

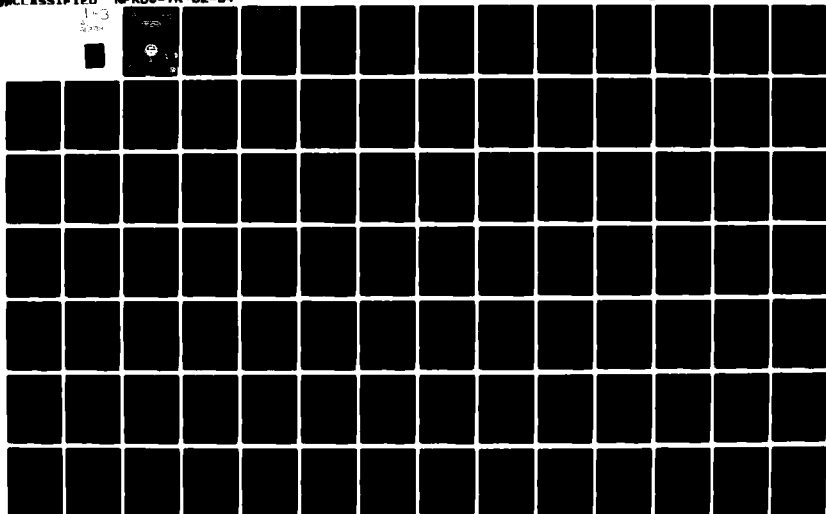
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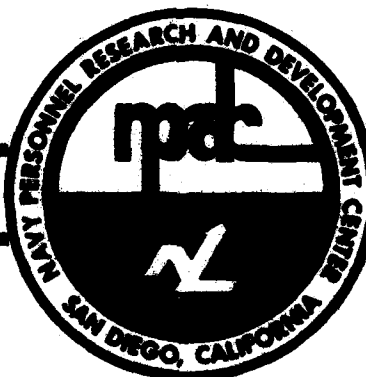
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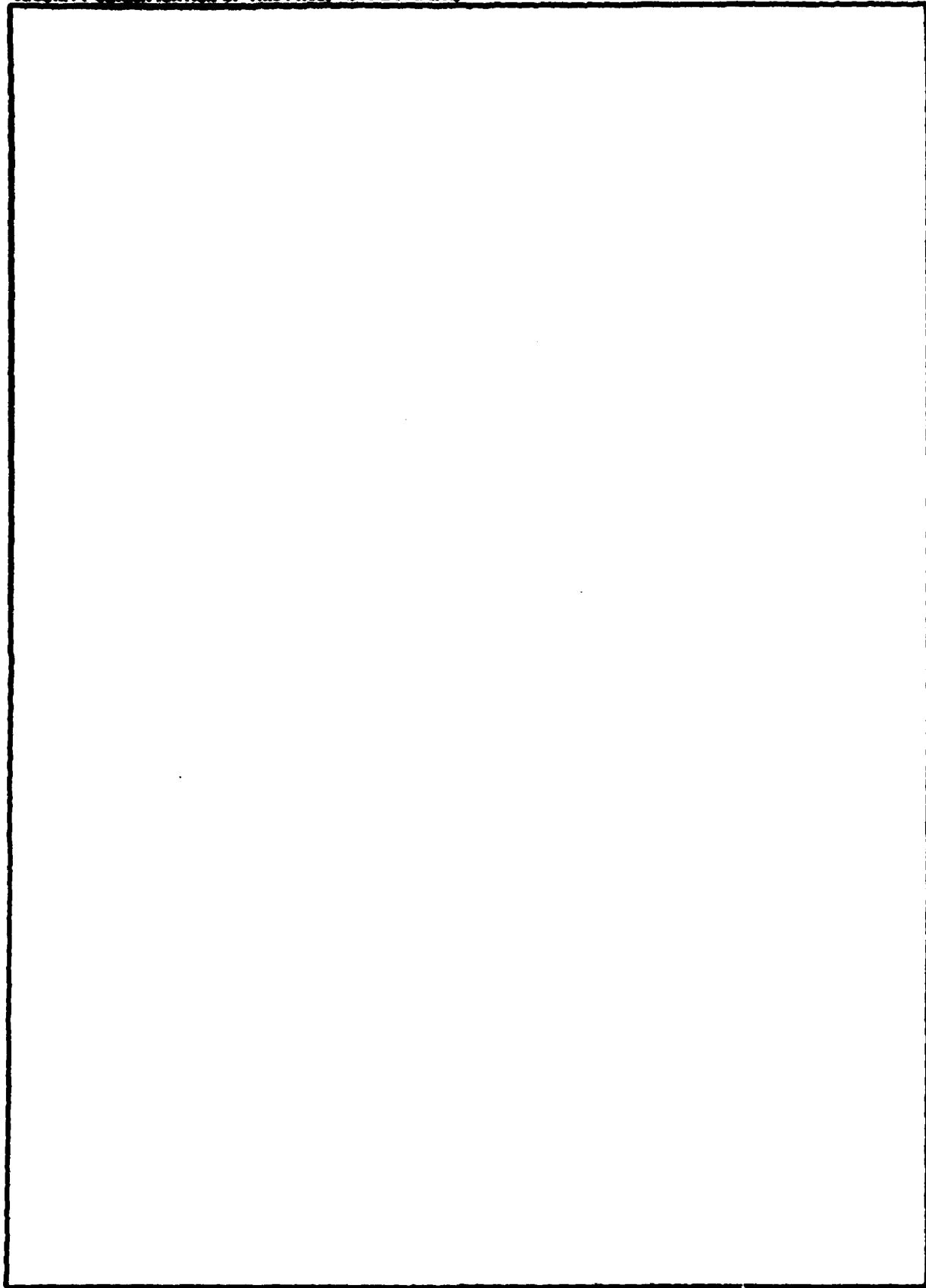
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FOREWORD

This report lists all unclassified technical reports, special reports, and technical notes that have been published by this Center from FY 1974 through FY 1981. Publications in each category are listed in chronological order under seven areas: Education and training, organization management, personnel administration, human performance, manpower management, R&D methods and techniques, and bibliographies, reviews, and summaries. All reports published by Navy personnel research organizations in San Diego and Washington, DC from FY 1949 to FY 1973 are listed in NPRDC TR 74-15 (Vols. I-IV).

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EDUCATION AND TRAINING

TECHNICAL REPORTS

Investigation of Rate-controlled Speech for Training Applications. TR 74-6. October 1973. J. H. Steinemann and O. A. Larson. (AD-769 689)

Two experimental evaluations were conducted to obtain empirical data on the effects of rate-controlled speech variables upon the listening comprehension of Navy trainees using representative Navy training materials. The results of the first experiment indicated that the intelligibility of rate-controlled recordings produced by a selective deletion device was significantly better than the intelligibility of recordings produced by a systematic deletion device. The results of the second experiment demonstrated that both speech rate and content difficulty have a significant, but essentially independent, effect upon listening comprehension. Flesch readability data suggest that the difficulty level of representative Navy training materials is too high for the intended population.

An Evaluation of the Use of Chemically Treated Answer Sheets. TR 74-9. March 1974. L. G. Harding, P. A. Salop, and K. A. Johnson. (AD-778 339)

The purpose of this effort was to evaluate chemically-treated answer sheets as part of a system of computer-managed instruction. The performance of a group of students using chemically treated answer sheets was compared with that of a group using optically scanable sheets in terms of time required to complete course material and errors on an end-of-course test. Results indicated that training time for students using the chemically-treated answer sheets and associated procedural changes was reduced by about 15 percent.

