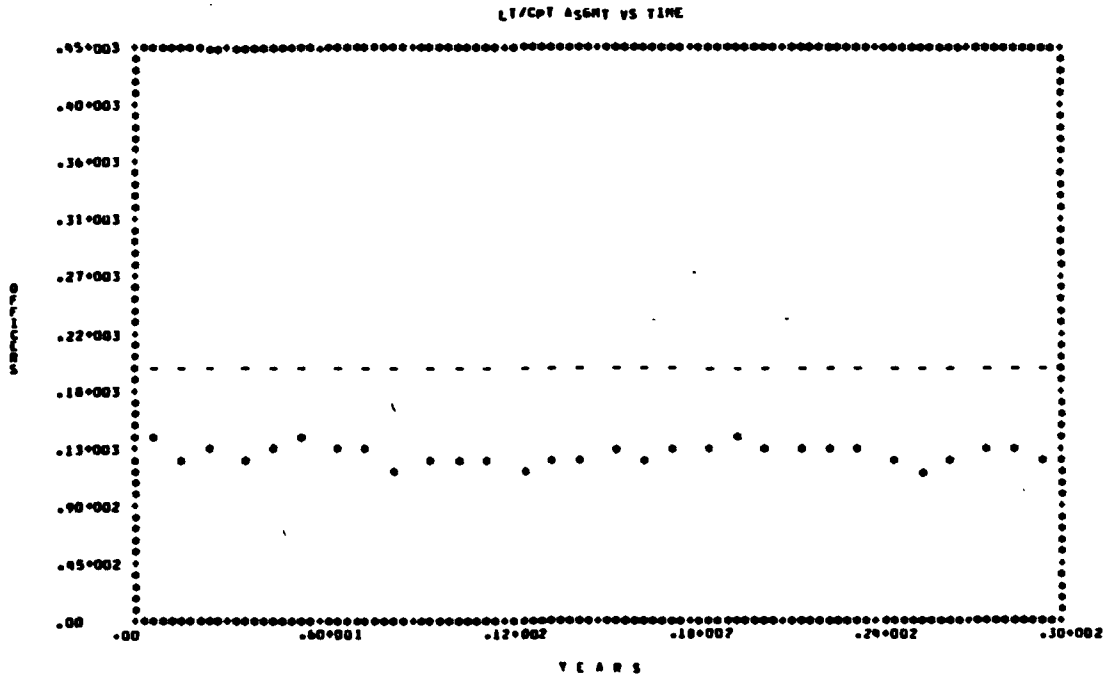


HISTOGRAM PLOT - 5 TIME IN GRADE - PROMOTE TO COL

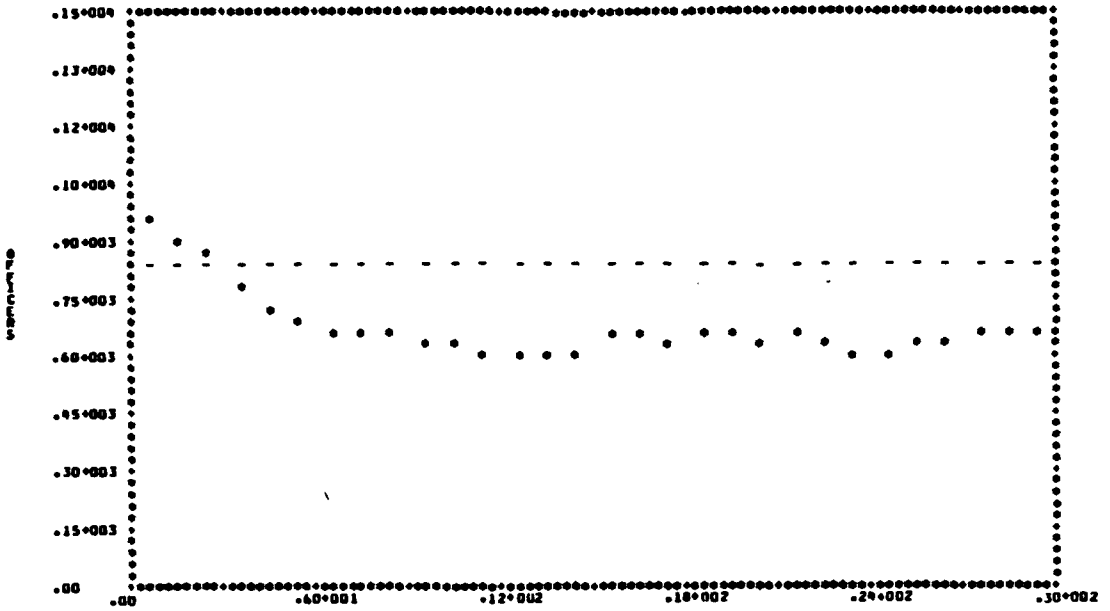
CELL	LIMITS	FREQ	%
1	-INF	0.	.000
2	1.00	0.	.000
3	2.00	0.	.000
4	3.00	105.	.273
5	4.00	140.	.364
6	5.00	78.	.203
7	6.00	43.	.112
8	7.00	14.	.036
9	8.00	2.	.005
10	9.00	3.	.008
11	10.00	0.	.000
12	11.00	0.	.000
13	12.00	0.	.000
14	13.00	0.	.000
15	14.00	0.	.000
16	15.00	0.	.000
17	16.00	0.	.000
18	17.00	0.	.000
19	18.00	0.	.000
20	19.00	0.	.000
	+INF		



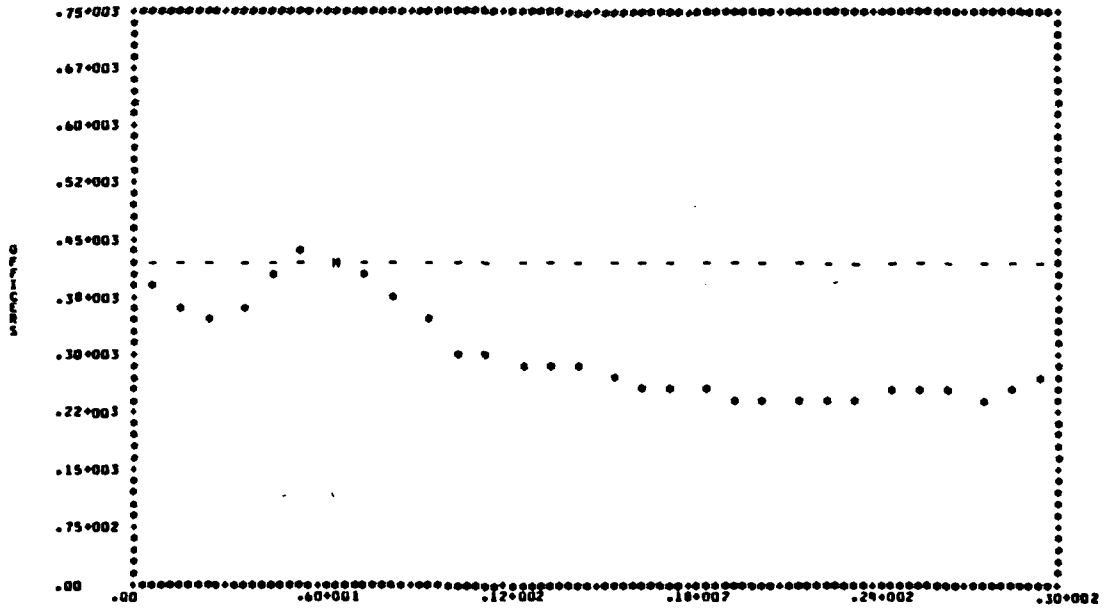

LIEUTENANTS VS TIME
.30+003
.27+003
.24+003
.21+003
.18+003
.15+003
.12+003
.90+002
.60+002
.30+002
.00
.00
.60+001
.12+002
.18+002
.24+002
.30+002
YEARS

