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ABSTRACT

The report summarizes the results of a field test conducted for the purpose of determining the utility to Naval training of the Systems Capabilities/Requirements and Resources (SCRR) and the Training Process Flow (TPF) computer-based mathematical models. Basic descriptions of the SCRR and the TPF and their development are given. Training management applications in which context model utility was to be demonstrated during the field test at Commander Training Pacific (COMTRAPAC) are listed. Documented applications were distributed to Navy training personnel with accompanying questionnaires to determine staff workload associated with each application. Enhancement modifications to the model and data base were identified during interviews, presentations, and demonstrations. Five major field test task activities are described briefly and discussed again in greater detail with key exhibits of forms and presentations used in accomplishing the test. Recommendations were made to improve model and data base usage, and the general view was that the models could be useful as management tools if identified deficiencies were corrected. Appended material (31 pages) includes a meeting attendees list, DOTS data element definitions, field test questionnaire samples, and DOTS model/data base field test results summary. (Author/MS)

TAEG REPORT NO. 33

DOTS UTILITY ASSESSMENT:

The Training Process Flow and System Capabilities/Requirements and Resources Models Operating in the TRAPAC Environment

Larry R. Duffy

This Study Was Performed By

International Business Machines Corporation

for the

Training Analysis and Evaluation Group

May 1976

Alfred F. Smode

ALFRED F. SMODE, Ph.D., Director
Training Analysis & Evaluation Group

FOREWORD

The Design of Training Systems (DOTS) project objectives are in consonance with the requirements of Advanced Development Objective ZPN07 (formerly ADO 43-03X), Education and Training Development. ZPN07 includes a number of projects concerned with demonstrating and evaluating the technical, operational and financial feasibility of applying advanced technological applications to improving the training process.

The Bureau of Naval Personnel initiated the original ADO in 1966 to make naval training more responsive to the changing times. As one project under this effort, DOTS was designed to improve the process of managing training resources through application of the techniques of system analysis and system simulation as accomplished through mathematical modeling. The end objective is a family of computerized mathematical models enabling training management to more rapidly predict the impact of changes in training resource availability or requirements.

The majority of education and training was reorganized in 1971 under one command, Chief of Naval Education and Training (CNET). Because of this change, DOTS responsiblity was transferred to CNET in March of 1972, more specifically to the Training Analysis and Evaluation Group (TAEG), Orlando, Florida. The new CNET organization greatly increased the potential benefits to be gained from the increased application of new management techniques and, therefore, from the DOTS' R&D effort. Accomplishment of DOTS began in February of 1973 with the majority of tasking being assigned to the International Business Machines Corporation, Federal Systems Division, Cape Kennedy Facility, located at Cape Canaveral, Florida.

In conducting the Phase I study and definition effort, the TAEG/IBM technical team conducted multi-level interviews at some eighty activities or training related groups within the Naval Education and Training Command (NAVEDTRACOM). The willing and competent participation of all personnel contacted is gratefully acknowledged. During this Phase IV task, COMTRAPAC and its activities provided exceptional cooperation and contributed significant time and interest to the data collection and evaluation effort. Special appreciation is expressed for the participation of LCDR T. Ferrier, COMTRAPAC, who served as the liaison and primary interface with the command.

The TPF and SCRR models evaluated in this field test were developed by Mr. K. Branch and Mr. R. Yanko, respectively. Systems Programming support was provided to the modelers by Mr. J. Staley. Messrs. K. Branch, L. Duffy, and R. Yanko participated in the field test at COMTRAPAC. Mrs. [illegible]. Reilly provided editorial and secretarial services. Mr. R. Hallman was Project Manager.

The Training Analysis and Evaluation Group, Dr. A. Smode, Director, project team members Mr. M. Middleton and Mr. W. Lindahl, complemented the contracted effort by providing direction and guidance, establishing organizational interfaces, and assisting in the performance of the utility assessment.

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This final report summarizes the results of a field test conducted for the purpose of determining the utility of the TPF and SCRR models to naval training. This task is a part of a Design of Training Systems (DOTS) Phase IV contractual effort, Contract No. N61339-73-C-0097.

Phases I, II and III were accomplished by the IBM Federal Systems Division with the Training Analysis and Evaluation Group, Orlando, Florida,

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providing technical guidance and support. The overall DOTS' objective is to provide Naval Education and Training Command (NAVEDTRACOM) management with additional tools in the form of computerized mathematical models to assist in predicting the quantitative impact of training resource decisions. The planning process will be enhanced by providing decision makers with the capability to economically and rapidly consider a wider range of alternatives.

Phase I was a study and definition effort resulting in a complete functional description of the NAVEDTRACOM; a strategic definition of the social, political, economic and technological environments pertinent to the naval education and training system in the 1980's; a list of existing and potential models amenable to computerization and to improving the decision-making process. Phase II was devoted to the selection and development of three mathematical models from the Phase I list of candidates. The three were the System Capabilities/Requirements and Resources (SCRR), the Educational Technology Evaluation (ETE), and the Training Process Flow (TPF) models.

The Phase IV field test was performed at COMTRAPAC and five of its subordinate activities in San Diego, CA. During the field test, a data base containing courses, instructors, and facilities was established for each COMTRAPAC activity. Management applications of the models were then identified; some were tested using the models operating on the real-world data supplied by the activities. At the same time, a number of enhancements were identified for improving the use of the models and data base. Finally, a review was conducted by the Training Analysis and Evaluation Group (TAEG) with participants from COMTRAPAC and each activity.

In summary, a number of recommendations were made to improve model and data base usage, and the general view was that the models could be useful as management tools if identified deficiencies were corrected. However, without further evaluation their value could not be established. Therefore, the decision was made to incorporate several of the enhancements whereby the transition can be made from R&D to the operational phase when resources become available.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SECTION I

TASK INTRODUCTION

BACKGROUND

In Phases II and III of the Design of Training Systems (DOTS) project, three computer-based models were designed, developed, and validated. They are the Systems Capabilities/Requirements and Resources (SCRR) model, the Training Process Flow (TPF) model, and the Individualized Training Simulation System (ITSS) model. A data base for storing certain types of training information required to drive the models was also developed. The programmed models and data base reside in a timesharing computer system operated by National CSS, Inc. The models and data base are accessible on an interactive basis using a remote display terminal and a teleprocessing link to the host computer. Two of the models (SCRR and TPF) were selected for field testing at the headquarters and activities of the Commander Training Pacific (COMTRAPAC). The SCRR and TPF models and associated data base are described in detail in several previous TAEG reports.[1] However, the general DOTS system relationships are shown in Figure 1 and the two models are briefly described below in order for the reader to acquire a sufficient understanding for purposes of this report. Also contained in each description is a list of the training management appications in which context model utility was to be demonstrated during the field test at COMTRAPAC.

THE SYSTEM CAPABILITIES/REQUIREMENTS AND RESOURCES MODEL. The SCRR model is a linear programming (LP) optimization model. The SCRR model formulates an LP objective function and constraint equations from information contained in the data base. The LP problem is then solved to optimize training complex student throughput and resource utilization. Basically, the model has two modes of operation. In the first mode, the resources; i.e., the classrooms, laboratories, instructors, and the appropriate constraints and limitations applicable to each, are specified, and the model determines the maximum student throughput and the optimal mix of course convenings which can be attained in a specified time period. In the second mode, the desired output profile is specified, and the model determines the minimum combination of resources required

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[1]TAEG Report No. 12-1, Phase I Final Report, Volume 1, dated December 1973
TAEG Report No. 12-1, Phase I Final Report, Volume 2, dated December 1974
TAEG Report No. 12-2, Phase II Report, Volume 1, dated December 1974
TAEG Report No. 12-2, Phase II Report, Volume 2, dated December 1974
TAEG Report No. 12-2, Phase II Report, Volume 3, dated December 1974
TAEG Report No. 28, Phase III Final Report, Dated September 1975
TAEG Report No. 29, Program Maintenance Manual, dated September 1975
TAEG Report No. 30, User's Manual, dated September 1975