Retention of Text Information as a Function of the Nature, Timing, and Number of Quizzes. TR 74-28. February 1974. R. C. Anderson, J. R. Surber, W. B. Biddle, P. M. Zych, and C. E. Lieberman. (AD-780 515)

In two experiments, a total of 662 high school students read a prose passage, took a verbatim or paraphrase quiz, and a week later completed a verbatim or paraphrase delayed test. Taking a quiz significantly enhanced performance on the delayed test. Performance was consistently much higher on the verbatim than on the paraphrase forms of quizzes and tests. Fitting the data rather well was a theory that assumes that a verbatim question is best at evoking retrieval of phonologically coded information in short-term memory whereas a paraphrase question is best at instigating transfer of the information into long-term, semantic memory.

Development and Implementation of the Computer-assisted Instruction Study Management System (CAISMS). TR 74-29. February 1974. S. M. Alessi, R. C. Anderson, T. H. Anderson, W. B. Biddle, B. R. Dalgaard, D. W. Paden, H. R. Smock, J. R. Surber, and E. J. Wietecha. (AD-780 516)

The purpose of this project was to design, try out, and evaluate a system for maintaining attentive study of instructional materials. A computer-assisted instruction (CAI) system was used for this purpose but, in contrast to most CAI efforts, existing materials were used and students spent minimal time in on-line contact with the computer. The report includes a manual of procedures for preparing test items

EDUCATION AND TRAINING (Continued)

that maintain attentive study, evaluation of the system, cost projections for use of the system, and a suggested extension of the system.

The Role of Selected Organizational Variables in Learning from Written Instruction. TR 74-31. May 1974. J. F. Carter and C. Carrier. (AD-780 789)

In research aimed at improving the writing in Navy textual materials, two experiments were performed. In the first, the logical sequence of sentences and the manner in which ideas were subordinated were varied in a prose passage. Trainees with high and low verbal ability read the passage either once or three times, with total time equated. In the second experiment, the material was presented in a manner designed to increase the impact of the organizational variables.

Results of the first experiment indicated that organization had little effect on uncued immediate recall. Three rapid readings were superior to one slow reading. As expected, high verbal ability trainees were superior to those of low ability; the difference being associated with superior recall of the organizational structure. In the second experiment, logical sequencing had a significant positive effect only on cued recall following three readings.

Development and Validation of an Experimental Radiograph Reading Training Program. TR 74-33. June 1974. J. F. Brock, R. G. Wells, and M. L. Abrams. (AD-782 332)

An individualized program for training radiograph inspectors of welds is described. The program trained subjects better in 13 percent of the time required by the previous training program. The current nondestructive testing (NDT) certification procedure is criticized.

Computational Achievement of Group IV Trainees With a Self-study Format: Effects of Introducing Audio, Withdrawing Assistance, and Increasing Training Time. TR 75-11. September 1974. R. E. Main. (AD-A001 687)

A series of experiments using the practical arithmetic self-study (PASS) course was performed to determine levels of computational skills that could be achieved by Group IV trainees (personnel with marginally acceptable preinduction scores on the Armed Forces Qualification Test). The effects of providing supplementary audio materials, decreasing assistance from instructors, and increasing training time were investigated. In general, PASS course training was found to be highly effective in the printed format. Without direct assistance from instructors and with as little as 15 hours of instruction, the average level of performance was raised by approximately one full grade. Supplementing or replacing printed instructions with audio instructions produced no advantage. Extending training time to 24 hours allowed more trainees to complete the coursework and resulted in significantly higher gain scores. Criterion achievement was found to be related to initial levels of performance even for trainees who had completed most of the coursework. Implications of these findings are discussed with reference to the potential utilization of Group IV personnel.

EDUCATION AND TRAINING (Continued)

Acquisition of a Psychomotor Skill Using Simulated-task, Augmented Feedback (Evaluation of a Welding Training Simulator). TR 75-13. October 1974. M. L. Abrams, H. B. Schow, and J. A. Riedel. (AD-A000 818)

The present investigation evaluated the effectiveness of simulated-task, augmented feedback on acquiring a physically complex, continuous three-dimensional psychomotor skill. The device designed to provide the feedback was an arc-welding training simulator. Results indicated that simulated-task, augmented feedback is significantly superior to that provided by the task itself.

An Evaluation of Intercultural Relations Training For Navy Overseas Personnel. TR 75-18. January 1975. A. W. Lau and P. N. Blanchard. (AD-A005 365)

Relatively little data exists concerning the effectiveness of Navy intercultural relations (ICR) training programs. In addition, much training research in this area is characterized by methodological and design inadequacies. The purposes of this study were to design and test a methodological model and to provide an objective assessment of ICR training impact.

Results showed that that training had a modest but significant effect upon the attitudes of Overseas Duty Training (ODT)/Personnel Exchange Program (PEP) and Human Resource Development Center (HRDC) IDR Personnel. The attitudes of ODT/PEP personnel changed significantly on 13 of 24 scales; and those of HRDC personnel, on 9 of 24 scales ($p < .05$). Scales measured self-actualization, flexibility, tolerance of ambiguity, acceptance of self and others, leadership styles, and basic motivational patterns. The failure to detect a greater degree of change may have been due to various test ceiling effects or to the nature of the change process itself.

Computational Performance of Group IV Personnel in Vocational Training Programs. TR 75-23. February 1975. R. E. Main and R. J. Harrigan. (AD-A007 511)

This investigation concerns an evaluation of the performance of Navy Group IV personnel on limited sets of task-related computational operations. Training was tailored to the trainee's level of academic skill and courses were taught within the context of vocational training programs covering linear measurement and recipe conversion. Performance was evaluated both in terms of test score gains and skill level achievement.

For both types of vocational tasks, Group IV personnel achieved significant gains in computational skills as a result of training. However, the levels of computational proficiency achieved were judged to be inadequate for effective task accomplishment within relevant Navy ratings.

Analysis of Training Requirements in the Landing Force Training Commands (NSAP Project PHIB-6-73). TR 75-26. April 1975. C. R. Chiles and R. G. Ryan. (AD-A010 520)

Research was conducted to develop recommendations for improving training methods, equipment, and facilities at the Landing Force Training Commands (LFTCs), Atlantic and Pacific. Information was obtained through review of relevant documentation, interviews and conferences, and on-site visits to both LFTCs. Major conclusions of the study are that (1) implementation of the systems approach to

EDUCATION AND TRAINING (Continued)

course design would be a major step in improving LFTC course design methods, (2) greater use of mediated presentations may increase the efficiency of mobile training teams, and (3) computer system simulation technology could be employed to provide training for users of the new automated support systems currently being implemented in the amphibious community.

Training Mathematics Skills with Games. TR 75-28, April 1975. P. H. McCann. (AD-A009 364)

The goal of this endeavor was to test the efficacy of using games presented on the PLATO IV instructional system to provide remedial mathematics training for Basic Electricity/Electronics (BE/E) School trainees. Two learning tasks which provide the most difficulty for students were selected and instructionally programmed for the PLATO IV system. Drill and practice routines for the two tasks were prepared in three methods. Two games were designed that utilized PLATO IV display capabilities, along with a conventional problem presentation followed by answer feedback routine. Results showed no significant differences in performance or training time measures between the three training methods. Questionnaire data indicated that students who experienced both game mathematics practice and conventional practice definitely preferred game practice. Due to favorable student reaction to game practice, further development and evaluation of instructional games are warranted.