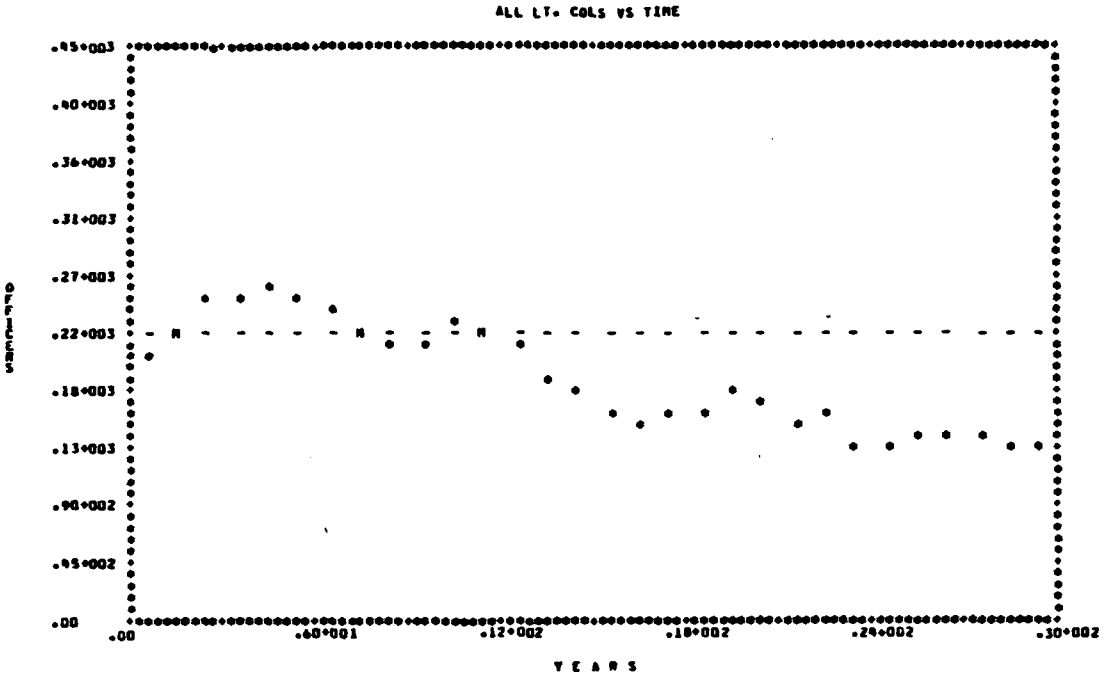

LT/CPT ASGMT VS TIME
.45+003
.40+003
.36+003
.31+003
.27+003
.22+003
.18+003
.13+003
.90+002
.45+002
.00
.00
.60+001
.12+002
.18+002
.24+002
.30+002
YEARS