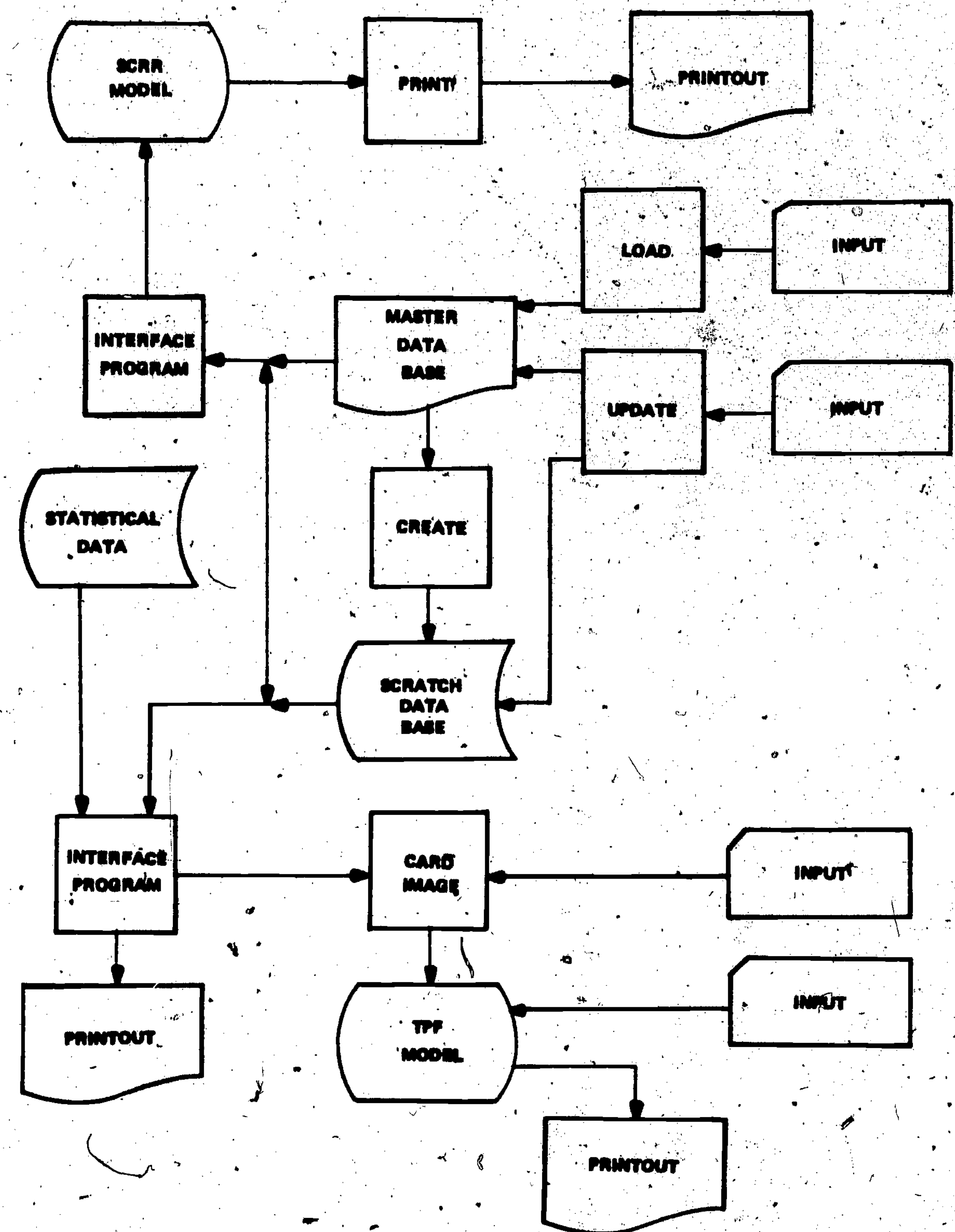

FIGURE 1. DOTS SYSTEM DIAGRAM

to produce it. The model solution consisting of the linear programming solution and the sensitivity analysis, gives a total picture of the training complex output and the utilization of each resource. Factors are presented which indicate the effectiveness of, and the limits for, manipulating each input variable without impacting the optimal solution.

The SCRR model can be applied in the following specific types of situations:

a. Assessment of long-term training demand. The SCRR model in its first mode of operation will optimize the number of course convenings or student throughput within stated resource constraints. It can be used, therefore, to determine whether annual training requirements are feasible. If demand is projected beyond the coming year, the SCRR model can signal the need for additional facilities before present facilities are exhausted. The optimized convening rate can serve as a guideline for course scheduling.

b. Assessment of the impact of short-term demand that might arise from unscheduled events, such as a ship repair operation, an activation of reserves, or unusual seasonal recruitment levels. In these instances, the SCRR model maximized throughput by course would serve as an immediate indication of training complex capability. If necessary, a training manager can alter the present course convening schedule, deleting low priority courses to gain classroom space, and possibly instructors, for additional sessions of high priority courses.

c. Assessment of the use of training resources. In its second mode of operation, the SCRR model will take the current throughput rates and determine the optimum combination of resources required to produce them. In this mode of operation, the model output can be compared with real resource utilization to obtain estimates of the efficiency of training complex resource use.

d. Comparison of alternative training implemenation strategies. Either mode of operation may be used to evaluate different combinations of training technologies (when average-time-to-complete, etc., are supplied). In addition, the sensitivity analysis gives an indication of the sensitivity of the training complex throughput to each resource. Sensitivity factors indicate the range over which the resource may be manipulated without affecting the optimum convening/throughput rate. The training manager can easily determine the limiting resource for any particular set of conditions, and apply his energy effectively by dealing with the most crucial problem. If, for example, instructor availability proved to be the limiting factor on one course, cross-training of present staff might prove to be the most cost-effective way to increase school throughput.

In summary, the SCRR models has two basic modes of operation. In the first mode, training complex throughput is maximized within specified constraints and available resources; in the second mode, the throughput by course is specified by the user, and the model outputs the optimum (minimum) mix of resources required to produce that throughput. By using one or the other of these modes of operation as appropriate, the training official or training staff member may plan for meeting projected demand, solve resource use problems, or assess different training implementation strategies.

THE TRAINING PROCESS FLOW MODEL. The TPF model is a simulation model. It uses information contained in the data base to create an aggregated data matrix, upon which the execution module logic operates in order to calculate output quantities which predict training system performance. The key elements of the TPF are the profiles of course characteristics and student characteristics by course. The profiles and the weighting factors associated with them were created by statistical analysis of historical data from BUPERS and the Fleet Training Center, Norfolk, Virginia. A substantial portion of the student performance data was not in an Automated Data Processing (ADP) form, and had to be gathered during instructor interviews. It was not necessary to perform additional statistical analysis at COMTRAPAC since the TPF logic was found generally applicable to COMTRAPAC training.

Basically, the TPF starts with a course convening schedule obtained from the data base, or an optimized convening frequency obtained from the SCRR model. The profile characteristics of the student groups are then compared with selected course factors; e.g., failures, disenrollment, etc., versus demand, backlog, etc., and the throughput of the training complex is predicted. In addition to throughput, certain aspects of resource utilization are calculated from the predicted throughput versus maximum capacity figures.

Although the TPF model is intended as a resource utilization control tool similar to the SCRR, because its design incorporates student charcteristics and additional course information, its applications are significantly different. The TPF model can be applied in the following specific types of situations:

a. Simulation of the training complex to determine the accumulated effects of demand. In this type of application, the TPF will assess the average-on-board, the training complex throughput, and the student backlog that builds if demand exceeds the enrollment capability.

b. Assessment of overutilization or underutilization of resources at the course level. In this application, the model is used to evaluate the effects of increasing the demand for a particular course. Evaluation of the capacity, utilization, and no-show data will determine the need for scheduling additional sessions of the course or tightening the input requirements and the methods of reserving space in class.

c. Analysis of the effects of changes in student performance; e.g., failure rates, setback rates, etc., on training throughput.

In summary, the Training Process Flow model can be used in the analysis of resource utilization at the training complex level, or at the individual course level. The TPF can assess the effects of changing the student quantity and/or performance. As a simulation tool, the TPF allows the training manager to evaluate different training resource utilization strategies in terms of overall training implementation efficiency. While the SCRR can determine the maximal throughput based on total class capacity and convening frequency, the TPF can predict actual throughput based on the maximal throughput, student attrition, and no-show data.

FIELD TEST OBJECTIVES

The primary objective of this task was to demonstrate the usefulness of the SCRR and TPF models to Navy training managers. Toward this end, real world model applications were identified; the models were then applied in the analysis and solution of specific training situations. Documented applications were distributed to Navy training personnel with accompanying questions to determine staff workload associated with each application. The questionnaire inputs were the basis for assessing potential model benefits in relation to these operational costs.

A secondary objective was to define enhancements to the model and data base which might significantly increase their value to training managers. Enhancement modifications were identified during meetings, interviews, presentations, and demonstrations. The list of proposed enhancements was reviewed and high priority items were further analyzed in terms of the additional development costs. Certain enhancements were selected as having substantial benefit as compared to cost, and will be incorporated into the models and data base design.

TASK ACTIVITIES AND SCHEDULE OVERVIEW

Five major definable tasks were performed in order to complete the field test. Briefly, they can be described as follows; greater detail is provided in Section II of this report.

- Install Software at TRAPAC

  The TPF and SCRR models and support programs were reinstalled in the IBM CKF workspace at National CSS. Some minor modifications were made at that time. The data base format was defined and data were collected from five TRAPAC activities. A period of data base purification followed the initial TRAPAC data load operation. Approximately five thousand records (punched cards) were inputted to establish the data base.

- Identify and Document Model/Data Base Applications

  The five TRAPAC activities involved in the field test were briefed on the purpose and schedule for this particular task, as well as the following three tasks, which culminated in a review of the field test results by the evaluation team. The objective was to identify situations arising during the normal course of managing training to which the models might potentially apply. Department/division heads and staff personnel were interviewed in order to identify these situations. The result was a list of potential applications.

- Utilize Model Software and TRAPAC to Solve Identified Problems —

  Several of the potential model applications were analyzed to a greater depth. Changes or inputs to correspond with the approach taken by training managers in resolving a particular problem situation were prepared. The appropriate model was run and results were compared with those expected by the training managers. Only a few tests of this type could be made because of time constraints and data inconsistencies.

- Define Usability Enhancements

  During the briefings and subsequent interviews, TRAPAC activity personnel identified a number of changes or additions which they believed would make the models more suitable to their use. These ranged from minor data base modifications to new additional modeling tasks. A list of proposed enhancements was maintained for later analysis, prioritization, and possible development.

- Review by Evaluation Team

  A questionnaire was developed for TRAPAC personnel to determine the frequency and associated workload on identified applications. The results were tabulated and presented to key personnel at each activity. Activities were requested by TRAPAC to develop a position statement regarding the usefulness of DOTS models to the management of training within their function. TRAPAC, Activity, and TAEG personnel (IBM representatives were not present) reviewed the overall field test results to decide the future course of the DOTS effort at TRAPAC. A decision was made to incorporate certain enhancements whereby the transition can be made from R&D to the Operational Phase when resources become available.

The major milestones achieved during the field test effort are listed below; the overall task schedule is shown in Figure 2.