A Multifaceted Computer-based Course Management System. TR 75-30. April 1975. T. H. Anderson, R. C. Anderson, S. M. Alessi, B. R. Dalgaard, D. W. Paden, W. B. Biddle, J. R. Surber, and H. R. Smock. (AD-A010 120)

The Course-management System was designed to integrate books, computers, and live teachers in an effective manner for courses with large numbers of students and instructors. The logistic problems associated with multifaceted instructional programs were solved, in part, by using PLATO--a computer-assisted instruction system centered at the University of Illinois. Students in the computer-managed course acquire basic information and concepts from individual reading. Their attention to the material is maintained and their progress monitored by a previously developed computer-assisted instruction study-management system (CAISMS). Lectures and standard quiz sections are little used. The time of instructors is invested in remediation for students having trouble mastering the core curriculum and in teaching seminars. The role of the computer is to manage study behavior, administer on-line achievement tests, and schedule group tutorial and seminar sessions. The system has been tried out with generally favorable results in an introductory college economics course having an enrollment of 360 students.

An Experimental Evaluation of a Computer-assisted Instruction Study Management System. TR 75-31. April 1975. T. H. Anderson, R. C. Anderson, B. R. Dalgaard, D. W. Paden, W. B. Biddle, J. R. Surber, and S. M. Alessi. (AD-A010 119)

A computer-assisted instruction study management system (CAISMS) was experimentally investigated in the context of an introductory college economics course. The 228 students in the CAISMS and control classes attended similar lecture-discussion classes and received an identical battery of achievement tests and questionnaires during the semester. Results indicated that (1) the CAISMS group

EDUCATION AND TRAINING (Continued)

scored significantly higher ($\alpha = 0.05$) on achievement tests than did the control group, and (2) the attitudes of CAISMS students were more positive ($\alpha = 0.01$) than were those of control students. Attrition rates were approximately equal in the two groups.

Computer Applications in Education and Training: Status and Trends. TR 75-32. April 1975. J. D. Fletcher. (AD-A009 800)

This report updates information on various developmental efforts in computer-based training and provides information on new developments that may have implications for Navy training. Although projects in the military services are emphasized, major developments in the civilian sector are also reviewed. The range of activities considered emphasizes the use of computers for teaching and includes a wide variety of computer aids to instruction. The information is organized under five major topic areas: military activities, civilian activities, systems developments, current issues in instructional design, and state-of-the-art and Navy training needs. An overview is provided for each of the major topic areas as well as for many subtopic areas.

Comparison of a Discovery and Didactic Strategy for Radiographic (X-Ray) Interpretation Training. TR 75-33. April 1975. R. G. Wells and M. L. Abrams. (AD-A009 236)

A comparison was made of the effects of a discovery strategy and a didactic strategy on industrial radiograph interpretation training. Trainees in the discovery group completed the respective program approximately one-third faster than those in the didactic group. There was no difference between the two groups in performance level at the end of training.

A Method for Increasing the Training Effectiveness of Marine Corps Tactical Exercises: A Pilot Study. TR 75-34. May 1975. E. H. Rocklyn, R. R. Jacobs, M. A. Magy, and A. G. Archibald. (AD-A013 224)

The Marine Corps requires methods for better utilizing current and to-be-developed simulated combat systems for training officers to ensure efficient acquisition of combat decision-making skills at battalion and higher levels of command. In support of this requirement, several combat training systems were reviewed to identify a set of major training problems and a method aimed at solving these problems and thus increasing the training effectiveness of Marine Corps tactical exercises was formulated and experimentally applied. Results obtained seem promising enough to warrant further development of this training method.

The Development of the NVMA Operator Manual and Training Materials Concurrently with System Development: A Case Study. TR 75-36. June 1975. A. J. Abrams, R. C. Panell, Jr., and J. D. Winchell. (AD-B005 578)

This project was undertaken to (1) develop an operator manual and training materials for the noise-vibration monitor analyzer (NVMA) being developed by the Naval Undersea Center, and (2) assess the feasibility of developing this software concurrently with hardware. The NVMA has been installed on one submarine, USS PUFFER (SSN 652), for preproduction evaluation. Thus, the quantity of data available is quite limited. However, the consistency of reported data indicates that

EDUCATION AND TRAINING (Continued)

the operator manual and training materials are effective. The results of a second evaluation aboard PUFFER after a substantial period of sea experience will provide a more definitive answer as to the effectiveness of the operator manual and training materials.

An Evaluation of Computer-managed Instruction in Navy Technical Training. TR 75-38. May/June 1975. S. B. Carson, L. L. Graham, L. G. Harding, K. A. Johnson, G. D. Mayo, and P. A. Salop. (AD-A012 638)

The purpose of this project was to develop and evaluate a computer-managed instruction (CMI) system that would be (1) less expensive than computer-assisted instruction (CAI), (2) provide a frequency of interaction that falls somewhere between that provided by CAI and that normally provided by CMI, and (3) handle some of the clerical and administrative burdens that are normally imposed by student-paced instruction. A system was developed that would make assignments, grade tests, provide feedback to the student, and provide some of the information needed for the effective control and management of a large-scale system of student-paced instruction. Both the instruction and testing took place off-line.

The system was compared to classroom instruction and to a system of student-paced instruction that was based on the training materials and tests developed for the CMI system but that substituted manual operations for certain operations performed by the computer in the CMI system. It was found that the use of either form of student-paced instruction reduced training time approximately 50 percent and resulted in slightly higher scores on criterion-referenced tests of student knowledge. There were no substantial differences between the two student-paced systems in terms of training effectiveness or in terms of either cost or cost avoidance. Both were substantially less expensive than current CAI systems.

Transfer of Training Following Computer-based Instruction in Basic Oscilloscope Procedures. TR 76-1. July 1975. H. W. Stern. (AD-A012 637)

As test equipment training becomes more individualized, the student usually has greater opportunity to experiment with the equipment he will be using on the job. Yet, for a variety of reasons, he may have to train on outmoded equipment or have limited exposure to the equipment. Computer-aided individualized instruction can overcome some of these problems. This method of training exposes the student to a wide range of situations where state-of-the-art equipment can be readily simulated.

A program was developed for oscilloscope training utilizing the PLATO IV instructional system. Students trained by this method were compared with those trained in a traditional laboratory setting using an individualized workbook having the same objectives as the PLATO lesson. The laboratory-trained group was better at control manipulation, while the PLATO-trained group was superior in using the displays, even though they took longer to perform the test. Following identical laboratory practice, another performance test showed these differences disappeared. Thus, it is concluded that computer-assisted instruction can provide acceptable levels of performance but, with the level of simulation provided in this experiment, needs to be integrated with some actual equipment usage.

EDUCATION AND TRAINING (Continued)

The Effects of Practice and Positional Variables in the Acquisition of a Physically Complex Psychomotor Skill. TR 76-7. July 1975. M. L. Abrams, H. B. Schow, and J. K. Grice. (AD-A015 282).