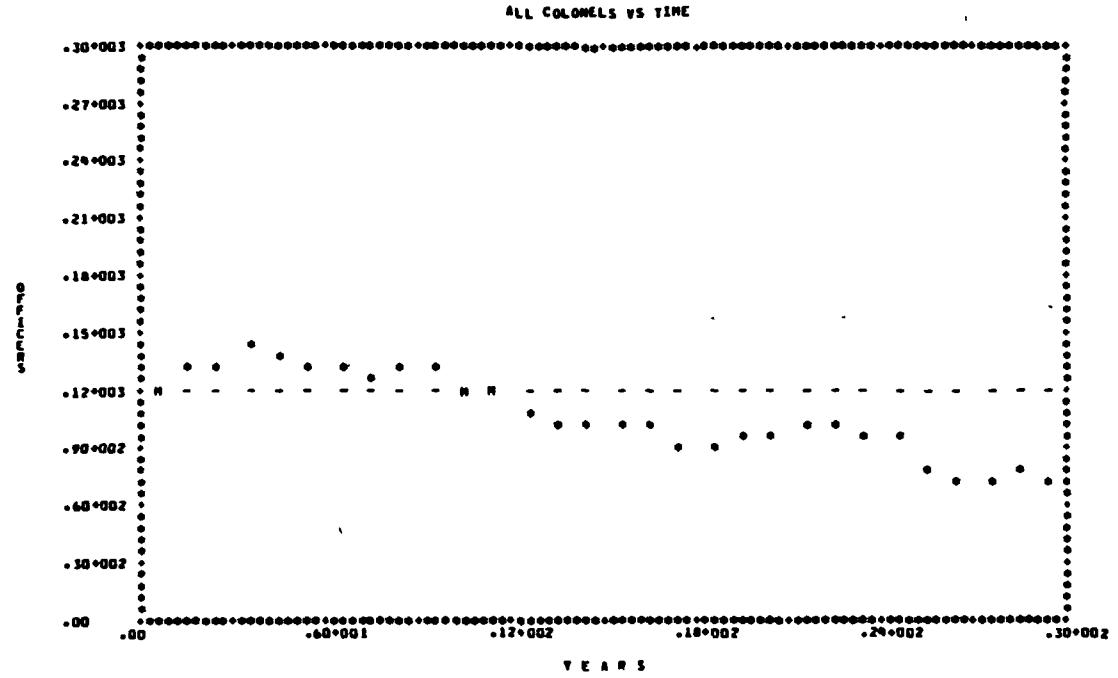
ALL CAPTAINS VS TIME



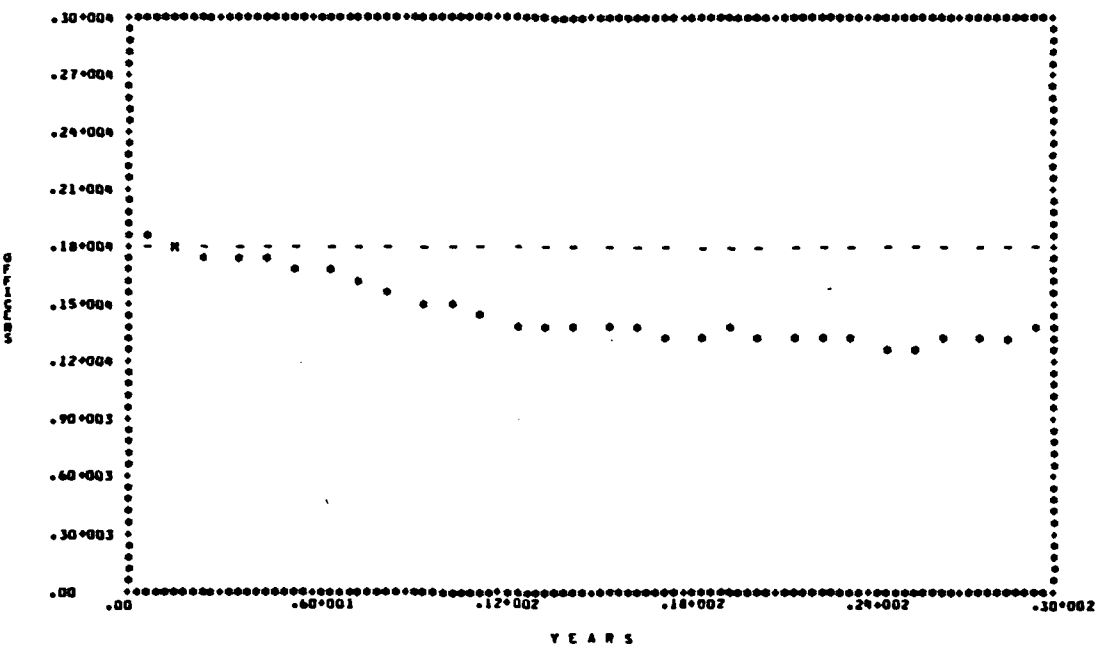
ALL MAJORS VS TIME



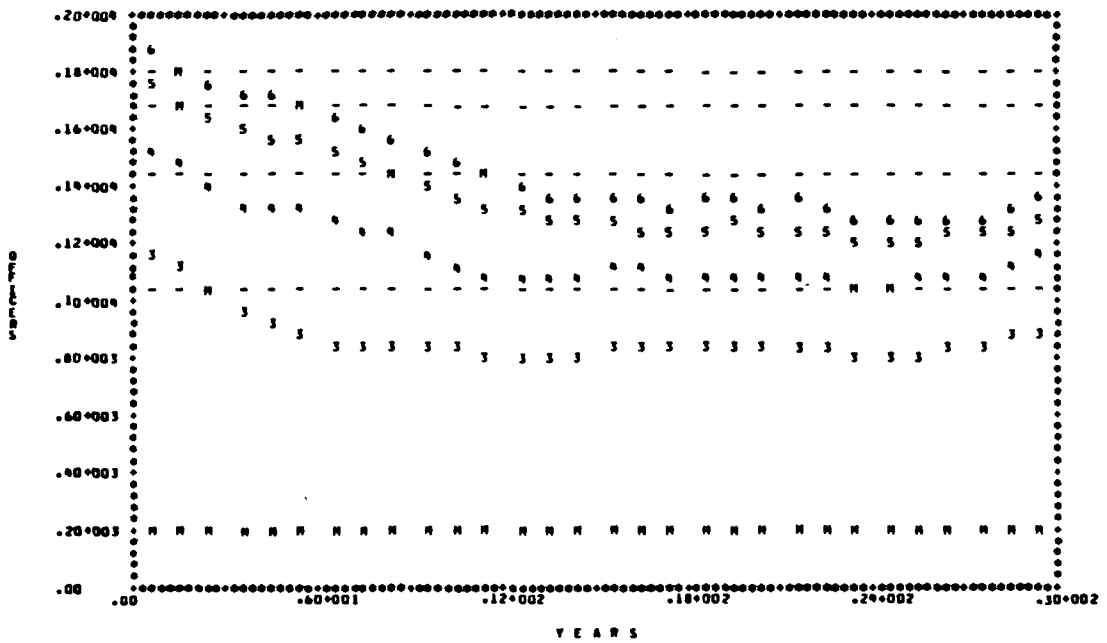

ALL LT. COLS VS TIME
.45+003
.40+003
.36+003
.31+003
.27+003
.22+003
.18+003
.13+003
.90+002
.45+002
.00
OFFICERS
.00
.60+001
.12+002
.18+002
.24+002
.30+002
YEARS


ALL COLONELS VS TIME
.30+003
.27+003
.24+003
.21+003
.18+003
.15+003
.12+003
.90+002
.60+002
.30+002
.00
OFFICERS
.00
.60+001
.12+002
.18+002
.24+002
.30+002
YEARS

ALL OFFICERS VS TIME



SUPERPOSITION OF ACTUAL AND AUTHORIZED VS. TIME



APPENDIX F

PROGRAMS AND SUBROUTINES

F-1. GENERAL. This appendix contains the listings of the programs and subroutines necessary to expand the capabilities of the basic Q-GERT software package and operate the JAG Officer Personnel Model (JOPM). As stated earlier, Q-GERT is a proprietary package and is not transferable from one computer facility to another. A potential user of this model must have access to a facility which has Q-GERT installed. Information concerning acquisition of the Q-GERT software package is available from the address below:

Pritsker and Associates, Inc.
Post Office Box 2413
West Lafayette, Indiana 47906

F-2. MODEL SUBROUTINES. The flowchart at Figure F-1 presents the model subroutines unique to JOPM in solid line blocks.

a. Subroutine UI calls all subroutines that contain instructions and data used only at the start of the simulation, such as reading inputs and initializing data files.

b. Subroutine UF calls all subroutines that are required during the simulation. These subroutines contain the logic for accessing officers and processing officers.

c. Subroutine UO calls the subroutines that contain instructions used only at the end of the simulation, such as building output histograms and output plots.

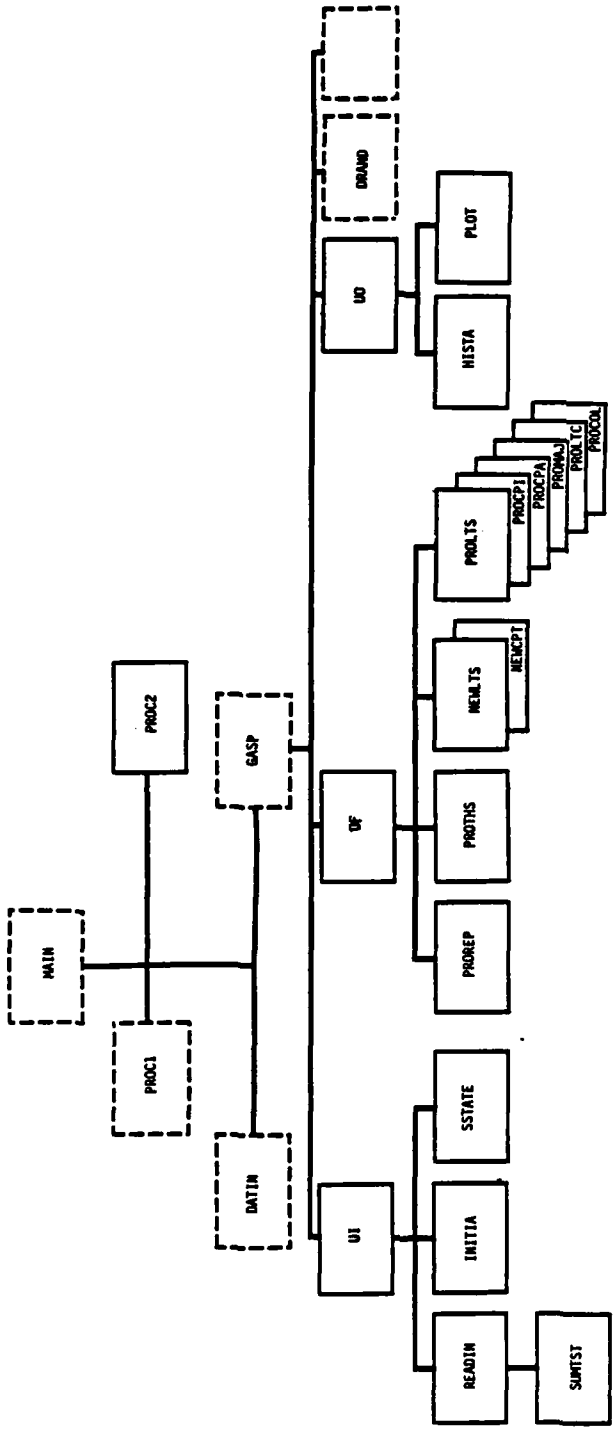


Figure F-1. Q-GERT/JOPM Flowchart

F-3. PROGRAM MAIN

```
      C   PROGRAM QGERT (INPUT,OUTPUT,TAPE7,TAPE8,TAPE9,TAPE10,
      C   TAPE5=INPUT,TAPE6=OUTPUT)
      C   SET QGERT CONSTANTS
      C
            INCLUDE PROC1
            IFIN=0
            NPRNTS=10
            NCRDR=5
            NPRNT=6
            NPRNT2=7
            NPRNT4=8
            MMPAK=10000
            MXNMC=100
            NPRNT3=9
            MXNTR=50
            MXNS2=100
            MXNOD=MXNOD1
            MXTRS=MXTRS1
            MAXDS=MAXDS1
            MXSTA=200
            MXQUE=50
      C     MXSER=MXQUE
            MXSER=100
            MXRES=40
            MMRES=500
            MXABA=280
            MXNPO=100
            MXVAS=MVAS1/16
            MXPAR=100
            MXSOU=20
            MXCEL=20
            MXSTR=10
            MXEVT=MEVT1/5
            RMXVA=1.E20
            ID=MID1/7
            IM=6
            IMM=IM-1
            MUCOL=25
            MUTIM=25
            MUHIS=25
      C
          1 CALL DATIN
            CALL GASP
            IF (IFIN.EQ.0) GO TO 1
            STOP
      C
            END
```