- 8 January 1976 - Began Analysis - Initial TRAPAC Briefing
- 15 January 1976 - Completed Initial Data Collection Phase
- 23 January 1976 - Completed Activity Briefings
- 26 January 1976 - Completed Initial Data Base Load
- 27 February 1976 - Completed Applications Analysis
- 3 March 1976 - Completed Field Test Evaluation

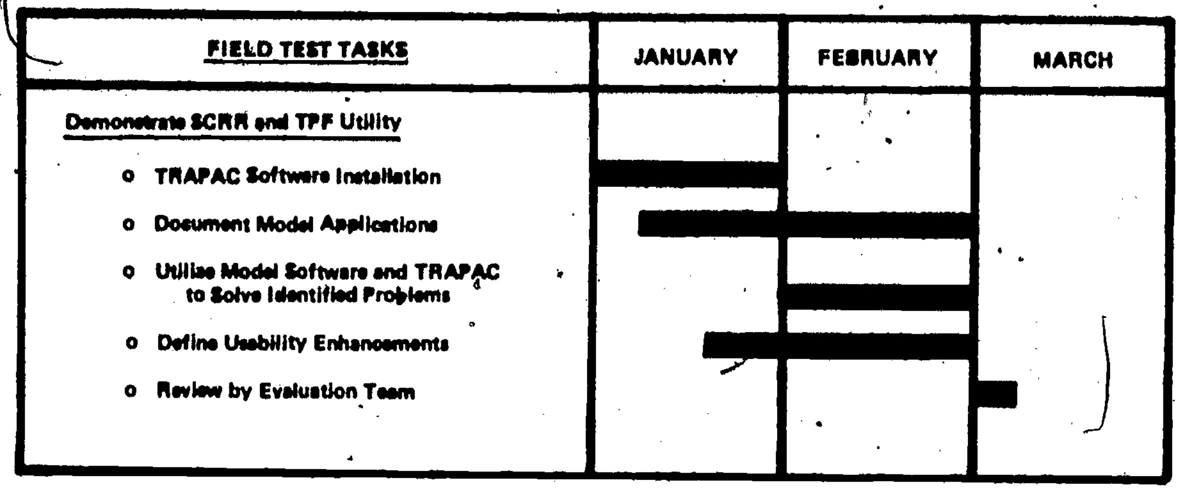

FIGURE 2. FIELD TEST SCHEDULE

FIELD TEST PARTICIPANTS

Five activities within COMTRAPAC participated in the field test, namely:

- Fleet AntiSubmarine Warfare Training Center, Pacific (FASWTCP)
- Fleet Combat Direction Systems Training Center, Pacific (FCDSTCP)
- Fleet Intelligence Training Center, Pacific (FITCPAC)
- Fleet Training Center, Pacific (FLETRACEN)
- Nuclear Weapons Training Group, Pacific (NWTGP)

In addition, several staff codes at COMTRAPAC participated.

On 8 January, a meeting was conducted at COMTRAPAC to brief key personnel within COMTRAPAC and its activities on the objectives and approach of the field test. Approximately 20 persons attended this meeting. Each activity was given data collection forms and instructions for gathering course, instructor, and facility data.

During the week ending 23 January, briefings were held for staff, department, and division heads (or their representatives) at each of the activities. Approximately 50 persons attended this series of meetings which initiated the applications analysis phase of the field test.

A listing of meeting attendees is provided in Appendix A of this report.

Following the applications analysis briefings, interviews were scheduled with various COMTRAPAC and activity personnel. During these interviews departmental data were reviewed, model and data base capabilities were demonstrated, potential applications were elicited, and usability enhancements were identified. A number of persons who had not attended prior briefings were contacted during this interview phase.

SECTION II

FIELD TEST TASK ACTIVITIES - DISCUSSION

The five major task activities constituting the field test for demonstrating SCRR and TPF model utility were briefly described in Section I. This section presents those task activities in greater detail, and displays key exhibits of forms, presentations, etc., used in accomplishing the field test.

FIELD TEST OVERVIEW

The purpose of the field test was to demonstrate the degree of utility that two previously developed models (SCRR and TPF) and associated data base would have for Navy training managers at the activity and functional command level. The two models with some minor modification were installed in the National CSS system in Norwalk, CT, and were accessible via a teleprocessing terminal at San Diego. Course, instructor, and facility data were collected from five COMTRAPAC activities in order to establish the data base from which the models could be operated. Following command briefings, a number of key personnel were interviewed to identify situations with which they were confronted where the models and data base might help. Once the potential applications were identified, a questionnaire was prepared and distributed throughout the command. Its purpose was to determine the frequency and amount of effort expended in handling each of the identified situations. The survey results were then summarized and presented to key personnel at each activity who were requested to establish their activity's position on the utility of the models and data base. The position statements with their comments and qualifications constituted the major input to the decision on whether to continue at COMTRAPAC. The decision reached by the Training and Analysis and Evaluation Group (TAEG) and COMTRAPAC was to incorporate certain utility enhancements, provide support to COMTRAPAC through June 1976, and to seek a sponsor to provide operational funds for the future.

INSTALL SOFTWARE AT TRAPAC

The SCRR and TPF models were installed into the IBM CKF workspace on the National CSS, Inc., computer. Several minor modifications were made to facilitate their operation at TRAPAC.

SCRR. The following changes were made to the SCRR model operation.

- Revised to permit multiple levels of analysis within the school code; i.e., by activity, by department, or by division.
- Revised to operate selectively from either the master or scratch data bases.
- Added a facilities assignment and utilization report similar to the existing instructor assignment listing.

TPF. The following changes were made to the TPF model operation:

- Revised to permit multiple levels of analysis within the school code (same as SCRR).

- Revised to operate for any one or combination of the three fiscal years of data contained in the data base.

- Modified the no-show algorithm to more closely reflect the quota control system at TRAPAC.

DATA BASE. The major effort within this task activity was the establishment of a data base for the five activities participating in the field test. This was necessary in order to demonstrate model and data base applications to the various training staff and management personnel. While much of the data was contained in established data bases; e.g., NITRAS, it was decided due to present data inaccuracies and the time required to structure and perform the data transfer to the DOTS data base manual collection would be more efficient for the field test.

Data collection forms were distributed at the 8 January meeting. These were copies of the key punch sheets for Course Cards 1, 2 and 3, Instructor Cards 1 and 2, and the Facilities Card. The forms were the same as previously used in building other test data bases and are shown in the prior documentation referenced in Section I of this report. Instructions describing each of the data fields were also provided and are shown in Appendix B. Note that the three fiscal years of data requested were 76, 77, and 78. To simplify the process, FY 7T was not included in the data base.

Several changes were made to the data base and to the data base programs during the installation phase. These were as follows:

- Redefined the data base description to eliminate the timekeeping fields previously contained within the Instructor file.

- Changed the definition of the three course length fields to allow lengths of 100 days or more to be entered.

- Redefined the use of several fields to permit CONTRAPAC requested data to be collected; i.e., the J-Number (JNO) field was used for the maximum class capacity, and the Planned AOB (PAOB) field was used for minimum class capacity.

- Redefined the use of the school code (SCH) field designating the high order as a unique number for each activity; i.e., 4 = NUWPNTRAGRUPAC, 5 = FITCPAC, 6 = FLETRACEN SDIEGO, 7 = FLTCOMBATDIRSYSTRACENPAC, and 8 = FLEASWTRACENPAC.

- Developed several programs to facilitate data editing prior to loading RAMIS.[2]

Keypunch cards were inputted through the OFFLINE READ facility at National CSS, Inc., in San Diego. Table 1 summarizes the number of data entries required for each activity and department/division to establish the three data base files; i.e., Course File, Instructor File, and Facility File.

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[2]RAMIS is a proprietary program developed and maintained by Mathematica, Inc.

TABLE 1. DATA BASE ENTRIES BY ACTIVITY

ACTIVITY/DEPT/DIV		INPUT RECORDS		
NUWPNTRAGRUPAC DEPT	NO. OF COURSES	COURSE FILE	INSTR FILE	FACILITY FILE
430 (30)	19	175	30	35
440 (40)	1	4	1	1
450 (50)	9	78	9	9
460 (60)	5	34	6	5
470 (70)	3	42	7	6
TOTAL	37	333	53	56
		TOTAL INPUT RECORDS = 442		
FITCPAC				
5INT (ALL)	13	192	16	52
		TOTAL INPUT RECORDS = 260		
FLETRACEN SDIEGO DEPT				
6A (20)	39	309	58	43
6B (30)	10	89	20	15
6C (40)	31	208	30	74
6D (50)	25	178	23	33
6E (60)	14	236	43	20
TOTAL	119	1020	174	185
		TOTAL INPUT RECORDS = 1379		
FLECOMBATDIRSYSTRACENPAC DEPT				
7A (31)	6	144	17	20
7B (32)	4	107	11	6
7C (33)	4	57	13	8
7D (34)	9	86	9	14
7E (35)	9	137	13	23
7F (36)	4	65	10	10
7G (37)	10	97	12	17
7T (41)	14	42	0	0
TOTAL	60	735	85	98
		TOTAL INPUT RECORDS = 918		
FLEASWTRACENPAC DEPT				
821 (21)	18	424	93	45
822 (22)	20	212	50	37
823 (23)	11	185	42	36
824 (24)	1	90	29	10
825 (25)	1	123	31	8
826 (26)	1	4	16	0
861 (61)	3	26	9	10
862 (62)	6	39	11	16
863 (63)	4	28	5	7
864 (64)	7	114	20	8
TOTAL	72	1245	306	177
		TOTAL INPUT RECORDS = 1728		
TOTAL ALL ACTIVITIES:	301	3525	634	568
		TOTAL INPUT RECORDS = 4727		

IDENTIFY AND DOCUMENT MODEL/DATA BASE APPLICATIONS

During the week beginning 19 January, a series of individual activity briefings were held. A presentation covering the following items was made.

- Purpose of visit to COMTRAPAC activities
- Tasks and project schedule
- Background and purpose of DOTS
- SCRR model description and applications
- TPF model description and applications
- Data base description and application
- Specifics of this applications analysis task.

Each of the meetings lasted approximately 1½ hours and attendees were provided with copies of selected material from the presentation. Approximately fifty persons attended the four meetings (FASWTCP and FITCPAC activities were combined); attendees are listed in Appendix A.