The purposes of this effort were to (1) evaluate distributed/massed practice schedules for learning a physically complex psychomotor skill within the constraints of a real-world learning environment and (2) determine if there are interaction effects between practice and the positional variables in the acquisition of the skill. Distributed/massed practice was studied from two aspects: Trial length and session length. Data from the study show that the position in which the task was performed was a relevant variable in skill acquisition (i.e., different practice schedules were optimal for the two positions studied). Distributed sessions were significantly better than massed sessions in the overhead position; distributed trials were significantly better in both positions.

Computer-based Shipboard Training Administration System (STAS): Development Phase. TR 76-11. September 1975. C. D. Hayward, L. E. Hay, and S. R. Jaffin. (AD-A015 326)

Computer systems have been used aboard combatant ships to perform functions in support of tactical operations. An additional goal has been the use of computer systems to support nontactical functions (e.g., training administration). In this effort, a shipboard training administration system (STAS), based on a minicomputer system (NOVA 1200) aboard USS DAHLGREN, was developed to support nontactical data management functions.

Uses of Time-compressed Speech in a Reading Remediation Program: Some Exploratory Tests. TR 76-13. September 1975. W. A. Shennum, E. G. Aiken, and G. S. Thomas. (AD-A015 284)

Using time-compressed speech methodology, a program was developed to improve reading rate and comprehension of Navy personnel with low reading ability. Four groups of trainees were tested. One group read training text while simultaneously listening to a speeded auditory version of the same text. A second group listened to speeded text without concurrently reading the material. The third group simply read material silently, with no auditory input. The fourth group was a control group that took pre- and posttests only. All groups except the control group showed sizeable but comparable increases in unaided reading rate and comprehension performance. Thus, it appeared that the salient aspects of all procedures provided trainees with specific learning goals and precise feedback on their progress, coupled with teacher encouragement to improve.

Learning From Lecture: Investigations of Study Strategies Involving Note Taking. TR 76-14. September 1975. N. H. Van Matre, E. G. Aiken, J. F. Carter, W. A. Shennum, and G. S. Thomas. (AD-A015 285)

Two experiments were conducted with college students as subjects in an effort to determine the note-taking strategy most effective for learning from lecture. In Experiment I, students listened to a lecture while engaging in either parallel or distributed note taking. The information density of the lecture and the lecture presentation speed were also varied. In Experiment II, the students engaged in one of four learning strategies involving combinations of note-taking and review procedures

EDUCATION AND TRAINING (Continued)

with either immediate or delayed review and testing. Results indicated that note taking, by itself, interferes with learning but, when performed in conjunction with a notes review, constitutes the optimal study strategy. Analysis of the notes in connection with recall tests showed that they provide a critical control of what was learned. Suggested instructional guidelines for instructors were provided.

Further Investigation of Coding/Rehearsal Strategies During a Segmented Lecture Format. TR 76-15. September 1975. G. S. Thomas, E. G. Aiken, and W. A. Shennum. (AD-A015 628)

Data from a previous lecture-learning effort were combined with data from the current endeavor to provide information on the effects of a filler task used in the previous study and to compare other coding/rehearsal strategies that have potential for improving learning in a lecture. Results showed that the filler task only slightly reduced performance on a delayed recall test; confirmed a previous finding that, when coding/rehearsal is separated from listening in a lecture setting, recall increases significantly; and indicated that procedures that aid/guide the student's coding/rehearsal behaviors further enhance learning.

A Comparison of Three Combinations of Text and Graphics for Concept Learning. TR 76-16. September 1975. W. A. King. (AD-A016 805)

Research was conducted to determine how verbal instruction could be supplemented by visuals and, in particular, how to take pedagogical advantage of the excellent capabilities of the PLATO IV computer-based instructional system. Three versions of a lesson on the sine-ratio concept were prepared, one with verbal text supplemented with animated graphics, one supplemented with still graphics, and one without graphics (text only). Forty-five students from the Basic Electricity/Electronics School at the Naval Training Center (NTC), San Diego, were randomly assigned to the three versions. A comparison of the pretest and posttest mean scores for each group revealed learning took place in each group, and a questionnaire administered after the posttest revealed that the students gave positive ratings to the instructional materials and presentations. The groups did not differ in time required for training. It was concluded that these results are consistent with previous findings suggesting that graphics are more useful for teaching concepts involving time and motion than for concepts involving space, and more useful for tasks involving stimulus identification than for tasks involving terminology or comprehension.

Shipboard Computer-integrated Instruction in General Damage Control: Development Phase. TR 76-17. October 1975. W. G. Hoyt, A. K. Butler, and C. D. Hayward. (AD-A016 812)

This report covers the shore-based development phase of a study to determine the feasibility of a shipboard minicomputer system for Computer Integrated Instruction (CII). In CII, instruction is conducted off-line and is integrated with on-line testing, diagnostics, and prescriptives. The off-line training media for this effort are programmed instruction, audio visual, and self-study guides. General damage control was chosen as the prototype subject area because of its criticality during emergency situations aboard ship, and because relatively few shipboard personnel receive training in this area at shore-based schools. This report describes: (1) program

EDUCATION AND TRAINING (Continued)

development, system operation, and user procedures for CII, (2) design and development of the CII courseware and module tests, (3) shore-based demonstration and checkout, and (4) installation of the CII system aboard a demonstration ship.

An Aid to Independent Study Through Automatic Question Generation (AUTOQUEST). TR 76-18. October 1975. J. H. Wolfe. (AD-A017 059)

AUTOQUEST is a computer aid to independent study. It presents ordinary text to a student at a computer terminal, a paragraph at a time. Using a pattern-matching approach, the system generates a question based on one of the sentences of the text and grades the student's answer. If the student's answer does not match the words of the text, the paragraph is displayed again. Results showed that about 68 percent of the generated questions were satisfactory and that the errors were largely syntactic, indicating the need for a structural parser to preprocess the sentences.

Use of an Interactive General-purpose Computer Terminal to Simulate Training Equipment Operation. TR 76-19. November 1975. G. F. Lahey, A. M. Crawford, and R. E. Hurlock. (AD-A019 514)

This research examined a computer-based simulation of operational equipment as a potentially cost-effective training mode. CAI materials simulating use of the Simpson 260-1 multimeter were presented to experimental students at PLATO IV terminals where the frontal topography and external operations of the multimeter were simulated by computer graphics. Control students learned the material from self-paced module booklets. Comparisons of the two groups revealed no significant difference in written or performance tests, but experimental students spent more time in training. It was concluded that simulations of equipment on an interactive general-purpose computer terminal, such as the PLATO IV, are practical and could provide an alternative to the purchase of special training equipments.

Models of the Learner in Computer-assisted Instruction. TR 76-23. December 1975. J. D. Fletcher. (AD-A020 725)

The adaptability of computer-assisted instruction to individuals should be enhanced by the use of explicit models of the learner. To be appropriate for computer representation, these models must take the form of effective procedures. Such procedures may be derived from four areas of investigation: quantitative models of memory, regression models of performance, automaton models of performance, and artificial intelligence. Relevant work in these four areas is identified and reviewed.

A Comparison of Adaptive and Nonadaptive Training Strategies in the Acquisition of a Physically Complex Psychomotor Skill. TR 76-24. December 1975. J. A. Riedel, M. L. Abrams, and D. Post. (AD-A018 880)

The relative effectiveness of using adaptive and nonadaptive (fixed) strategies to facilitate acquisition of a physically complex psychomotor skill was investigated. In addition, task and practice difficulty levels were studied. Sixty subjects were each given pre- and posttraining tests and the data were evaluated by analysis of covariance. Results suggest no significant difference between fixed and adaptive techniques for the skill studied.