F-4. PROGRAM PROC2.

```
      PROC2 PROC
            COMMON/INPTZ/ RATT(10),PINPS(2,24),TIS1CK,TIS2CK,LTADSW
            COMMON/UCOM1/IC20,X20(30),Y20(30),Y30(30),Y36(30)
           +,Y2(30),Y7(30),Y16(30),Y17(30),Y140(30)
           +,Y145(30),Y32(30),Y51(30),Y60(30),YY2(2,30),YY7(2,30)
           +,YY20(2,30),YY16(2,30)
           +,YY30(2,30),YY17(2,30)
           +,YY145(2,30),YY140(2,30),YY32(2,30),YY36(2,30)
           +,YY51(2,30),YY60(2,30),YYCP(2,30),YCP(39)
           +,YYTOT(2,30),YTOT(31),YYMTOT(2,30),YMTOT(31)
            COMMON/UCOM2/CO(2,5,30),NALT(30),PMO(30)
           +,CODE(24),SVCMAX(6),NREP,NACP(30)
           +,PTM1(15),PTIG2(15),PTM2(15)
            COMMON/FSAP/ PADS1(24),PADS2(24),PTMS(6,30),TIMTHS(6),PPROMO(5,30)
            COMMON/TEMP/Y41(30),Y43(30),Y45(30),Y47(30)
           +,YLVS(30),INT(3,5,31)
            COMMON/TEMP2/PSA1(24),PSA2(24),IODE(24),PTM3(30),PTM46(3,30)
           +,PTIG3(15),PTIG46(3,15),NUMB(6),PMALE(6),PSTY(2,5,30)
            COMMON/AUTO/NCNT(6,31),ISAV(6,31),IRIF(6,31),NIN(6,31),IDIF(6,31)
           +,IDEL3,IDEL4,IDEL5,ICNT1(31),ICNT2(31),ISCHL(6,31)
           +,NREP3,NREP4,NREP5,CMAX1,CMAX2
            COMMON CPHOLD(30),NN1,NN2,NN3,NC(9),CB(9),CW(9),HD(9)
       END
```

F-5. PROGRAM UI.

```
                  SUBROUTINE UI
                  INCLUDE PROC1
                  INCLUDE PROC2
            C
                  IF(NRUN.GT.1)GO TO 1000
            C
                  CALL READIN
            C
                  CALL INITIA
            C
             1000 IC20 = 0
                  DO 1020 I=1,30
                    ICNT1(I)=0
                    ICNT2(I)=0
            1020  CONTINUE
            C
                  CALL SSTATE
            C
                  RETURN
            C
                  END
```