From 26 January through 27 February, interviews, presentations, and demonstrations were held at all activities. These were generally held on an individual basis with key staff personnel and department/division heads for the purpose of identifying applications where use of the models and/or data base could be of assistance. In addition, enhancements and new applications were identified.

MODEL APPLICATIONS ANALYSIS. The analytic framework for identifying potential model applications was a series of topics posed to the personnel being interviewed. The questions were not rigidly adhered to, however, the following presents the general outline of categories used during the interviews.

- Situation Description: (Problems, "what ifs", Feasibility Studies, etc.)

  Mission to which situation solution contributes.
  Specific situation description.
  Origination of situation.
  Seriousness of situation. Importance of solution.
  Areas impacted by situation.

- Normal Approach to Solution:

  Who works out solution.
  Information requirements.

Sources of information.
Time to solve.
Frequency of occurrence.
Users of solution.

o Present Solution:

Quality of solution.

o Model Approach to Solution:

Model(s) used.
Input data elements.

o Model Solution:

Comparison to present solution.

POTENTIAL MODELING/DATA BASE APPLICATIONS. The following list of potential applications was compiled during the briefings and ensuing interview sessions.

1. Assess the effects of reducing service training related manpower by some specific percentage; e.g., 5 percent, 10 percent or 30 percent.

2. Assess capability to handle an increased training load for a specific course using existing instructor and facility resources; e.g., GMT A-School load increases from 220 in FY 76 to 340 in FY 78.

3. Assess effect on training throughput from reducing (or increasing) instructor weekly contact hours; e.g., from 25 down to 20 or to 15.

4. Assess utilization or proposed expanded physical plant in handling a projected future training load; e.g., use utilization from future demand figures in justifying MILCON funds to expand physical training plant.

5. Assess impact upon training throughput from permitting increased non-training use of trainers/mockup/etc.; e.g., additional shift use of TACDEW by support group.

6. Reevaluate baseline data outputs as a result of a change in methodology, computational techniques, etc; e.g., change in course lengths from student day to calendar day, recalculation of AOB based on new formula, etc.

7. Evaluate the effects upon specific courses or all courses in general as a result of different quota control strate-

gies; e.g., over-booking, substitute quota emphasis in reducing no shows, etc.

8. Perform specific manipulations of data base elements to identify problem areas on an exception basis; e.g., which courses have a demand exceeding capacity by X percent, which courses have X percent excess capacity, which courses have inconsistencies between their length, total facilities requirements, and instructor contact hours, etc.

9. Analyze equipment utilization and constraint effects from varying team training demands. Determine sensitivity of throughput capability to different demands.

While variations of the above general applications list were identified, when considered in a broad context they appear to be a fairly exhaustive representation of the types of situations to which the existing models and data base could be applied. Two other areas frequently mentioned dealt with student data and cost data. The existing system does not treat these two categories of data.

UTILIZE MODEL SOFTWARE AND TRAPAC TO SOLVE IDENTIFIED PROBLEMS

Some of the model/data base applications identified during the course of the interviews were actually run on the computer using the existing models (with some of the modifications previously mentioned, installed) and the data base which contained course, instructor, and facility data for each of the five participating TRAPAC activities. Following are summary descriptions of some applications demonstrated to TRAPAC personnel during the field test.

1. In January, CNET requested that all CNET functional commands (and their activities) assess the effects of 10 and 30 percent personnel reductions from planning level without corresponding reductions in planned AOB loads.

   The SCRR model was applied in the analysis of this problem for several departments. Because billet data are not incorporated in the existing data base, only the effects from eliminating existing personnel could be evaluated. The modeled results showed the redistribution of contact hours across remaining personnel. Also, since support hours were not considered, the contact hours had to be evaluated with a knowledge of the additional workload requirements which might exist for remaining personnel.

2. One course was analyzed for the effects of a projected significant student load increase. As with the previous example, the SCRR model run showed the redistribution of contact hour time across remaining instructors. Because support data were not

available, however, judgments had to be made regarding the new contact hour times.

3. One of the activities was updating a Basic Facilities Requirements List (BFRL) in order to justify future MILCON funding.

   A major facet of the analysis was the calculation of facilities utilization considering the projected future student demands. To facilitate the substantial amount of data manipulation required, a special course and facilities file were established to reflect future student loads and classroom, lab, and training availabilities. The activity was provided with a report showing the projected utilization of each classroom, lab, and trainer.

4. Another activity in the beginning phases of a BFRL input requested a report of basic course data; i.e., length, loads, student/instructor ratios, course hours, etc. This report was provided to personnel responsible for facilities planning.

5. A number of requests were made for specialized reports from the data base. Following is a list of the type of reports produced for one or more departments.

   - Printed listing of instructors by NEC and by Rotate Date.
   - Printed report of courses which had not been reviewed in the past two years (1975 and 1976).
   - Listed courses in which the no-show rate exceeded 10 percent.
   - Listed courses where the demand exceeded capacity. A graphic report was also produced showing demand versus capacity on a course and departmental basis.
   - A report was produced to show courses where capacity was greater that 125 percent of demand.
   - Printed a report of courses where historical utilization (of capacity) was less than 50 percent.
   - A report was generated to show data inconsistencies between the course length in calendar days and the total course hours based upon the curriculum outline.
   - AOB's were calculated and listed by course, department, and activity.

6. Numerous baseline runs were made using the TPE model and provided to each department (or division). These were multi-level runs by course, division, department, and activity. No specific data

base changes were made to respond to "what if" requests, however, situations to which the TPR could be applied were discussed.

Unfortunately, it was not possible to make comparisons with results of the manually performed exercises since the effects of these exercises were not clearly defined other than in general terms; e.g., there will be a severe degradation in training quality, etc. This subject will be discussed in greater detail in the concluding section of this report.

DEFINE USABILITY ENHANCEMENTS

The following list represents capabilities beyond those of the existing models which were mentioned at briefings or during interviews. They suggest either enhancements (e) to the existing system or additional modeling (m) efforts. The list is generally ordered based upon the frequency which items were suggested. Items 1. and 2. were, by far, the most frequently mentioned.

1. Develop program for scheduling required class convenings for effective application of instructor/facility/training resources. (m)

2. Incorporate support activities and support personnel workload requirements into SCRR manpower equations; e.g., course review and revision, instructor training, trainer maintenance, supply, fleet-levied workload, administrative, supervisory, etc. (e)

3. Incorporate dynamics of instructor rotation, instructor training, and instructor qualification cycle into SCRR model evaluation and optimization process. (e)

4. Develop model which can evaluate effects of specific decrement drills involving either personnel or dollar resources, with an inherent priority assignment to these resources for automatically handling percentage type cuts. (m)

5. Develop model which can evaluate resource implications from workload restructuring, reorganization, etc.; e.g., centralization of course development activity, consolidation of training aids development, departmental reorganization and consolidation, etc. (m)

6. Provide capability to define instructor availability to the SCRR model on an individual basis considering total annual availability less time assigned to non-podium (support) activities. (e)

7. Provide alternate capability for SCRR model to evaluate training capacity based upon allowance (or approved billets) in addition to actual manning. Also, provide ability for specifying a manning level from the NMP (Navy Manning Plan) by rate/grade to adjust the available resource inputted to the model. (e)

8. Provide a data base flag to indicate whether an instructor was filling an approved I-Billet (as opposed to teaching from some other billet; e.g., CO, XO, maintenance, etc.) (e)

9. Data base should be expanded to include five fiscal years of data upon which models could operate. (e)

10. Data base should be expanded to include more than a PNEC and SNEC for instructors; fields for five NEC's would be desirable. Also, this field should be designated for either NEC's or NOBC's as well as designator codes for officers. (e)

11. Data base should be expanded to include instructor time reporting data which is completed weekly by instructors. (e)

12. Modify resource algorithms for team training and for the use of mockups; e.g., mockup utilization may vary as a function of class size as well as class days. (e)

13. Modify CANTRAC data base to incorporate PQS sections automatically signed off as a result of successful course completion. (m)

14. Maintain a data base of current reference materials related to each course. (m)

15. Data base should include an identification of which resource limits the normal capacity figure; e.g., CAP 1, CAP 2, and CAP 3 might be limited due to equipment, instructors, or space. (e)

16. Data base should include definitions of the meanings for terms used within the data base, or for input and output data elements for the models; e.g., LEN 1, LEN 2, LEN 3 specify the course length in calendar days, etc. (e)

17. Data base should include sufficient historical summary data from which time series analysis of trends and cyclic variations could be performed. (e)

18. Incorporate cost factors from Mechanized Course Cost System and refine cost attached to equipment to more accurately reflect true costs of installing, operating, and maintaining it. (e)

19. Develop model to more accurately predict demand for fleet type courses. (m)

20. Develop a model for optimizing the number of course convenings versus the individual class size; e.g., is it more optimal (from a need versus resource standpoint) to schedule one class of twenty students or five classes of four students? (m)

A frequent concern which should be considered an enhancement proposal was for the data base maintenance. Each of the activities believed that the maintenance of the data base would be a substantial workload and that they could not tolerate another separate update requirement similar to NITRAS.

A preliminary analysis was made as to the proposed enhancements which should be studied in greater detail. They are as follows:

1. Maintenance procedures.

2. Incorporation of billet data into the data base.

3. Identification of times by instructor for the various support workload categories.

4. Data base modifications; e.g., additional NEC fields, etc.

REVIEW BY EVALUATION TEAM

The major objective of the field test was to reach a decision regarding the usefulness of the DOTS models (SCRR and TPF) to Navy training managers. Review meetings with key personnel from each activity were scheduled on 2 and 3 March. These were individual meetings conducted by TAEG at which a presentation was made by IBM on the field test results.

COLLECTION AND ANALYSIS OF FIELD TEST DATA. The primary input to the field test results was a questionnaire completed by twenty-five COMTRAPAC and activity staff personnel and department/division heads. The purpose of the questionnaire was to identify existing and potential workload in the areas where the DOTS models and data base might be of assistance. A separate questionnaire sheet was prepared for each of the nine previously identified "Potential Modeling/Data Base Applications." The questionnaire formats are shown in Appendix C.