EDUCATION AND TRAINING (Continued)

The Graphics Terminal Display System: A Powerful General-purpose CAI Package. TR 76-25. December 1975. F. W. Hornbeck and L. Brock. (AD-A020 814)

The report describes a system developed to support research and development in computer-based instruction. A powerful and versatile CAI language was developed that allows authors to present materials on a graphic display, on slides, or by means of voice synthesizer. The language was developed on an IBM 360/50 computer and is transportable to other similar machines. Comparisons are made between this system and others, such as PLANIT, PLATO, and TICCIT.

Adaptive Computer-assisted Tutorials: A Cybernetic Approach Optimization With Finite-State Machines. TR 76-33. March 1976. J. Offir. (AD-A024 712)

The report outlines a formal approach to computer-based adaptive tutorial systems. The components that such a system must have in order to improve dynamically the performance of an individual trainee are described.

Learner Control of Lesson Strategy: A Model for PLATO IV System Lessons. TR 76-36. June 1976. G. F. Lahey, A. M. Crawford, and R. E. Hurlock. (AD-A025 249)

The objectives of this research were to develop a technique to facilitate creating computer-based instruction (CBI) with a minimum of effort on the part of the author/coder and to investigate the feasibility of using a structure that puts control of lesson strategy into the hands of the student learner. A major premise was that the lesson development technique should be usable over a wide variety of subject matters and should require no special expertise on the part of the author preparing the lesson materials or of the individual encoding them for use.

A model was developed in which each CBI lesson is composed of two distinctly separate parts: a strategy section or driver common to all such lessons and a content section peculiar to each lesson. The strategy section of this model puts lesson control in the hands of the student learner by allowing him a free choice of the sequence in which he sees lesson segments (learning objectives) and types of content (rules, examples, practice).

Effect of Human Relations Training on Racial Attitudes of Marines. TR 76TQ-42. August 1976. W. F. Kieckhaefer. (AD-A209 383)

The purpose of this effort was to determine the relationship between racial attitudes of Marines, as measured by scores obtained on a social distance scale (SDS) and a situational attitude scale (SAS), and training at the Marine Corps Human Relations Institute. It was hypothesized that HRI training would decrease both positive and negative interracial and intraracial bias. Results showed that the positive and negative intraracial bias decreased more for the White trainees and for Black trainees than for the White control group, and that positive and negative interracial biases decreased more for the White trainees than for the control group.

EDUCATION AND TRAINING (Continued)

Experimental Evaluation of PLATO IV Technology: Final Report. TR 76TQ-44. August 1976. R. E. Hurlock and D. A. Slough. (AD-A029 384)

This project experimentally evaluated the computer-based instruction (CBI) technology of the PLATO IV system. The approach was to conduct a set of eight research studies in different Navy training application areas: remedial math, oscilloscope simulation, sine ratio, multimeter simulation, learner control, recipe conversion, oscilloscope guidance, and part-task trainer. The report summarizes the research design, method, results and findings of each study. Experience, information, and data obtained from the research is then used to evaluate instructional effectiveness, technical features and characteristics, range of training applications, instructional material development methods and effort, and development and delivery costs.

Low Cost Part-task Training Using Interactive Computer Graphics for Simulation of Operational Equipment. TR 76TQ-46. September 1976. A. M. Crawford, R. E. Hurlock, R. Padilla, and A. Sassano. (AD-A029 540)

The appearance and functions of the S-3A copilot integrated control system panel were simulated with plasma screen computer graphics and touch panel to develop an interactive computer-based training (CBT) course. The performance of students who studied a workbook 8 hours was compared with that of those who received 1 hour of practice with an instructor in a high fidelity position trainer (PT). Results showed that the performance of CBT students before hands-on practice in the PT was equal to that of conventionally trained students at the end of PT practice. This methodology appears to offer an effective and low-cost approach to part-task training.

A Personnel Readiness Training Program: Operation of the AN/BQR-20A. TR 77-4. December 1976. J. D. Winchell, R. C. Panell, and E. J. Pickering. (AD-A033 435)

Performance-oriented tests were used to diagnose deficiencies in job performance among fleet personnel. Self-instructional training materials designed for shipboard use were then individually prescribed to correct identified deficiencies. Testing and training programs were developed for three applications: (1) the submarine sonar technician operating the AN/BQR-20, (2) the submarine missile technician maintaining the missile test and readiness equipment, and (3) the boiler technician operating and maintaining the 1200 PSI steam propulsion plant. This report describes the AN/BQR-20 application.

Videodisc Technology Use Through 1986: A DELPHI Study. TR 77-11. December 1976. R. R. Daynes. (AD-A034 857)

A preliminary research effort to investigate the diffusion of videodisc technology in diverse environments over a 10-year period was undertaken to determine disc availability for future Navy training requirements. The DELPHI, a technique for eliciting judgments, was used as the primary research approach. It was concluded that, by 1986, the use of audiovisual formats will have increased and the use of videodisc technology will have reached sufficient levels to warrant immediate instructional systems development procedures of videodisc technology.

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A Personnel Readiness Training Program: Maintenance of the Missile Test and Readiness Equipment (MTRE MK 7 MOD 2). TR 77-19. March 1977. G. J. Laabs, R. C. Panell, and E. J. Pickering. (AD-A037 546)

Performance-oriented tests were used to diagnose deficiencies in job performance and shipboard self-instructional materials. Testing and training programs were developed for three applications. This report describes the application for the submarine missile technician maintaining the missile test and readiness equipment. The application for the submarine missile technician maintaining the AN/BQR-20 is described in NPRDC TR 77-4.

Computer-based Training of Recipe Conversion with Lower Aptitude Personnel. TR 77-24. April 1977. P. S. Fredericks and L. B. Hoover-Rice. (AD-A038 420)

The purposes of this effort were to test the feasibility of computer-based training (CBT) for students with below average academic skills and to evaluate a job performance aid used in recipe conversion for the Mess Management Specialist School. Sixty students were assigned to one of two CBT experimental groups or to a control group. One CBT group received the job aid; and the other, the traditional math as taught in the school but on-line. The control group received classroom training from an instructor using traditional math. Results showed that the CBT groups required significantly less training time than did the control groups while maintaining high scores on the final test (criterion-referenced). However, the CBT job aid group performed significantly poorer than the no-job-aid and classroom groups.

Validation of the Instructional Strategy Diagnostic Profile (ISDP): Empirical Studies. TR 77-25. April 1977. M. D. Merrill and N. D. Wood. (AD-A042 334)

The purpose of this effort was to validate the Instructional Strategy Diagnostic Profile (ISDP) and the accompanying design prescriptions in real-world settings. Two different methodologies were used. In the first, existing instructional materials were modified based on a selected prescription that resulted from an ISDP analysis of those materials. Two or more versions of the materials were compared in an experimental comparison. In the second, a weak unit of an existing course was identified and modified via several prescriptions resulting from an ISDP analysis. Test performance, affect, confidence, and time were compared for students using the revised materials and students using the original materials.