F-6. PROGRAM READIN.

```
      SUBROUTINE READIN
      INCLUDE PROC1
      INCLUDE PROC2
C
C     ******************************************
C     READ IN USER DEFINED DATA
C     ******************************************
C
C     LIEUTENANT ADDITIONAL SPECIALTY SWITCH AND TIS CHECKS FOR
C     CAPTAINS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,1) LTADSW
      READ(5,2) TIS1CK
      READ(5,2) TIS2CK
C
C     AUTOMATIC FORCE LEVELING SWITCHES FOR FIELD GRADES
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,5) NREP3, NREP4, NREP5
C
C     INITIAL FORCE OF ALL OFFICERS
      DO 100 I = 1 , 6
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,7) NUMB(I), PMALE(I)
  100 CONTINUE
C
C     PROB. DIST. OF TIS SERVED FOR INITIAL FORCE LTS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,9) ( PTM1(I) , I = 1 , 15 )
C
C     PROB. DIST. OF TIS SERVED FOR NEWLY ACCESSED CAPTS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,9) ( PTM2(I) , I = 1 , 15 )
C
C     PROB. DIST. OF TIS SERVED FOR INITIAL FORCE CAPTS (ESTABLISHED PATHS)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,9) ( PTM3(I) , I = 1 , 30)
C
C     PROB. DIST. OF TIS SERVED FOR INITIAL FORCE MAJS, LTCS, + COLS
      DO 200 I = 1 , 3
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,9) ( PTM46(I,J) , J = 1 , 30 )
  200 CONTINUE
C
C     PROB. DIST. OF TIG SERVED FOR NEWLY ACCESSED CAPTS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,9) ( PTIG2(I) , I = 1 , 15 )
C
C     PROB. DIST. OF TIG SERVED FOR INITIAL FORCE CAPTS(ESTABLISHED PATHS)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,9) ( PTIG3(I) , I = 1 , 15 )
C
```

```
      C     PROB. DIST. OF TIG SERVED FOR INITIAL FORCE MAJS, LTCS, & COLS
            DO 30 I = 1 , 5
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,9) ( PTIG46(I,J) , J = 1 , 15  )
         30 CONTINUE
      C
      C     YEARLY ACCESSION RATE OF ASSESSED LTS
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,11) ( NALT(I) , I = 1 , 30   )
      C
      C     YEARLY ACCESSION RATE OF ASSESSED CAPTS
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,11) ( NACP(I) , I = 1 , 30   )
      C
      C     PROB. THAT NEW ACCESSION IS A MALE OFFICER
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,9) ( PMO(I) , I = 1 , 30   )
      C
      C     PROB. THAT MALE AND FEMALE OFFICERS REMAIN IN SERVICE BY TIS
            READ(5,3)
            DO 40 I = 1 , 2
            READ(5,3)
            READ(5,3)
            READ(5,3)
            DO 40 J = 1 , 5
            READ(5,9) ( PSTY(I,J,K) , K = 1 , 30    )
            READ(5,3)
         40 CONTINUE
      C
      C     MAXIMUM ALLOWABLE YEARS IN SERVICE FOR ANY OFFICER
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,13) ( SVCMAX(I) , I = 1 , 6        )
            NN1 = IFIX(SVCMAX(1))
            NN2 = IFIX(SVCMAX(2))
            NN3 = IFIX(SVCMAX(3))
      C
      C     CAPTAIN RETENTION CONSTRAINT BY YEAR IN GRADE
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,15) CMAX1, CMAX2
      C
      C     PROB. DISTRIBUTION OF MALE AND FEMALE INSPEC CODES
            DO 50 I = 1 , 2
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,17) ( PINPS(I,J) , J = 1 , 24     )
         50 CONTINUE
      C
      C     PROB. AN OFFICER IS PROMOTED UP ONE GRADE BY TIG
            DO 60 I = 1 , 5
            READ(5,3)
            READ(5,3)
            READ(5,3)
            READ(5,3)
            IF (I .EQ. 1) READ(5,9) ( PPROMO(I,J) , J = 1 , 15  )
            IF (I .EQ. 2) READ(5,9) ( PPROMO(I,J) , J = 1 , 15 )
            IF (I .EQ. 3) READ(5,9) ( PPROMO(I,J) , J = 1 , 15  )
            IF (I .EQ. 4) READ(5,9) ( PPROMO(I,J) , J = 1 , 15 )
            IF (I .EQ. 5) READ(5,9) ( PPROMO(I,J) , J = 1 , 15 )
         60 CONTINUE
```

```
157         C
158         C       PROB. AN OFFICER RECEIVES AN ADDITIONAL SPECIALTY BY INSP
159                 READ(5,3)
160                 READ(5,3)
161                 READ(5,3)
162                 READ(5,3)
163                 READ(5,17) ( PADS1(I) , I = 1 , 24     )
164         C
165         C       PROB. AN OFFICER IS ASSIGNED A SPECIFIC ADSPEC BY INSPEC
166                 READ(5,3)
167                 READ(5,3)
168                 READ(5,3)
169                 READ(5,3)
170                 READ(5,17) ( PADS2(I) , I = 1 , 24     )
171         C
172         C       PROB. AN OFFICER IS ASSIGNED INTO THE THS ACCOUNT
173                 READ(5,3)
174                 READ(5,3)
175                 READ(5,3)
176                 READ(5,3)
177                 DO 80 I = 1 , 6
178                 READ(5,91) ( PTHS(I,J) , J = 1 , 30    )
179                 READ(5,3)
180            80 CONTINUE
181         C
182         C       LENGTH OF TIME AN OFFICER IS IN THE THS STATUS
183                 READ(5,3)
184                 READ(5,3)
185                 READ(5,3)
186                 READ(5,21) ( TIMTHS(I) , I = 1 , 6         )
187         C
188         C       INSPEC CODE IDENTIFICATION TABLE
189                 READ(5,3)
190                 READ(5,3)
191                 READ(5,3)
192                 READ(5,3)
193                 READ(5,23) ( IODE(I) , I = 1 , 24     )
194         C
195         C       PROB. THAT A POSITION IS SLOTTED AS MALE-ONLY BY INSPEC
196                 READ(5,3)
197                 READ(5,3)
198                 READ(5,3)
199                 READ(5,3)
200                 READ(5,17) ( PSA1(I) , I = 1 , 24     )
201         C
202         C       PROB. THAT AN INTERCHANGEABLE SLOT IS SET ASSIDE AS MALE-ONLY
203                 READ(5,3)
204                 READ(5,3)
205                 READ(5,3)
206                 READ(5,3)
207                 READ(5,17) ( PSA2(I) , I = 1 , 24     )
208         C
209         C       AUTH. STRENGTH LEVELS FOR LTS EACH YEAR FOR 30 YEARS
210                 READ(5,3)
211                 READ(5,3)
212                 READ(5,3)
213                 READ(5,3)
214                 READ(5,25) ( YY2(2,I) , I = 1 , 30    )
215         C
216         C       AUTH. STRENGTH LEVELS FOR NEWLY PROMOTED/ACCESSED CAPT. FOR 30 YEARS
217                 READ(5,3)
218                 READ(5,3)
219                 READ(5,3)
220                 READ(5,3)
221                 READ(5,25) ( YY7(2,I) , I = 1 , 30    )
222         C
223         C       AUTH. STR. LEVELS FOR MALE CAPTS(GENER) EACH YEAR FOR 30 YEARS
224                 READ(5,3)
225                 READ(5,3)
226                 READ(5,3)
227                 READ(5,3)
228                 READ(5,25) ( YY140(2,I) , I = 1 , 30   )
229         C
230         C       AUTH. STR. LEVELS FOR FEMALE CAPTS(GENER) EACH YEAR FOR 30 YEARS
231                 READ(5,3)
232                 READ(5,3)
233                 READ(5,3)
234                 READ(5,3)
```

```
      READ(5,25) ( YY145(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR MALE CAPTS(CONTR) EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY16(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR FEMALE CAPTS(CONTR) EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY20(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR MALE CAPTS(MISCE) EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY17(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR FEMALE CAPTS(MISCE) EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY30(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR TOTAL CAPTAINS EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YYCP(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR MALE MAJORS(GENER) EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY36(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR FEMALE MAJORS(GENER) EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY32(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR TOTAL MAJORS EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YYMTOT(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR TOTAL LT COLONELS EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY51(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR TOTAL COLONELS EACH YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YY60(2,I) , I = 1 , 30   )
C
C     AUTH. STR. LEVELS FOR TOTAL AUTH. FORCE YEAR FOR 30 YEARS
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,3)
      READ(5,25) ( YYTOT(2,I) , I = 1 , 30   )
```

```
313         C
314               CALL HISTA(1,6,0.0)
315               DO 222 I = 1,2
316                     DO 123 J = 1,24
317                           CPHOLD(J)=PINPS(I,J)
318         123         CONTINUE
319                     CALL SUMTST(CPHOLD,24,'PINPSM',IER)
320                     DO 124 J = 1,24
321                           PINPS(I,J)=CPHOLD(J)
322         124         CONTINUE
323         222   CONTINUE
324               DO 444 I = 1,3
325                     DO 126 J = 1,30
326                           CPHOLD(J)=PTM46(I,J)
327         126         CONTINUE
328                     CALL SUMTST(CPHOLD,30,'PTM46 ',IER)
329                     DO 127 J = 1,30
330                           PTM46(I,J)=CPHOLD(J)
331         127         CONTINUE
332                     DO 128 J = 1,15
333                           CPHOLD(J)= PTIG46(I,J)
334         128         CONTINUE
335                     CALL SUMTST(CPHOLD,15,'PTIG46',IER)
336                     DO 129 J = 1,15
337                           PTIG46(I,J)=CPHOLD(J)
338         129         CONTINUE
339         444   CONTINUE
340               CALL SUMTST(PTIG2,15,'PTIG2 ',IER)
341               CALL SUMTST(PTIG3,15,'PTIG3 ',IER)
342               CALL SUMTST(PTM1,15,'PTM1  ',IER)
343               CALL SUMTST(PTM2,15,'PTM2  ',IER)
344               CALL SUMTST(PTM3,30,'PTM3  ',IER)
345               IF (IER .EQ. 1) STOP
346             1 FORMAT(10X,I5)
347             2 FORMAT(10X,F5.0)
348             3 FORMAT(                    )
349             5 FORMAT(3I5)
350             7 FORMAT(15X,I5,25X,F5.3)
351             9 FORMAT(15F5.3)
352            11 FORMAT(10I5)
353            13 FORMAT( 6(5X,F5.0) )
354            15 FORMAT(15X,F5.3,25X,F5.3)
355            17 FORMAT(12F5.3)
356            21 FORMAT(6(5X,F5.2))
357            23 FORMAT(12I5)
358            25 FORMAT(15F5.0)
359            27 FORMAT( I5,F5.3,F5.0,4X,A35)
360         C
361               RETURN
362               END
```