The questionnaires were summarized to show the manhours expended on each potential application by activity (including COMTRAPAC). The results of this summarization are shown in Table 2.

It was recognized that not all manhours identified against the applications could be saved by use of the models. Therefore the following "Savings Rationale/Assumptions" were made, and are the basis for the figures in the COMTRAPAC Activities Manhour Summary displayed in Table 2.

1. Fifty percent of the identified effort was associated with collecting and manipulating data on the problem.

2. The remaining 50 percent of the time was devoted to human analysis and corresponding judgmental activities.

3. The models and data base could save the time associated with data collection and manipulation.

4. Additionally, where the manhours identified appeared to reflect a misinterpretation of the application, the hours were adjusted before applying the preceding assumptions.

TABLE 2. COMTRAPAC ACTIVITIES MANHOURS SUMMARY

APPLICATION	COMTRAPAC	ASW	FITCPAC	NWTGP	FCDSTCP	FTC	TOTAL
PERSONNEL REDUCTIONS	75	656	240	85	350	302	1,708
TRAINING LOAD CHANGE	120	5,872	60	137	988	60	7,237
INSTRUCTOR REQUIREMENT ASSESSMENT	0	296	0	50	132	58	536
MILCON/BFRL ANALYSIS	60	1,160	0	0	260	512	1,992
TRAINER UTILIZATION	0	196	0	0	786	0	982
DATA CALCULATIONS	0	1,226	450	2,070	40	317	4,103
QUOTA CONTROL	48	0	0	96	103	941	1,188
DATA BASE EXCEPTION REPORTING	250	400	0	96	494	44	1,284
EQUIPMENT CONSTRAINT ANALYSIS	0	262	0	0	362	90	714
ADDITIONAL APPLICATIONS	0	520	0	0	0	0	520
TOTAL	553	10,588	750	2,534	3,515	2,324	20,264

The total questionnaire results including benefits and comments, as well as field test background information was presented to each activity. A copy of the complete presentation is reproduced in Appendix D.

POSITION STATEMENTS AND DECISION BASED ON FIELD TEST RESULTS. Each of the activities were formally requested to prepare a position statement regarding the usefulness of the DOTS models and data base to the management of their activity. Comments, qualifications, and recommendations were to be incorporated into the position statement. A representative sample from the position inputs is paraphrased below.

DOTS models as they presently exist are deficient in several ways.

- No NITRAS interface is established for updating the data base.
- Outputs from DOTS models are subject to misinterpretation, especially since instructor support time categories are not identified.
- The models do not address either cost or student related problems.
- Solutions are based upon onboard personnel rather than billets.

Incorporation of recommended enhancements to correct identified deficiencies could make DOTS models useful as management tools, however, the extent to which they would assist the management of training cannot be determined at this time and will require further evaluation.

It is recommended that liaison be maintained with the activity to define modifications and to determine the extent to which viable models can be applied. Activities, however, are more absorbed in day-to-day operational situations rather than longer range planning, therefore, a more palatable system would be one which aided the solution of these types of training management problems.

No clear basis for a decision to continue toward implementation appears from an analysis of the position statements. They do, however, suggest the need for:

1. Modifying the models and data base to incorporate suggested enhancements.
2. Continuing the evaluation once the enhancements are added until a firm decision can be reached.

Therefore, a further analysis of the proposed changes is being made. Certain ones of these will be incorporated during the March through June period. COMTRAPAC and activity personnel will be trained in the use of the models, data base, and maintenance procedures in June and July. The decision to proceed beyond that point will be made in July 1976.

28

SECTION III

CONCLUSIONS AND RECOMMENDATIONS

This section of the report addresses the application of models within Navy training in the context of the system characteristics, especially those that are relevant to the successful (or unsuccessful) use of models. Some general observations of the system features are initially presented; this is followed by a discussion of their effects upon the application of models. Conclusions from the foregone analysis are summarized and are followed by a series of recommendations for improving the usefulness of management science techniques; e.g., modeling, to Navy training management.

CONCLUSIONS

GENERAL OBSERVATIONS OF TRAINING SYSTEM. The training system is a subsystem within a much larger and rather rigidly structured system -- the military. The ability of the training system to plan and operate is directly influenced by several features of this larger system, primarily by the personnel planning and operating characteristics as well as by the resource management system. Also, a major driver of the manner in which training is managed is the continuing congressional scrutiny of operations and resources. The view at the operating level that resources will always be taken away when not needed, but rarely returned to handle additional workload, leads training managers to be highly protective of the resources they presently have. Some of the more specific characteristics of the personnel and resource systems which affect the management of training can be summarized as follows.

Personnel System Influences. The Navy exists in a state of readiness prepared to engage in military action if required. Thus, the personnel system is designed to ensure that qualified people are available to operate, maintain, and support a variety of naval weapons systems. To conserve the supply of technical skills, a balance must be maintained between the number of reenlistees, the numbers of personnel continuing to gain experience in their skill on the job, and those being trained or retrained in a skill category. To meet all of these demands, personnel must be rotated on a periodic basis between fleet and shore assignments. Thus training officers, while generally experienced to command, do not normally have experience in managing in the terms connoted by management within the industrial sector. This comparison does not imply that management in these two environments should be exactly the same; however, there are basic principles which should be applied by managers, whether in the military or in industry.

One of the principles applicable to either sector is the effective and efficient use of resources. The military training officer, however, is faced with somewhat of a paradox. On one hand he is taught the importance of readiness which promotes the maintenance of resources in a standby mode (just in case they may be needed); on the other hand, the accepted management approach in the industrial sector would be to control the level of resource consistent with varying requirements. Considering the relative rigidness of the personnel system, and the attendant difficulty it presents the training manager in increasing staff size (or sometimes in even getting personnel to fill existing billets), it is proper to question whether application of the management principle under discussion would improve overall management effectiveness.

Resource Management System. As a governmental service function without profit incentive, there appears to be little motivation to reduce expenses except as necessary to achieve the budgeted amount. Pure cost reduction initiatives as might exist in the industrial sector for increasing profits do not appear to be important factors in managing training, especially at the operating level. The primary objective seems to be to spend up to (as close as possible) but not over the budget.

Another rigidity in the resource system stems from the different appropriations (e.g., O & MN, MPN, OPN, etc.) and the relative inability of training managers to make tradeoffs between them. A major question, as with respect to the personnel system, is whether managers could be more effective if they gave up resources when they were not needed and then battled to regain them when a new need arises.

Planning System. The major focus of of much of the planning activity appears to be on the week to week scheduling of instructor and facility resources made necessary by fluctuating input levels. Considerable emphasis is placed on reacting to fleet operational requirements and planning for contingencies is hampered by a variety of factors most major of which is a decided lack of a consistent, timely and accurate data base from which sound planning can take place. The characteristics of the plan data necessary to support external requirements channel the limited planning assets available into production of numerical data. Consequently, most activities are unable to establish planning as a process promoting awareness of potential future problems so that they can be handled more effectively if and when they occur.

From observing training planning at the training operations level, it appears that good planning will be accomplished only if 1) it is required, and 2) there is some benefit to the planner; e.g., it reduces his overall workload or helps him avoid future problems.

PROBLEMS IN THE APPLICATION OF MODELS TO NAVY TRAINING. Models by their very nature require a fairly well definable system operating with some degree of consistency. If the system consistently deviates from normal practices, real data used to drive the model may produce "noise" making interpretation of output data difficult or potentially misleading. Deviation in this context refers to any practices that are not, or cannot, be included in the model logic.

For a model to effectively help the training manager, it must:

- Tell him something he doesn't know or cannot pinpoint.
- Justify his assumed position; e.g., the department is short of resources.

- o Produce output in a form that can be easily used to support a particular position.
- o Be manpower and cost effective.
- o Be accurate.

So for models to be applied effectively to the management of naval training, they must have technical validity. That is, they must project a reasonable picture of the system, as an output, given accurate data on the system as input. Also, when system variables are changed, the corresponding changes in output should again project a reasonable picture of the actual system in its changed state.

But technical validity is only one of the requirements for effective use of models. Another major requirement relates to the motivation of the model users. They must recognize some benefit from using models, and these benefits must outweigh the costs and other liabilities. This motivation may be lacking for a number of reasons, for example:

- o The model output does not depict conditions as they actually exist, either because the input data are not accurate, the processing logic is in error (this is a problem in technical validity), the output picture is incomplete, or the output is subject to misinterpretation.
- o The model output is accurate but exposes aspects of the system operation which are not consistent with the manager's view (or the view he projects to higher levels of command).
- o The model output does not reveal new information on which improved decisions could be made.
- o The model projects conditions beyond the operational and planning period of interest to the manager.

Even if model outputs could project a reasonably valid and useful view of training conditions, there may be little motivation for the training manager to structure a "what if" situation (modify the necessary input variables) for running the model.

One of the conditions mentioned for valid model output is accurate input. This generally implies that a data base be maintained with relatively current information. Data base maintenance can result in a substantial workload for training staffs. Navy training is presently implementing NITRAS which requires a significant maintenance workload at the activity level (at least in relation to the perceived benefits). It is not reasonable to expect activities to duplicate inputs in order to maintain separate data bases. The activity should view data inputing and data maintenance of multiple data bases as an integrated system where any data element residing in more than one data base is defined only once at the activity level. The propagation of data to multiple data bases should be transparent to the user at the activity level.

SUMMARY CONCLUSIONS ON THE APPLICATION OF MODELS IN THE NAVAL EDUCATION AND TRAINING ENVIRONMENT. The conclusions reached as a result of the field test at COMPTRAPAC are, in general, consistent with those identified in prior evaluations of the use of models within naval training activities.

1. The present naval training system is influenced, and essentially driven, by external systems over which it has little or no control. It therefore must operate within the constraints of those systems; namely, the personnel and resource management systems.