Reading Skill and Performance in a Sample of Navy Class "A" Schools. TR 77-28. April 1977. E. G. Aiken, T. M. Duffy, and W. A. Nugent. (AD-A038 535)

This project sought to define the relationships between reading skill, reading requirements, and success in a sample of Navy Class "A" Schools. Results showed wide variation in the dependence of performance on reading skills among the schools as well as the amount and difficulty of the reading they require. Reading skill and general ability were as good or better as predictors of school performance as course selector tests in some schools. A discussion of the advantages and disadvantages of several options for dealing with deficient reading is included.

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Reading Retention as a Function of Method for Generating Interspersed Questions. TR 77-29. April 1977. J. H. Wolfe. (AD-A038 536)

In this experiment, the effects on reading retention of adjunct (interspersed) questions generated by four different procedures were compared. The procedures were linguistic processing, the AUTOQUEST computer program (see NPRDC TR 76-18), and two types of cloze algorithms. Results showed that cloze questions interfered with retention and that AUTOQUEST improved retention as much as the use of human-generated questions. No indirect effects of human or computer questions were observed. Further research is recommended to increase the instructional relevance of AUTOQUEST and to test its effectiveness in an on-line situation with feedback.

Instructional Decision Making in the Design of Operator Training: An Eclectic Model. TR 77-31. May 1977. J. F. Brock. (AD-A039 800)

An instructional design process for the F-14 aircrew is reviewed. The process emphasized job-relevant learning objectives, hierarchies of learning, and prescriptions for determining instructional strategies.

A Personnel Readiness Training Program: Operation and Maintenance of the 1200 PSI Steam Propulsion Plant. TR 77-36. June 1977. G. J. Laabs, H. T. Harris, Jr., and E. J. Pickering. (AD-A042 033)

Performance-oriented tests were used to diagnose deficiencies in job performance and shipboard self-instructional materials. Testing and training programs were developed for three applications. This report describes the application for the boiler technician operating and maintaining the 1200 PSI steam propulsion plants. The other two applications are described in NPRDC TRs 77-4 and 77-19.

A Personnel Readiness Training Program: Final Report. TR 77-39. August 1977. A. V. Anderson, G. J. Laabs, E. J. Pickering, and J. D. Winchell. (AD-A043 371)

Performance-oriented tests were used to diagnose deficiencies in job performance among fleet personnel. Shipboard self-instructional materials were then individually prescribed to correct identified deficiencies. Testing and training programs were developed for three applications: (1) the submarine sonar technician operating the AN/BQR-20A, (2) the submarine missile technician maintaining the missile test and readiness equipment (MTRE MK 7 MOD 2), and (3) the boiler technician operating and maintaining the 1200 PSI steam propulsion plant. Results from all three applications are summarized here and described in detail in NPRDC TRs 77-4, 77-19, and 77-36.

Integrated Job Skills and Reading Skills Training System. TR 77-41. September 1977. T. G. Sticht, L. C. Fox, R. N. Hauke, and D. W. Zapf. (AD-A044 227)

An exploratory effort was conducted to evaluate the feasibility of determining the reading demands of Navy jobs using a methodology that identifies the type of reading tasks performed on the job and the level of general reading skill required to perform that set of reading tasks. Next, a survey was made of the Navy's job skills training program, career counseling system, and general education development

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system. Based on the results of these two efforts, a general plan was designed outlining the initial development of a job-related reading training program and its later integration into the Navy's job skills training program.

Computer-based Graphic Simulations for Tactical Communications Training. TR 77-42. September 1977. A. M. Crawford, R. E. Hurlock, and T. P. Rogo. (AD-A044 837)

The research investigated the use of two-dimensional simulations of the controls and displays of an antisubmarine warfare jet. The purpose was to examine the use of the simulation methodology for training performance skills. Results showed that students liked the training and felt that it had been effective in helping them master the requisite skills. An evaluation by fleet-experienced operators supported these findings. Features of the computer-based training system were discussed, and recommendations for needed research were made.

Empirical Validation of Selected Instructional Strategy Diagnostic Profile Prescriptions. TR 77-43. September 1977. M. D. Merrill, N. D. Wood, M. Baker, J. A. Ellis, and W. H. Wulfeck, II. (AD-A045 309)

The Instructional Strategy Diagnostic Skills (ISDP), an instrument for diagnosing defects in instruction and prescribing revisions, is designed to rate instruction on two major dimensions--consistency and adequacy. In this study, three experiments were conducted to test the hypotheses underlying the ISDP's consistency and adequacy prescriptions. Navy enlisted men were assigned to 12 treatment groups--four representing remember level instruction; and eight, use level. Experiment I investigated the effects of manipulating consistency of test items and presentation strategies; and Experiments II and III, the effects of manipulating adequacy of instructional materials designed to teach students to remember and use information respectively. Results provided strong support for the consistency prescription and for two of the three adequacy prescriptions for use level tasks. However, the two adequacy prescriptions for remember level tasks were not clearly supported. It was concluded that the ISDP is a valid instrument for predicting student performance and for evaluating instructional materials.

Conference Proceedings: Schooling and the Acquisition of Knowledge. TR 78-6. December 1977. R. C. Anderson, R. J. Spiro, and W. E. Montague. (AD-A049 878)

This report summarizes activities at a conference on Schooling and the Acquisition of Knowledge held in November 1975 at San Diego, California.

Relationship Between Navy Off-duty Educational Programs and Recruitment, Performance, and Retention. TR 78-8. December 1977. W. H. Githens and G. L. Wilcove. (AD-A048 351)

A series of studies was conducted relating off-duty educational programs to recruiting, performance, and retention. The relationships are all high and positive in studies involving the opinions of recruits, current and past program participants, Navy operational commands, Navy recruiters, and Navy wives. When participants were compared to a matched group (same rate, rating, years in service, age, etc.) of nonparticipants, there is evidence that they were promoted more frequently, but

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were less likely to stay in the Navy. No relationships were found with rated performance, disciplinary records, or commendations.

Alternative Delivery Systems for the Computer-aided Instruction Study Management System (CAISMS). TR 78-10. February 1978. J. Nievergelt, S. M. Alessi, and W. E. Montague. (AD-A050 330)

The Computer-aided Instruction Study Management System (CAISMS) is used for automatic study management implemented on the PLATO IV system at the University of Illinois. This report discusses alternative configurations for delivering CAISMS, varying from general-purpose time-sharing systems to a microcomputer-based stand-alone terminal.

Immediate vs. Delayed Feedback in a Computer-managed Test: Effects on Long-term Retention. TR 78-15. March 1978. P. T. Sturges. (AD-A052 993)

Four groups of college undergraduates took a multiple-choice computer-managed test. Three of these groups received informative feedback (the entire item with the correct answer identified) either (1) immediately item-by-item (2-second delay), (2) following the entire test (20-minute delay), or (3) 24 hours later (24-hour delay). The fourth (control) group received no feedback. Scores on a criterion test, given 1 to 3 weeks later, showed that retention was significantly better for the two delayed feedback groups (20-minute and 24-hour delay) than for the immediate feedback group (2-second delay). These results confirmed previous findings of laboratory experiments--that retention following delayed feedback is not degraded by the delay.

Curriculum Information Networks for Computer-assisted Instruction. TR 78-18. April 1978. M. Beard, A. Barr, L. Gould, and K. Westcourt. (AD-A054 599)

This report describes research in curriculum design for computer-assisted instruction. It covers (1) the issues and difficulties involved in courseware development with particular emphasis on the problems of current "generative" techniques, (2) the Curriculum Information Network, as used in the Basic Instructional Program (BIP), including its advantages, weaknesses, and possible future development, (3) results obtained from analysis of students' experience with BIP, and (4) the relevance of the network idea to Navy technical training.