F-7. PROGRAM UF.

```
      FUNCTION UF(IFN)
C
      INCLUDE PROC1
      INCLUDE PROC2
C
      GO TO (1,2,3,4,5,6,7,8,9,10),IFN
C
C     ****************************************************************
C     *                      USER FUNCTION # 1                       *
C     ****************************************************************
C
    1 CONTINUE
C     WRITE(NPRNT,1001)
 1001 FORMAT (1X,'**********THIS IS THE START OF UFN #1*******')
C
C     UF 1 GENERATES THE ASSESSION OF NEW LIEUTENANTS EACH YEAR OF THE
C     SIMULATION. THESE NEW ASSESSIONS ARE ENTERED AT THE BEGINNING OF
C     EACH TIME PERIOD AND ENTER AT NODE #11. THE NUMBER OF NEW LTS ARE
C     STORED IN ARRAY NALT(30).
C
      CALL GETAT(RATT)
      CALL NEWLTS
      UF= 0.0
C     WRITE(NPRNT,1002)
 1002 FORMAT (1X,'*****THIS IS THE  END  OF UFN #1*******')
C
      RETURN
C
C     ****************************************************************
C     *                      USER FUNCTION # 2                       *
C     ****************************************************************
C
    2 CONTINUE
C     WRITE(NPRNT,1005)
 1005 FORMAT (1X,'*****THIS IS THE START OF UFN #2*******')
C
C     UF 2 GENERATES THE ASSESSION OF NEW CAPTAINS EACH YEAR OF THE
C     SIMULATION. THESE NEW ASSESSIONS ARE ENTERED AT THE BEGINNING OF
C     EACH TIME PERIOD AND ENTER AT NODE #21. THE NUMBER OF NEW CPTS ARE
C     STORED IN ARRAY NACP(30).
C
      CALL GETAT(RATT)
      CALL NEWCPT
      UF= 0.0
C     WRITE(NPRNT,1006)
 1006 FORMAT (1X,'*****THIS IS THE  END  OF UFN #2*******')
C
      RETURN
C
C     ****************************************************************
C     *                      USER FUNCTION # 3                       *
C     ****************************************************************
C
    3 CONTINUE
C     WRITE(NPRNT,1009)
 1009 FORMAT (1X,'*****THIS IS THE START OF UFN #3*******')
C
C     UF 3 GENERATES THE PROCESSING OF ALL LTS EACH YEAR OF THE
C     SIMULATION. THESE  LTS CAN; LEAVE THE SERVICE, BE PROMOTED
C     UP ONE GRADE, BE ASSIGNED TO A THS STATUS, OR SERVE ANOTHER YEAR
C     IN THE SAME GRADE.
C
      CALL GETAT(RATT)
      CALL PROLTS
      UF = 1.0
      CALL PUTAT(RATT)
C     WRITE(NPRNT,1010)
 1010 FORMAT (1X,'*****THIS IS THE  END  OF UFN #3*******')
C
      RETURN
C
C     ****************************************************************
C     *                      USER FUNCTION # 4                       *
C     ****************************************************************
C
    4 CONTINUE
C     WRITE(NPRNT,1013)
 1013 FORMAT (1X,'*****THIS IS THE START OF UFN #4*******')
```

```
      C
      C     UF 4 GENERATES THE PROCESSING OF ALL NEWLY ACCESSED/PROMOTED CAPT
      C     EACH YEAR OF THE SIMULATION.  THESE CAPTS CAN:  LEAVE THE SERVICE,
      C     BE PROMOTED UP ONE GRADE, OR CHOOSE AND ADDITIONAL SPECIALTY.
      C
            CALL GETAT(RATT)
            CALL PROCPI
            UF = 1.0
            CALL PUTAT(RATT)
      C     WRITE(NPRNT,1014)
       1014 FORMAT (1X,'*****THIS IS THE  END  OF UFN #4*******')
      C
            RETURN
      C
      C     ************************************************************
      C     *                        USER FUNCTION # 5                 *
      C     ************************************************************
      C
          5 CONTINUE
      C     WRITE(NPRNT,1017)
       1017 FORMAT (1X,'*****THIS IS THE START OF UFN #5*******')
      C
      C     UF 5 GENERATES THE PROCESSING OF ALL EST. CAPTS EACH YEAR OF THE
      C     SIMULATION. THESE  CAPTS CAN: LEAVE THE SERVICE, BE PROMOTED
      C     UP ONE GRADE, BE ASSIGNED TO A THS STATUS, OR SERVE ANOTHER YEAR
      C     IN THE SAME GRADE.
      C
            CALL GETAT(RATT)
            CALL PROCPA
            UF = 1.0
            CALL PUTAT(RATT)
      C     WRITE(NPRNT,1018)
       1018 FORMAT (1X,'*****THIS IS THE  END  OF UFN #5*******')
      C
            RETURN
      C
      C     ************************************************************
      C     *                        USER FUNCTION # 6                 *
      C     ************************************************************
      C
          6 CONTINUE
      C     WRITE(NPRNT,1021)
       1021 FORMAT (1X,'*****THIS IS THE START OF UFN #6*******')
      C
      C     UF 6 GENERATES THE PROCESSING OF ALL MAJORS EACH YEAR OF THE
      C     SIMULATION. THESE  MAJORS CAN: LEAVE THE SERVICE, BE PROMOTED
      C     UP ONE GRADE, BE ASSIGNED TO A THS STATUS, OR SERVE ANOTHER YEAR
      C     IN THE SAME GRADE.
      C
            CALL GETAT(RATT)
            CALL PROMAJ
            UF = 1.0
            CALL PUTAT(RATT)
      C     WRITE(NPRNT,1022)
       1022 FORMAT (1X,'*****THIS IS THE  END  OF UFN #6*******')
      C
            RETURN
      C
      C     ************************************************************
      C     *                        USER FUNCTION # 7                 *
      C     ************************************************************
      C
          7 CONTINUE
      C     WRITE(NPRNT,1025)
       1025 FORMAT (1X,'*****THIS IS THE START OF UFN #7*******')
      C
      C     UF 7 GENERATES THE PROCESSING OF ALL LT. COLS EACH YEAR OF THE
      C     SIMULATION. THESE  LT. COLS CAN: LEAVE THE SERVICE, BE PROMOTED
      C     UP ONE GRADE, BE ASSIGNED TO A THS STATUS, OR SERVE ANOTHER YEAR
      C     IN THE SAME GRADE.
      C
            CALL GETAT(RATT)
            CALL PROLTC
            UF = 1.0
            CALL PUTAT(RATT)
      C     WRITE(NPRNT,1026)
       1026 FORMAT (1X,'*****THIS IS THE  END  OF UFN #7*******')
      C
```

```
157             RETURN
158       C
159       C     ****************************************************************
160       C     *                        USER FUNCTION # 8                     *
161       C     ****************************************************************
162       C
163           8 CONTINUE
164       C     WRITE(NPRNT,1029)
165        1029 FORMAT (1X,'*****THIS IS THE START OF UFN #8*******')
166       C
167       C     UF 8 GENERATES THE PROCESSING OF ALL COLONELS EACH YEAR OF THE
168       C     SIMULATION. THESE  COLONELS CAN: LEAVE THE SERVICE, BE PROMOTED
169       C     UP ONE GRADE, BE ASSIGNED TO A THS STATUS, OR SERVE ANOTHER YEAR
170       C     IN THE SAME GRADE.
171       C
172             CALL GETAT(RATT)
173             CALL PROCOL
174             UF = 1.0
175             CALL PUTAT(RATT)
176       C     WRITE(NPRNT,1030)
177        1030 FORMAT (1X,'*****THIS IS THE  END  OF UFN #8*******')
178       C
179             RETURN
180       C
181       C     ****************************************************************
182       C     *                        USER FUNCTION # 9                     *
183       C     ****************************************************************
184       C
185           9 CONTINUE
186       C     WRITE(NPRNT,1033)
187        1033 FORMAT (1X,'*****THIS IS THE START OF UFN #9*******')
188       C
189       C     UF 9 GENERATES THE PROCESSING OF ALL OFFICERS ENTERING
190       C     INTO A THS ACCOUNT STATUS. THE TIME SPENT IN A THS STATUS IS
191       C     DETERMINED. THE TIMES AVAILABLE ARE STORED IN ARRAY TIMTHS(6).
192       C
193             CALL GETAT(RATT)
194             CALL PROTHS
195             UF = 0.0
196             CALL PUTAT(RATT)
197       C     WRITE(NPRNT,1034)
198        1034 FORMAT (1X,'*****THIS IS THE  END  OF UFN #9*******')
199       C
200             RETURN
201       C
202       C     ****************************************************************
203       C     *                        USER FUNCTION # 10                    *
204       C     ****************************************************************
205       C
206          10 CONTINUE
207       C     WRITE(6,1037)
208        1037 FORMAT (1X,'*****THIS IS THE START OF UFN #10*****')
209       C
210       C     UF 10 GENERATES THE PROCESSING OF STATISTICS FOR USE IN OUTPUT
211       C     PLOTS AND REPORTS.
212       C
213             CALL GETAT(RATT)
214             CALL PROREP
215             UF = 0.0
216       C     WRITE(NPRNT,1038)
217        1038 FORMAT (1X,'*****THIS IS THE  END  OF UFN #10*****')
218       C
219             RETURN
220       C
221             END
```