2. Training managers have little motivation to manage resources up and down in relation to requirements because of the rigidities imposed by these external systems. The primary operational objective appears to be to maintain a level input and thus a steady resource level. There are many techniques available for accomplishing this at the present time.

3. Models, and especially data bases, which would be available to all command levels are viewed as a threat by the training center levels since they may be used to "squeeze out" excess resources without the corresponding benefit of justifying additional resources when required.

4. The most beneficial types of data processing support at the activity level can be categorized as follows:

   - Scheduling tools which facilitate optimizing the use of resources; namely, instructors and facilities.

   - Locally accessible data bases and computational programs which permit rapid assessment of resource requirements with changing input demand.

5. A system of models in order to be effective requires a closer coupling between the various command levels. This coupling must promote a willingness to interallocate resources within a functional command permitting variations in resources, both up and down, at the activity level. Models, then, would be used to justify new and existing resource requirements at the activity and functional command levels, and would promote a more equitable distribution of those resources.

6. There are some indications that the management change

required for the effective use of models is occurring in an evolutionary way. One evidence of this is the manning of activities to meet recurring requirements with an increasing tendency to share resources for peak demands. Because of this trend, there is a reasonable expectation that models would receive an objective evaluation at the functional command level, with a good chance of a positive evaluation regarding their utility.

RECOMMENDATIONS

The major recommendations based upon the preceding conclusions are:

1. Identified enhancements be incorporated.

2. Activities should identify key personnel to interface with the DOTS models/data base system to:

    a. structure inquiries

    b. perform data base maintenance

3. COMTRAPAC should identify a key individual who will be responsible for:

    a. inputing data base changes to NCSS

    b. ensuring data integrity

    c. controlling changes

    d. performing all RAMIS functions necessary to recoup from data or program errors

    e. identifying and programming RAMIS reports for COMTRAPAC and its activities

4. Train activity and COMTRAPAC personnel identified above to the level required to perform their defined functions.

5. Additionally, train Logistics and Plans Division personnel in the operations, use, and capabilities of the models for application at the functional command level.

6. Conduct additional model/data base evaluation at the COMTRAPAC level, specifically with the Logistics and Plans Division.

7. Obtain strong CNET support for the identified applications of models at the functional command level, and for the management philosophies required for their effective use. Without this support, there is little likelihood that models will be effectively applied within the training command.

APPENDIX A

MEETINGS ATTENDEES

APPENDIX A

MEETINGS ATTENDEES

8 January 1976 - COMTRAPAC

NAME	RANK	COMMAND	TELEPHONE
M. R. WASHBURN	CIV	FLETRACEN	235-1611
J. P. CROWDER, JR	CDR	FASWTCP	225-3301
B. G. SMITH	CDR	FITCPAC	225-3326
H. A. SANSOUCY	CIV	FITCPAC	225-3326
M. G. ORBANN	LTJG	FLETRACEN	235-1611
W. G. YOUNG	LCDR	NWTGP	437-7576
P. J. SHELDON	LTJG	NWTGP	437-5026
C. KELLOGG	LTJG	NWTGP	437-7557
D. PLUNNECKE	LCDR	COMTRAPAC	225-4556
A. G. ROACH	LCDR	FASWTCP	225-4400
A. F. ROBB	STCS	FASWTCP	225-3310
M. H. LEPICK	LT	FASWTCP	225-4400
R. C. ALBRIGHT	LCDR	FASWTCP	225-3310
J. R. BRIANT	CIV	COMTRAPAC	225-4219
F. MC CURLEY	CIV	NWTGP	437-7569
P. W. CURRY	LT	COMTRAPAC	225-4219
C. J. MICHAEL	LTJG	COMTRAPAC	225-4219
N. WALLACE	CIV	NATIONAL CSS	286-9635
R. E. MC CUTCHEON	CIV	FCDSTCP	225-6334

19 January 1976 - NWTGP

NAME	RANK	CODE	TELEPHONE
W. J. STURGEON (XO)	CDR	01	437-7566
C. D. KELLOGG	LTJG	11	437-7557
R. E. HALLMAN	CIV (IBM)	-	305-783-0043
E. NICHOL	LT	40	437-7274
M. G. MIDDLETON	CIV (TAEG)	-	305-646-5198 AV-791-5198
H. M. WINFREY	CDR	50	437-5954
R. P. TOETTCHER	MAJ	70	437-5954
J. D. DEHLER	CDR	50	437-7553
F. MC CURLEY	CIV	14	437-7569
R. E. POWELL	LCDR	30	437-7571
C. WACK	CDR	60	437-7554
W. G. YOUNG	LCDR	10	437-7567

21 January 1976 - FLETRACEN

BRUCKNER, J. W.	LCDR	50	235-1637
BAILEY, P. E.	LCDR	10	235-1601
GUTTERREZ, Z. R.	CWO-3	11	235-1621
STURVIST, G. H.	LCDR	05	235-1641
FIKE, D. C.	LTJG	06	235-1660
OTTO, V. F.	FTCM	42	235-1524
ORBANN, M. G.	LTJG	021	235-1611
SMITH, P. D.	CDR	20	235-2361
GALLAGHER, T. M.	LCDR	40	235-1661
BRIGGS, L. J.	LTJG	21	235-2634
HAMMOND, T. J.	LCDR	30	235-2634
RUCH, M.(XO)	CDR	01	235-1601
SHEMANSKI, F. B.(CO)	CAPT	00	235-1601

22 January 1976 - FASWTCP

NAME	RANK	CODE	TELEPHONE
H. G. WENZEL (CO)	CAPT	00	225-3303
L. E. MENCH (XO)	CDR	01	225-3303
F. R. JOHNS	CDR	02	225-3305
P. M. FAGAN	LCDR	02B	225-4413
D. D. THOMSON	LT	23	225-4411
D. F. WALSH	LT	25	225-4412
J. P. CROWDER, JR.	CDR	03	225-3301
R. C. ALBRIGHT	LCDR	30	225-3310
A. F. ROBB	STCS	30A	225-3310
L. M. WHITE	STGC	30B	225-3310
M. H. LEPICK	LT	31A	225-4400
A. G. ROACH	LCDR	31	225-5134
R. CLAUSEN	STCM	22	225-4418
M. A. SKUBINNA	CAPT	06	225-5311

22 January 1976 - FITCPAC

B. G. SMITH (CO)	CDR		225-3326
H. A. SANSOUCY	CIV		225-3326

23 January 1976 - FCDSTCP

NAME	RANK	CODE	TELEPHONE
R. MC CUTCHEON	CIV	00E1	225-6331
G. E. DENN, JR.	LCDR	35	225-6263
R. M. GABRYELSKI	LCDR	33	225-7511
D. M. SCHWARTZ	LCDR	34	225-6529
J. W. CASHIN	LCDR	41	225-7654
W. C. DUNHAM	CDR	03	225-7034
G. G. LOSLI	LT	37	225-6374
M. L. WHITEHEAD	LT	36	225-7635
B. A. MAC DONALD	CDR	32	225-7347
W. E. SMITH	OSCS	41A	225-7017

APPENDIX B

DOTS DATA ELEMENT DEFINITIONS

APPENDIX B

DOTS DATA ELEMENT DEFINITIONS

COURSE CARD 1 (Enter 1 in Column 80)

FIELD NAME	FORM	DEFINITION
CDP	AAAA	The CDP code is the unique 4 position alphanumeric identifier code for each course taught in the Navy (from NITRAS).
CTLG	A-AAA-AAAA	This is the 10 position alphanumeric CIN code used in the Catalog of Navy Training Courses (CANTRAC). This code is identical for the same course taught at different locations (from NITRAS).
CRS	A16	This is the 16 character name of the course (Activity Short Name from NITRAS).
CONV 1	NNN	This is the annual number of convenings for the course planned for the current fiscal year (from NITRAS).
LEN 1	NN(.)N	This is the length in days including weekend days, of the course for the current fiscal year (from NITRAS).
CAP 1	NNN	Current limiting capacity (normal capacity) for the course. This is the lesser of the numbers for PERSONNEL, EQUIPMENT, and SPACE from NITRAS.
BCAP 1	NNN	This is the current number of seats in the course allocated to BUPERS or other agencies and not available for local quota control (locally obtained).
DMD 1	NNNNN	This is the current total anticipated annual demand for the course (from NITRAS).
BDMD 1	NNNNN	This is the current annual demand for the course for students detailed by BUPERS and other agencies (locally obtained).
OFST		Leave blank.
PFAIL	N(.)NNN	This is the current historical (last 12 months) failure rate for the course (from NITRAS).

NADIS	N(.)NNN	This is the historical (last 12 months) non-academic disenrollment rate for the course (from NITRAS).
NO SHOW	N(.)NNN	This is the historical (last 12 months) no-show rate experienced by the course. This rate is determined as the percentage of those scheduled for the course that did not attend or cancel (locally obtained).
SETB	N(.)NNN	This is the historical (last 12 months) set back rate for the course (from NITRAS).
BKLG	NNNN	This is the length in weeks that a student must wait for a local quota for a course (locally obtained).
JNO		Leave blank.

COURSE CARD 2 (Enter 2 in Column 80)

CDP	AAAA	Same as CDP on Card 1.
CONV 2	NNN	Same as CONV 1 on Card 1 but for FY77.
LEN 2	NN(.)N	Same as LEN 1 on Card 1 but for FY77.
CAP 2	NNN	Same as CAP 1 on Card 1 but for FY77.
BCAP 2	NNN	Same as BCAP 1 on Card 1 but for FY77.
DMD 2	NNNNN	Same as DMD 1 on Card 1 but for FY77.
BDMD 2	NNNNN	Same as BDMD 1 on Card 1 but for FY77.
CHWK 2		Leave blank.
CONV 3	NN(.)N	Same as CONV 1 on Card 1 but for FY78.
LEN 3	NN(.)N	Same as LEN 1 on Card 1 but for FY78.
CAP 3	NNN	Same as CAP 1 on Card 1 but for FY78.
BCAP 3	NNN	Same as BCAP 1 on Card 1 but for FY78.
DMD 3	NNNNN	Same as DMD 1 on Card 1 but for FY78.
BDMD 3	NNNNN	Same as BDMD 1 on Card 1 but for FY78.
CHWK3		Leave blank.