Algorithms for Developing Test Questions from Sentences in Instructional Materials. TR 78-23. June 1978. G. H. Roid and P. Finn. (AD-A056 614)

The feasibility of generating multiple-choice test questions by transforming sentences from prose instructional materials was examined. A computer-based algorithm was used to analyze prose subject matter and to identify high-information words. Sentences containing selected words were then transformed into multiple-choice items by four writers who generated foils or question alternatives informally and by an algorithmic method. Items were organized into tests and administered to subjects before and after they had studied instructional materials. Results indicated that this item-writing technique was feasible and that algorithmic methods of generating foils produce items of reasonably good quality.

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Effects of Administrative Policy on Student Performance. TR 78-25. July 1978. M. L. Abrams, J. Sachar, C. Buckley, and L. J. Brown. (AD-A057 833)

The effects of two types of school administrative policy on Navy student performance were investigated. They were (1) direct instructor-trainee interactions with a primary stress on military behaviors and a secondary stress on academic behaviors (M^a), and (2) indirect instructor-trainee interactions with a primary emphasis on academic behaviors and a secondary emphasis on military behaviors (A^m). Subjects were 151 students attending a Navy Hydraulics course; three classes were conducted under each policy. The A^m policy treatment significantly reduced attrition and improved academic performance. It was suggested that the study be replicated in a different school setting or that the A^m treatment be tried out in one or more schools. If the results support those of the study, it is recommended that the Navy implement this policy and provide administrators with a course in the procedures for establishing and maintaining the use of A^m methods.

Tailoring Shipboard Training to Fleet Performance Needs: I. Approach and Initial Efforts. TR 78-30. August 1978. R. E. Main, M. L. Abrams, C. R. Chiles, M. R. Flaningam, and R. M. Vorce. (AD-A059 292)

An approach to shipboard training was proposed that was designed to produce instructional methods that are both responsive to fleet priorities and compatible with the constraints of a shipboard environment, and a three-stage plan was developed to implement and evaluate that approach. Under the first stage of that plan, an extensive survey was conducted on board three aircraft carriers (1) to determine characteristics of present training systems, (2) to assess environmental constraints, and (3) to determine major problem areas where shipboard training could be applied to enhance job performance. Survey results provided a comprehensive overview of the major types of performance problems being experienced, current training systems being implemented, and implementation difficulties caused by the shipboard environment. Twenty of the major problems were selected for further evaluation by fleet representatives. As a result, main propulsion system problems were determined as most critical and selected for research attention.

Accommodating Instruction to Student Characteristics: Trends and Issues. TR 79-1. October 1978. P-A. Federico. (AD-A060 587)

The relevant professional literature concerning adaptive teaching systems was reviewed. Several alternative approaches to accommodating instruction to student characteristics were identified and discussed. Several recommendations were made regarding what additional research and development efforts are needed to ensure the successful implementation of adaptive instructional strategies in Navy training.

Relating Performance in Basic Electricity and Electronics and "A" Schools. TR 79-2. October 1978. J. Sachar, M. Abrams, and C. Buckley. (AD-A060 914)

Relationships found between BE/E and "A" school performance were used to (1) determine the feasibility of applying lower mastery standards for different ratings without significantly affecting follow-on school success, and (2) develop criteria for

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reassigning a student early to a class "A" school on the basis of his early BE/E performance. Few differences were found on BE/E modules between successful and failing class "A" school students. Reassigning students to alternative class "A" schools using the models in this study did not lead to successful prediction of performance or attrition. It was recommended that students be permitted to go through BE/E with lower mastery standards on an experimental basis and that some students omit BE/E entirely to determine whether and to what extent BE/E is a prerequisite to the follow-on school.

Evaluation of a Computer-based Course Management System. TR 79-3. October 1978. A. Crawford, W. Montague, and B. Smith (Editors). (AD-A061 118)

The research reported on the evaluation of a computer-based course management system in a college economics course. Students acquired course information from individual reading while the computer maintained attention to the material and monitored progress. Results indicated that the course management system had facilitated the study of text and that student attitudes regarding the system were favorable. From these results, it was concluded that this procedure may hold considerable promise for increasing the efficiency of military training.

Interior Communications Supervised Alarm and Warning Systems: Validation of Instructional Materials. TR 79-6. December 1978. D. Van Kekerix, W. Wulfeck, II, and J. Ellis. (AD-A063 117)

Experimental instructional development procedures were used to develop Interior Communications School instructional modules on alarm and warning systems. On an empirical test of the material, students showed significant gains on a posttest and performed as well as more advanced students on the same test items.

Microfiche and Printed Materials in Individualized Instruction: A Comparison. TR 79-18. May 1979. L. Graham and K. Johnson. (AD-A069 898)

Comparisons were made between microfiche materials and conventional printed materials in two short military courses taught by individualized instruction. Students took the courses in sequence. In one set of comparisons, microfiche was used only for the tests; in the other, it was used for both instructional materials and tests. In both sets, control groups used printed materials exclusively. In the first course, students who used microfiche for tests required 18 percent more study time than did the control students; those who used microfiche for both instructional materials and tests required 26 percent more time. In the second course, the students who used microfiche for tests required 11 percent more time; those who used if for both instructional materials and tests required 10 percent more time.

Discriminating Between Failures and Graduates in a Computer-managed Course Using Measures of Cognitive Styles, Abilities, and Aptitudes. TR 79-21. June 1979. P-A. Federico and D. Landis. (AD-A070 748)

Measures of cognitive styles, abilities, and aptitudes were obtained for a sample of BE/E School graduates and failures, and used to perform discriminant analyses to determine which linear combination of measures could optimally differentiate the two groups. Classification functions obtained for derived discriminant functions were

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applied to measures of cognitive characteristics obtained for the study participants to evaluate the effectiveness of the discriminations in predicting group membership (i.e., BE/E graduates or failures). Results showed that the two groups differ significantly in certain cognitive characteristics, and that the classification functions were valid predictors of BE/E success or failure.

The Effect of Instructional Presentation Sequence on Student Performance in Computer-based Instruction. TR 79-23. June 1979. G. Lahey. (AD-A071 314)

Performance data were collected to compare the effects of four different methods of sequencing instructional presentations. Lessons prepared in a "rule-examples-practice" format were presented in either a rule-examples-practice, examples-rule-practice, practice-examples-rule, or random presentation sequence. The time to complete the lessons, total number of responses, post-lesson test scores, and percentage correct on practice problems of medium difficulty were compared for the four groups. The results indicate that the different presentation sequences have no significant effect on overall performance.

Study Behavior and Performance: Effect of Practice and Test Question Similarity. TR 79-26. July 1979. J. Ellis, W. Wulfeck, II, W. Montague, and W. King. (AD-A072 468)

This effort was conducted to test the effect of practice or adjunct questions on learning in a real-world training environment. Subjects were students enrolled in a self-study course at the Navy's Interior Communications "A" School. They were assigned to one of three experimental groups or to a control group. Students in the experimental groups received workbooks; those in the control group did not. The workbooks varied as to the amount of questions included that were identical to those in lesson tests or in the final test. In the first experimental group, all the workbook questions were identical; in the second group, half of the questions were identical; and in the third group, none of the questions were identical. These groups were subsequently referred to as the ALL, HALF, and NONE groups. At the end of the course, groups were compared on test and subtest scores, time required, and number of tries on lesson tests. In all cases, the performance of Group ALL subjects was superior. Groups HALF and NONE, who had been exposed to some of the test questions, either in the workbook or on the lesson tests, performed no better on the final test than the control group, who had not. Comparisons on subtests showed that practice questions that are not related to test questions can adversely affect both performance and study time.