F-8. PROGRAM UO.

```
      SUBROUTINE UO
        INCLUDE PROC1
        INCLUDE PROC2
        DIMENSION FINAL(30,10),RANGE(4)
        CHARACTER HD*35
        CHARACTER ITITL1*20,ITITL2*20
        CHARACTER ITITL3*20,ITITL4*20,ITITL5*20,ITITL6*20
        CHARACTER ITITL7*20,ITITL8*20,ITITL9*20,ITIL10*20
        CHARACTER ITIL11*20,ITIL12*20,ITIL13*20,ITIL14*20
        CHARACTER ITIL15*20,ITIL20*47
C
C  *** THIS IS THE OUTPUT ROUTINE CALLED AT THE VERY END OF THE RUN. ***
C  *** THE IMSL PLOT ROUTINE IS CALLED AT THIS TIME.
C  *** THE ESTIMATED NO. OF OFFICERS & THE AUTHORIZED NO. ARE PLOTTED
C  *** AGAINST TIME: I = 1,30 YEARS:REFERENCE
C  ***DR.E.R. CLAYTON,VA. TECH. 703-961-5003/6596.
C
      IF(NRUN.LT.NRUNS) RETURN
C
        ARUNS=NRUNS
        RATIO=1.0/ARUNS
        DO 11 I=1,30
        YY7(1,I)=Y7(I)*RATIO
        YY2(1,I)=Y2(I)*RATIO
        YY20(1,I)=Y20(I)*RATIO
        YY16(1,I)=Y16(I)*RATIO
        YY17(1,I)=Y17(I)*RATIO
        YY30(1,I)=Y30(I)*RATIO
        YY145(1,I)=Y145(I)*RATIO
        YY140(1,I)=Y140(I)*RATIO
        YY32(1,I)=Y32(I)*RATIO
        YY36(1,I)=Y36(I)*RATIO
        YY51(1,I)=Y51(I)*RATIO
        YY60(1,I)=Y60(I)*RATIO
        YYCP(1,I)=YCP(I)*RATIO
        YYTOT(1,I)=YTOT(I)*RATIO
        YYMTOT(1,I)=YMTOT(I)*RATIO
C       YY7(2,I)=YY7(2,I)*RATIO
C       YY2(2,I)=YY2(2,I)*RATIO
C       YY20(2,I)=YY20(2,I)*RATIO
C       YY16(2,I)=YY16(2,I)*RATIO
C       YY17(2,I)=YY17(2,I)*RATIO
C       YY30(2,I)=YY30(2,I)*RATIO
C       YY145(2,I)=YY145(2,I)*RATIO
C       YY140(2,I)=YY140(2,I)*RATIO
C       YY32(2,I)=YY32(2,I)*RATIO
C       YY36(2,I)=YY36(2,I)*RATIO
C       YY51(2,I)=YY51(2,I)*RATIO
C       YY60(2,I)=YY60(2,I)*RATIO
C       YYCP(2,I)=YYCP(2,I)*RATIO
C       YYTOT(2,I)=YYTOT(2,I)*RATIO
C       YYMTOT(2,I)=YYMTOT(2,I)*RATIO
11      CONTINUE
C
C       WRITE(6,53)
C        DO 50 K=1,30
C50      WRITE(6,55) I,((INT(I,J,K),J=1,5),I=1,3)
C
        WRITE(6,63)
        WRITE(6,53)
         DO 60 J=1,30
60       WRITE(6,65)(J-1), J , (NCNT(I,J),I=1,6)
C
        WRITE(6,95)
        WRITE(6,53)
         DO 90 J=1,30
90       WRITE(6,65)(J-1) , J, (IRIF(I,J),I=1,6)
C
        WRITE(6,105)
        WRITE(6,53)
         DO 100 J=1,30
100      WRITE(6,65)(J-1) , J, (NIN(I,J),I=1,6)
C
          WRITE(6,115)
          WRITE(6,53)
         DO 110 J=2,31
110      WRITE(6,65)(J-2),(J-1),(ISCHL(I,J),I=1,6)
C
        WRITE(6,75)
        WRITE(6,54)
         DO 70 J=1,30
70       WRITE(6,65)(J-1), J, (ISAV(I,J),I=4,6)
C
        WRITE(6,85)
        WRITE(6,54)
         DO 80 J=1,30
80       WRITE(6,65)(J-1), J, (IDIF(I,J),I=4,6)
C
```

```
      53    FORMAT(22X,'YEAR INTERVAL',31X,'GRADES',//
     *,38X,'   LTS    ',' CPT-NEW  ',' CPT-ESTD ','  MAJORS ',
     *' LT-COLS  ',' COLONELS '//)
C
      54    FORMAT(22X,'YEAR INTERVAL',13X,'GRADES',//
     *,38X,'  MAJORS ',' LT-COLS  ',' COLONELS '//)
C
      63    FORMAT(1H1,10(/),30X,'**** NUMBER OF OFFICERS WHO VOLUNTARILY'
     +,' LEAVE THE SERVICE ****'////)
      65    FORMAT(25X,12,'-',I2,3X,6I10)
C
      75    FORMAT(1H1,10(/),25X,'**** NUMBR OF OFFICERS WHO STAY IN'
     +,' SERVICE BECAUSE LEVELING SWITCH IS ON ****'////)
C
      85    FORMAT(1H1,10(/),30X,'**** NUMBER OF OFFICERS ABOVE OR BELOW'
     +,' AUTHORIZED STRENGTH ****'////)
C
      95    FORMAT(1H1,10(/),25X,'**** NUMBER OF OFFICERS REMOVED DUE TO'
     +,' MAX TIS AND OTHER POLICY CRITERIA ****'////)
C
     105    FORMAT(1H1,10(/),30X,'**** NUMBER OF OFFICERS PROMOTED '
     +,'TO THE NEXT GRADE ****'////)
C
     115    FORMAT(1H1,10(/),30X,'****NUMBER OF OFFICERS ATTENDING SCHO'
     +   'OL ****'////)
C
      55    FORMAT(2X,I3,2X,3(5I6,3X))
C
            CALL HISTA(3,6,0.0)
C
C           SET UP TITLES FOR PLOT ROUTINE, PLOT ROUTINE CAME FROM
C           AN IMSL PLOT PACKAGE
C
            ITITL1='LIEUTENANTS VS TIME '
            ITITL2='LT/CPT ASGMT VS TIME'
            ITITL8='CAPTS-M-GENL VS TIME'
            ITITL7='CAPTS-F-GENL VS TIME'
            ITITL4='CAPTS-M-CONT VS TIME'
            ITITL3='CAPTS-F-CONT VS TIME'
            ITITL6='CAPTS-M-OTHR VS TIME'
            ITITL5='CAPTS-F-OTHR VS TIME'
            ITIL13='ALL CAPTAINS VS TIME'
            ITIL10='MAJRS-M-GENL VS TIME'
            ITITL9='MAJRS-F-GENL VS TIME'
            ITIL15='ALL MAJORS  VS  TIME'
            ITIL11='ALL LT. COLS VS TIME'
            ITIL12='ALL COLONELS VS TIME'
            ITIL14='ALL OFFICERS VS TIME'
            ITIL20='SUPERPOSITION OF ACTUAL AND AUTHORIZED VS. TIME'
C
          CALL PLOT(YY2  ,ITITL1)
          CALL PLOT(YY7  ,ITITL2)
          CALL PLOT(YY140,ITITL8)
          CALL PLOT(YY145,ITITL7)
          CALL PLOT(YY16 ,ITITL4)
          CALL PLOT(YY20 ,ITITL3)
          CALL PLOT(YY17 ,ITITL6)
          CALL PLOT(YY30 ,ITITL5)
          CALL PLOT(YYCP ,ITIL13)
          CALL PLOT(YY56 ,ITIL10)
          CALL PLOT(YY32 ,ITITL9)
          CALL PLOT(YYMTOT,ITIL15)
          CALL PLOT(YY51 ,ITIL11)
          CALL PLOT(YY60 ,ITIL12)
          CALL PLOT(YYTOT,ITIL14)
            DO 300 J = 1,2
            DO 250 I = 1,30
            FINAL(I,J)=YY2(J,I)
            FINAL(I,J+2)=FINAL(I,J)+YYCP(J,I)
            FINAL(I,J+4)=FINAL(I,J+2)+YYMTOT(J,I)
            FINAL(I,J+6)=FINAL(I,J+4)+YY51(J,I)
            FINAL(I,J+8)=FINAL(I,J+6)+YY60(J,I)
     250    CONTINUE
     300  CONTINUE
          RANGE(1) = 0.0
          RANGE(2) = 30.0
          RANGE(3) = 0.0
         RANGE(4) = 0.0
          CALL HSPLO(X20,FINAL,30,30,10,1,ITIL20,47,'YEARS',5,'OFFICERS'
     +   ,8,RANGE,'2-3-4-5-6-',1,IER)
          RETURN
          END
```