PAOB		Leave blank.
AFAIL	N(.)NNN	This is the allowed or standard failure rate. Enter 0060 in absence of better data.
PRTY	NN	This is the 2 digit course priority code (from NITRAS).
CTYPE	AA	This is the 2 position type code for the course (i.e., fleet, A, C, etc.) (from NITRAS).
PNEC	NNNN	This is the primary NEC code for those courses granting NEC's (from NITRAS).
SCH	NAAA	The first portion (Co. 71) will be coded as follows: 4 - NWTGP 5 - FITCPAC 6 - FLETRACEN 7 - FCDSTCP 8 - FASWTCP The remaining three positions (Cols 72-74) can be any alphanumeric designation identifying the organizational unit into which the course is to be grouped, e.g., NAV.
SUIC	AAAAA	This is the Staff Unit Identification Code (from NITRAS).

COURSE CARD 3

CDP	AAAA	Same as prior definitions for CDP.
UCAP	NNN	The ratio of the total number of students enrolled in the course over a one year period to the annual class capacity. (Use fiscal year - to - date data).
UDEM		Leave blank.
FPRTY		Leave blank.
RDTE	YYMMDD	This is the date on which the course curriculum was last reviewed (Review Date).

HSETB		Leave blank.
TINSTER	NN.N	This is the total instructor required number from the Instructor Computation Form.
CCMM	AAAAAAAAAA	COMTRAPAC will complete this field.

FACILITIES FILE LOAD CARD

SCH	NAAA	See prior definition.
CDP	AAAA	See prior definition.
BLDG	AAAAA	The name or number of the building in which a classroom or laboratory space is located.
RM	AAA	The name or number of a classroom or laboratory space.
RMCAP	NNN	This is the number of permanent seats, lab positions, trainer positions, etc., which can be utilized by students.
RMPT	N	This is the type of training for which the space is utilized and is coded as follows: 1 - used for theory 2 - used for lab 3 - used for theory and lab 4 - designates a trainer
REQHRS	NNNN.N	Required hours represent the number of hours the indicated space is required to convene one session of the referenced course.
AVHRS	NNNNN	The number of hours, on an annual basis, the space is available for instructional purposes.

INSTRUCTOR FILE TYPE - 1 - CARD

ID	NNNNNNNNN	Social Security Number of Instructor
NME	A16	Instructor's last name.
IN	AA	Instructor's initials.
RATE	AAAAA	Instructor's rate or rank; e.g., PN1 or LCDR (left justify).

SCH	NAAA	See prior definition.
REP	YYMM	This is the date the Instructor reported on board.
ROT	YYMM	This is the Instructor's planned rotation date.
PNEC	NNNN	This is the Instructor's Primary NEC (if none leave blank).
SNEC	NNNN	This is the Instructor's Secondary NEC (if none, leave blank).

INSTRUCTOR FILE TYPE - 2 - CARD

ID	NNNNNNNNN	See prior definition.
NME	A16	See prior definition.
IN	AA	See prior definition.
SCH	NAAA	See prior definition.
CDP	AAAA	Enter CDP (one per line) for each course an instructor is qualified to teach.
TTL	-	Leave blank.
CTYP		Leave blank.
ASN	N	Enter a 1 if the instructor is assigned to teach this course; enter Ø if the instructor is qualified but is not assigned to teach.
QUAL	NNN	This is the percent; e.g., 090, that the instructor is qualified to teach.
SIR	NN.N	This is the student/instructor ratio from the Instructor Computation Form. A CDP may have more than one SIR; make one line entry per SIR.
CHRS	NN.N	The number of instructional contact hours taught at a given ratio of trainees per instructor. A contact hour represents sixty minutes of instruction. This refers to clock hours of curriculum time devoted to actual instruction, exclusive of breaks, administrative time, lunch, medical, dental, etc.

INSTRUCTIONS:

1. The Form Column is interpreted as follows:

   A - the field can contain any alphabetic or numeric character.

   N - the field can only contain numeric characters.

   - - insert a dash in this column.

   . - insert a decimal point in this column.

   (.)- this represents an assumed decimal position and is not written on the form.

   Ann - Eg. A16 - this represents an alphanumeric field of nn positions eg. 16.

2. Left zeros need not be inserted.

3. When data are repeated from line to line, indicate with a wiggly line down the column.

4. Questions can be addressed to:

   Larry Duffy - 225-4216/17
   Ron Yanko - 225-4216/17

45

APPENDIX C

FIELD TEST QUESTIONNAIRE SAMPLES

INFORMATION SHEETS

FOR

DOTS MODELS/DATA BASE

COST/BENEFIT ANALYSIS

Attached are information sheets outlining nine potential applications for the DOTS Models and associated Data Base. These were identified in interviews of key COMTRAPAC Activities personnel by members of the DOTS development team over the past few weeks. An initial assessment of the utility of the models and data base will be made from the information obtained on these information sheets.

Several additional blank sheets are also provided for identifying applications not obtained in the interviews.

Please complete each of the sheets for your area of responsibility. Department heads should include all efforts on a particular application performed within their department. Command level offices, e.g. Training Office, should report only on their particular efforts. The objective, however, is to obtain a complete picture of potential applications at each activity.

The application categories previously identified are meant to suggest broad evaluation and assessment workload requirements which may result from higher level command requests, or which may be self generated in performing the planning and control function at your activity. If they suggest a similar application, that can be clarified by providing additional comments. The reverse side of the sheets can also be used to document additional detail.

The completed sheets will be picked up by the DOTS personnel on Friday, February 27th. They should be forwarded to the DOTS liaison official at your activity prior to that time.

If there are any questions, DOTS personnel (Mr. Ron Yanko and Mr. Larry Duffy) can be contacted at 225-4219 or 225-3619.

Thank you for your cooperation in providing this information.

Application (Previously identified by COMTRAPAC Activities)

1. Assess the effects of reducing service training related manpower by some specific percentage; eg. 5 percent, 10 percent or 30 percent.

Frequency (e.g., 6 per month, 10 per year, etc.)

Manhours/Occurrence (e.g., 100 manhours total, 5 people for 20 hours each, etc.)

Task Typically Performed By (i.e., Officer, Enlisted, Civilian)

How Task is Typically Performed (e.g., manually, pen and pencil, calculator, brainstorming, etc.)

If Task is not currently performed, would it be performed if appropriate methods/tools were available (If this is the case, please project each of the previous categories)

Additional Comments: (optional)

Information Sheet for DOTS Models/Data Base Cost/Benefits Analysis

- Application (Previously identified by COMTRAPAC Activities)

  2. Assess capability to handle an increased training load for a specific course using existing instructor and facility resources; eg. GMT A-School load increases from 220 in FY 76 to 340 in FY 78.

Frequency (e.g., 6 per month, 10 per year, etc.)

Manhours/Occurence (e.g., 100 manhours total, 5 people for 20 hours each, etc.)

Task Typically Performed By (i.e., Officer, Enlisted, Civilian)

How Task is Typically Performed (e.g., manually, pen and pencil, calculator, brainstorming, etc.)

If Task is not currently performed, would it be performed if appropriate methods/tools were available (If this is the case, please project each of the previous categories)

Additional Comments: (optional)

Application (Previously identified by COMTRAPAC Activities)

9. Analyze equipment utilization and constraint effects from varying team training demands and resulting queries. Determine sensitivity of throughput capability to different demands.

Frequency (e.g., 6 per month, 10 per year, etc.)

Manhours/Occurence (e.g., 100 manhours total, 5 people for 20 hours each, etc.)

Task Typically Performed By (i.e., Officer, Enlisted, Civilian)

How Task is Typically Performed (e.g., manually, pen and pencil, calculator, brainstorming, etc.)

If Task is not currently performed, would it be performed if appropriate methods/tools were available (If this is the case, please project each of the previous categories)

Additional Comments: (optional)

50

Information Sheet for DOTS Models/Data Base Cost/Benefits Analysis

Application (Additional items not previously identified)

Frequency (e.g., 6 per month, 10 per year, etc.)

Manhours/Occurence (e.g., 100 manhours total, 5 people for 20 hours each, etc.)

Task Typically Performed By (i.e., Officer, Enlisted, Civilian)

How Task is Typically Performed (e.g., manually, pen and pencil, calculator, brainstorming, etc.)