APPENDIX G

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GLOSSARY

1. ABBREVIATIONS, ACRONYMS, AND SHORT TERMS

ADL	active duty list
ADSPEC	additional specialty(ies)
BZ	below zone
C&GSC	Command and General Staff College
CAA	US Army Concepts Analysis Agency
CAS^3	Combined Arms Staff Service School
CSA	Chief of Staff of the Army
DOPMA	Defense Officer Personnel Management Act
EEA	essential element(s) of analysis
JAG	Judge Advocate General
JAGC	Judge Advocate General Corps
MILPERCEN	US Army Military Personnel Center
NAPM-JAG	Network Analysis Planning Model for The Judge Advocate General (study)
OPMS	Officer Personnel Management System
OSA	Office of the Secretary of the Army
OTJAG	Office of The Judge Advocate General
SC	specialty code
SSI	specialty skill identifier
TIG	time-in-grade
TIS	time-in-service
THS	transient, holdee, student (account)
TJAG	The Judge Advocate General

2. MODELS, ROUTINES, AND SIMULATIONS

DATIN	the subroutine that reads in the simulation network
GASP	the subroutine that controls the Q-GERT operation
MAIN	the main program for Q-GERT containing the size specifications
PROC2	a procedure containing the dimension and common statements for expanding Q-GERT
Q-GERT	Queueing Systems - Graphical Evaluation and Review Technique: a simulation language made up of FORTRAN subroutines
UF	User Function: a subroutine written for Q-GERT to prescribe actions within NAPM-JAG
UI	User Input: a subroutine written to adapt model user input for NAPM-JAG
UO	User Output: a subroutine written to define and specify the output management reports for NAPM-JAG
NAPM	Network Analysis Planning Model
OFMM	Officer Force Management Model
JOPM	JAG Officer Personnel Model

NETWORK ANALYSIS PLANNING MODEL FOR THE JUDGE ADVOCATE GENERAL (NAPM-JAG)

STUDY SUMMARY CAA-SR-85-19

THE REASON FOR THE STUDY was to develop an analytical tool to assist the Office of the Judge Advocate General (OJAG) personnel managers in evaluating current and future OJAG personnel policies and to assess the impact of policy changes on the Judge Advocate General Corps (JAGC) force.

THE PRINCIPAL FINDINGS of this study are:

(1) An existing US Army Concepts Analysis Agency (CAA) Network Analysis Planning Model (NAPM) could be modified and enhanced to create the Judge Advocate General Officer Personnel Model (JOPM) for the OJAG.

(2) JOPM can simulate 100 percent of the JAG officer corps of approximately 2,000 men and women, aging this force over a 30-year period.

(3) The model is flexible, allowing the simulation of different personnel policies and constraints that affect officer accession, assignment, promotion, and retention rates.

THE MAIN ASSUMPTIONS are that the force structure, personnel authorizations and historical data (personnel distribution, promotion, and continuation rates by year and gender) are valid.

THE PRINCIPAL LIMITATIONS of the work which might affect the findings are:

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(3) The model tracks officers in a schooling account, but schooling credit does not enhance promotion opportunity or career goals.

THE SCOPE OF THE STUDY incorporates and modifies the NAPM code and its associated data base to create the JOPM. The modifications introduced into the enhanced model include:

(1) Allowing for the accession of captains.

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THE BASIC APPROACH followed in this study was to simulate an officer's career as a network process. The Queueing - Graphical Evaluation Review Technique (Q-GERT) software was selected for its ability to process problems structured as networks.

THE STUDY SPONSOR was the Office of The Judge Advocate General (OTJAG).

THE STUDY EFFORT was directed by Mr. Stanley H. Miller of the Force Systems Directorate.

COMMENTS AND QUESTIONS may be sent to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-FS, 8120 Woodmont Avenue, Bethesda, MD 20814-2797.

CAA	NETWORK ANALYSIS PLANNING MODEL FOR THE JUDGE ADVOCATE GENERAL (NAPM-JAG)	STUDY SUMMARY CAA-SR-85-19

THE REASON FOR THE STUDY was to develop an analytical tool to assist the Office of the Judge Advocate General (OJAG) personnel managers in evaluating current and future OJAG personnel policies and to assess the impact of policy changes on the Judge Advocate General Corps (JAGC) force.

THE PRINCIPAL FINDINGS of this study are:

(1) An existing US Army Concepts Analysis Agency (CAA) Network Analysis Planning Model (NAPM) could be modified and enhanced to create the Judge Advocate General Officer Personnel Model (JOPM) for the OJAG.

(2) JOPM can simulate 100 percent of the JAG officer corps of approximately 2,000 men and women, aging this force over a 30-year period.

(3) The model is flexible, allowing the simulation of different personnel policies and constraints that affect officer accession, assignment, promotion, and retention rates.

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