If Task is not currently performed, would it be performed if appropriate methods/tools were available (If this is the case, please project each of the previous categories)

Additional Comments: (optional)

APPENDIX D

DOTS MODEL/DATA BASE FIELD TEST RESULTS SUMMARY

DOTS

MODEL/DATA BASE

FIELD TEST

RESULTS SUMMARY

FIELD TEST APPROACH

- 8 JAN KICKOFF
- DATA COLLECTION AND PURIFICATION
- 19-23 JAN ACTIVITY BRIEFINGS
- DEPARTMENT/DIVISION INTERVIEWS AND DEMONSTRATIONS
- COST/BENEFIT ANALYSIS INFORMATION QUESTIONNAIRE
- COMTRAPAC/ACTIVITY UTILITY ASSESSMENT

COMTRAPAC/ACTIVITY UTILITY ASSESSMENT

- NINE GENERAL APPLICATIONS IDENTIFIED DURING ACTIVITY INTERVIEWS

- QUESTIONNAIRE DEVELOPED TO ASSESS EFFORT EXPENDED ON EACH APPLICATION
  - FREQUENCY
  - MANHOURS/OCCURRENCE
  - WHO DOES
  - TECHNIQUE

- QUESTIONNAIRE RESULTS SUMMARIZED
  - ACTIVITY BY DEPARTMENT/DIVISION
  - COMTRAPAC BY ACTIVITY
  - TOTAL BY APPLICATION

- KEY COMMENTS SUMMARIZED

COMTRAPAC ACTIVITIES MANHOURS SUMMARY

APPLICATION	COMTRAPAC	ASW	FITCPAC	NWTGP	FCDSTCP	FTC	TOTAL
PERSONNEL REDUCTIONS	75	656	240	85	350	302	1708
TRAINING LOAD CHANGE	120	5872	60	137	988	60	7237
INSTRUCTOR REQUIREMENT ASSESSMENT	0	296	0	50	132	58	536
MILCON/BFRL ANALYSIS	60	1160	0	0	260	512	1992
TRAINER UTILIZATION	0	196	0	0	786	0	982
DATA CALCULATIONS	0	1226	450	2070	40	317	4103
QUOTA CONTROL	48	0	0	96	103	941	1188
DATA BASE EXCEPTION REPORTING	250	400	0	96	494	44	1284
EQUIPMENT CONSTRAINT ANALYSIS	0	262	0	0	362	90	714
ADDITIONAL APPLICATIONS	0	520	0	0	0	0	520
TOTAL	553	10,588	750	2534	3515	2324	20,264

ASW BENEFITS SUMMARY

- TOTAL ANNUAL APPLICATIONS - APPROX 300
- TOTAL ANNUAL MANHOURS - 10588
- POTENTIAL MANPOWER SAVINGS FROM APPLYING MODELS/DATA BASE - 2.5 MEN
- SAVINGS RATIONALE/ASSUMPTIONS
  - 50% OF IDENTIFIED EFFORT DEVOTED TO DATA COLLECTION AND MANIPULATION
  - 50% OF IDENTIFIED EFFORT DEVOTED TO ANALYSIS
  - DATA COLLECTION AND MANIPULATION TIME CAN BE SAVED USING MODELS/DATA BASE
- ADDITIONAL COMMENTS
  - DEPARTMENT 06 NOT INCLUDED IN ANALYSIS
  - APPROX 50% OF TOTAL IDENTIFIED EFFORT IS APPLIED TO THE ANALYSIS OF TRAINING LOAD CHANGES
  - ADDITIONAL APPLICATION IDENTIFIED TO USE DATA BASE INFORMATION TO COMPLETE CNET FORM 1500/8
  - MILCON/BFRL ANALYSIS AND DATA RECALCULATIONS ACCOUNT FOR ABOUT 20% OF TOTAL IDENTIFIED TIME

ASW COMMENTS SUMMARY

- PRESENT APPROACH PRECLUDES THOROUGH ANALYSIS DUE TO TIGHT DEADLINES
- HARD COPY OUTPUT FROM ANALYSES MAY BE USED AS SUPPLEMENTS TO JUSTIFICATIONS/INFORMATION INPUTS, ETC.
- BFRL PREPARATION COULD BE SIMPLIFIED IF FACILITY LOADING COMPUTERIZED
- IMPROVED ACCURACY/REDUCED RESPONSE TIME/REDUCED TOTAL EFFORT WOULD RESULT FROM MODEL/DATA BASE USAGE

FTC BENEFITS SUMMARY

- TOTAL ANNUAL APPLICATIONS - APPROX 225
- TOTAL ANNUAL MANHOURS - 2324
- POTENTIAL MANPOWER SAVINGS FROM APPLYING MODELS/DATA BASE - .4 MAN
- SAVINGS RATIONALE/ASSUMPTIONS
  - ABOUT 50% OF MANHOUR ESTIMATES APPEAR TO DEAL WITH STUDENT ORIENTED PROBLEMS AND WERE ELIMINATED FROM THE COST/BENEFITS ANALYSIS
  - 50% OF IDENTIFIED EFFORT DEVOTED TO DATA COLLECTION AND MANIPULATION
  - 50% OF IDENTIFIED EFFORT DEVOTED TO ANALYSIS
  - DATA COLLECTION AND MANIPULATION TIME CAN BE SAVED USING MODELS/DATA BASE
- ADDITIONAL COMMENTS
  - HALF OF DEPARTMENTS INPUTTING INDICATED NO INVOLVEMENT WITH IDENTIFIED APPLICATIONS PROBABLY DUE TO A PREJUDGMENT OF DOTS APPLICABILITY

FTC COMMENTS SUMMARY

- SOLUTIONS TO PROBLEMS ARE RELATIVELY OBVIOUS
- NOT NECESSARY TO USE COMPUTERS TO PERFORM TASKS
- QUALITY OF TRAINING NOT ADDRESSED BY MODELS
- DOTS VALUE QUESTIONABLE DUE TO PERSONNEL AND FACILITY CONSTRAINTS
- ADDITIONAL FACTORS IN ANALYSES REQUIRE MANAGER'S JUDGMENT AND EXPERIENCE
- MODELS CANNOT PRODUCE IMPACT STATEMENTS
- DOTS PRINTOUTS REVEALED DATA NOT PREVIOUSLY AVAILABLE

FITCPAC BENEFITS SUMMARY

- TOTAL ANNUAL APPLICATIONS - APPROX 15
- TOTAL ANNUAL MANHOURS - 750
- POTENTIAL MANPOWER SAVINGS FROM APPLYING MODELS/DATA BASE - .2 MAN
- SAVINGS RATIONALE/ASSUMPTIONS
  - 50% OF IDENTIFIED EFFORT DEVOTED TO DATA COLLECTION AND MANIPLUATION
  - 50% OF IDENTIFIED EFFORT DEVOTED TO ANALYSIS
  - DATA COLLECTION AND MANIPULATION TIME CAN BE SAVED USING MODELS/DATA BASE
- ADDITIONAL COMMENTS
  - DUE TO LIMITED NUMBER OF COURSES USE OF DOTS MODELS/DATA BASE WOULD NOT BE A SIGNIFICANT IMPROVEMENT OVER THE PRESENT SYSTEM

NWTGP BENEFITS SUMMARY

- TOTAL ANNUAL APPLICATIONS - APPROX 100
- TOTAL ANNUAL MANHOURS - 2534
- POTENTIAL MANPOWER SAVINGS FROM APPLYING MODELS/DATA BASE - .6 MAN
- SAVINGS RATIONALE/ASSUMPTIONS
  - 50% OF IDENTIFIED EFFORT DEVOTED TO DATA COLLECTION AND MANIPULATION
  - 50% OF IDENTIFIED EFFORT DEVOTED TO ANALYSIS
  - DATA COLLECTION AND MANIPULATION TIME CAN BE SAVED USING MODELS/DATA BASE
- ADDITIONAL COMMENTS
  - MAJORITY OF EFFORT IS PROJECTED RATHER THAN ACTUAL SINCE ANALYSES ARE NOT CURRENTLY PERFORMED
  - 80% OF TOTAL EFFORT IS ASSOCIATED WITH DATA CALCULATION AND MANIPULATION

NWTGP COMMENTS SUMMARY

- MANY OF THE IDENTIFIED ANALYSES ARE NOT CURRENTLY PERFORMED BECAUSE DATA AND TOOLS ARE NOT AVAILABLE

- MANAGEMENT JUDGMENT REQUIRED IN THE PLANNING OF RESOURCE APPLICATIONS REPRESENTS A MAJOR PORTION OF TOTAL ANALYSIS EFFORT

- DATA BASE WILL NOT BENEFIT THE TRAINING ORGANIZATION AT THE DEPARTMENT LEVEL. (MAY BE USEFUL TO CTP/CNET).

- TRAINING UNITS DO 90% OF THE PAPERWORK TO PROVIDE DATA TO HIGHER MANAGEMENT BUT RECEIVE ONLY 10% OF THE BENEFITS

- CONTINUAL ASSESSMENT OF THE EFFECTS OF REDUCING TRAINING RELATED MANPOWER IS ROUTINELY PERFORMED THROUGHOUT THE YEAR

- WE HAVE THE FLEXIBILITY TO COPE (WITH MINIMUM IMPACT) WITH A 25% INCREASE IN TRAINING LOAD IN ANY COURSE

FCDSTCP BENEFITS SUMMARY

° TOTAL ANNUAL APPLICATIONS - APPROX 500

° TOTAL ANNUAL MANHOURS - 3515

° POTENTIAL MANPOWER SAVINGS FROM APPLYING MODELS/DATA BASE - .9 MAN

° SAVINGS RATIONALE/ASSUMPTIONS
  - 50% OF IDENTIFIED EFFORT DEVOTED TO DATA COLLECTION AND MANIPULATION
  - 50% OF IDENTIFIED EFFORT DEVOTED TO ANALYSIS
  - DATA COLLECTION AND MANIPULATION TIME CAN BE SAVED USING MODELS/DATA BASE

° ADDITIONAL COMMENTS
  - APPROX 25% OF IDENTIFIED TIME WAS DEVOTED TO ANALYSIS OF TRAINING LOAD CHANGES
  - TRAINER AND EQUIPMENT UTILIZATION ANALYSIS ACCOUNTED FOR ABOUT 30% OF IDENTIFIED TIME
  - DEPARTMENT 04 NOT INCLUDED IN ANALYSIS

FCDSTCP COMMENTS SUMMARY

- PROJECT MORE FREQUENT EFFORT ON MOST OF THE APPLICATIONS IN THE FUTURE
- DECREMENT SCHEDULE MUST PRESENTLY BE MAINTAINED TO RESPOND TO CUT REQUESTS
- DATA MUST CONTINUALLY BE MANIPULATED TO RESPOND TO INTERNALLY AND EXTERNALLY GENERATED QUESTIONS
- THROUGHPUT CAPABILITY IS CONSTRAINED BY EQUIPMENT AVAILABILITY
- ASSESSMENTS NOT NOW PERFORMED WOULD BE IF TOOLS WERE AVAILABLE

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