Predicting Student Performance in a Computer-managed Course Using Measures of Cognitive Styles, Abilities, and Aptitudes. TR 79-30. August 1979. P-A. Federico and D. Landis. (AD-A074 880)

Measures of cognitive styles, abilities, and aptitudes from a sample of 166 Basic Electricity and Electronics School graduates were analyzed to determine if they were predictive of student achievement and times to complete instructional modules. It was found that the cognitive characteristics can be used to predict student performance.

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A Study of Authoring Alternatives for Training-oriented Videodiscs. TR 79-33. September 1979. C. Bunderson, S. Jarvis, and R. Mendenhall. (AD-A075 276)

Videodisc technology shows great promise for use in a variety of training and information dissemination activities within the Navy. Little is known about the problems and procedures associated with the authoring of training-oriented videodiscs, however.

This report addresses eight areas that are related to the problems of authoring: (1) the delivery system itself (i.e., the various capabilities of players and associated computer devices), (2) media selection during instructional systems development, (3) instructional strategies, (4) author mock-up and simulation prior to premastering, (5) premastering, (6) mastering and replication, (7) composition of videodisc authoring teams, and (8) evaluation alternatives. It was concluded that optical videodisc technology and the authoring technologies associated with it are still in a state of flux and are expected to be changing and evolving during the next 5 years. Thus, the Navy should not plan to deploy videodiscs widely in the immediate future. Rather, the Naval Education and Training Command and its supporting agencies should track the development of knowledge in the videodisc field, which is expected to unfold rapidly in the next 2 years.

Algorithms for Developing Test Questions from Sentences in Instructional Materials: An Extension of an Earlier Study. TR 80-11. January 1980. G. Roid, T. Haladyna, and P. Finn. (AD-A080 262)

The purpose of this effort was to extend or replicate an earlier study that examined the feasibility of generating multiple-choice test questions by transforming sentences from prose instructional materials. In that study, a computer-based algorithm was used to analyze prose subject matter and to identify high-information words. Sentences containing selected words were transformed into multiple-choice items by four writers who generated foils or question alternatives informally and by an algorithmic method. These items were then organized into tests and administered to 24 college students before and after they had studied the instructional materials.

In this replication, the tests were administered to 249 high school students and results were combined with those obtained earlier. This provided stable estimates of item difficulty. Since results supported those obtained earlier, it appears that this item-writing technique is feasible and that algorithmic methods of generating foils produce items of reasonably good quality.

Improving the Productivity of Low Performers: An Intervention Case Study on a Navy Ship. TR 80-20. April 1980. K. S. Crawford, E. D. Thomas, and J. J. Fink. (AD-A083 977)

A training program was developed to improve the performance of low performers (LPs) aboard a Navy combatant ship. Workshops were conducted for the LPs, all supervisory personnel aboard their ship, and a smaller group of supervisors selected as mentors. The LPs' performance ratings, including supervisory evaluations and disciplinary records, were obtained before and after the training and used to assess improvements. Results indicated that, after training, the LPs received significantly

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higher supervisory evaluations and committed fewer disciplinary offenses than did control groups.

Computer-assisted Literacy Instruction in Phonics. TR 80-21. April 1980. R. A. Wisher. (AD-A084 270)

Twenty-four volunteers from the Academic Remedial Training (ART) Program at the Naval Training Center (NTC), San Diego, were given computer-assisted instruction (CAI) in phonics in place of the program's usual classroom instruction. The volunteers, native English-speaking recruits with reading grade levels (RGLs) below 4.5 (as measured on the Gates-MacGinitie Reading test) and poor pronunciation skills (as measured by the Wide Range Achievement Test (WRAT), Level II) were given phonics instruction on a computerized multimedia system (MMS). A control group of 24 students with comparable reading scores participated in the normal NTC classroom instruction in phonics.

The RGLs of both groups were remeasured immediately after phonics instruction (WRAT) and at the end of the ART Program (Gates-MacGinitie test), and their RGL gains were compared to assess the instructional efficiency of the CAI course. Results showed that the CAI and control groups gained 1.3 and 1.0 RGL respectively on the WRAT and 2.4 and 2.5 RGL respectively on the Gates-MacGinitie tests. Thus, the students in the computer-assisted course did as well in phonics and in the remainder of the program as did students who received classroom instruction.

Field Evaluation of the Generalized Maintenance Trainer Simulator: II. AN/SPA-66 Radar Repeater. TR 80-30. July 1980. J. W. Rigney, D. M. Towne, P. J. Morgan, and R. A. Mishler. (AD-A087 715)

The generalized maintenance trainer simulator (GMTS) is a relatively low-cost, stand-alone system for providing intensive practice in troubleshooting. To determine whether GMTS is indeed generalizable, it was applied to an entirely different target system from that used in initial testing--the AN/SPA-66 radar repeater. The data base was prepared by technical experts concerned only with supplying the specified data in the proper format and not with the nature of the GMTS program. Results indicated that technical experts can effectively produce the required data base, and that the technique can be applied to various types of target equipments or systems.

Shipboard Instruction and Training Management with Computer Technology: A Pilot Application. TR 80-34. September 1980. J. A. Dollard, M. L. Dixon, and P. H. McCann. (AD-A091 251)

To determine if computer technology could improve shipboard instruction and training, an automated shipboard instruction and management system (ASIMS) was used for computer-managed instruction (CMI) aboard USS GRIDLEY (CG 21) during 1975-77. ASIMS comprised a NOVA 1200 minicomputer with support peripherals, a computer integrated instruction (CII) system in general damage control (GDC), and a shipboard training administration system (STAS). CII GDC provided off-line instruction integrated with on-line computer testing, diagnostics, and prescriptives. STAS provided a generalized file management and information retrieval system (FMS) that facilitated control of shipboard files, records, and reports. Posttest scores indicated that graduates of the CMI course significantly outperformed groups trained under

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conventional shipboard methods. CMI was proved technically and operationally feasible aboard ship and it was shown that commercial, off-the-shelf minicomputer systems can support both CMI capability and limited nontactical ADP functions. A cost-effectiveness study was beyond the scope of the project.

Mathematical Requirements in Navy Class "A" Electronics Schools. TR 81-4. January 1981. J. Sachar and M. S. Baker. (AD-A093 946)

Instructors in 14 Navy electronics "A" schools (12 basic core and 2 advanced) were presented with a list of 70 mathematical skills and asked to indicate (1) how important they were to successful school performance and (2) whether they were prerequisite, reviewed, or taught in the "A" schools. Also, they were asked to state the number and type of performance aids used in the course and during the exam. Responses showed that, of the 70 skills surveyed, 19 do not appear in any basic core course and 2 more do not affect performance. Although the skills rated as affecting performance are generally considered as prerequisite in all schools, many students require review in these skills for successful performance. Across all schools, the most important skills are (1) addition, subtraction, multiplication, and division of numbers, (2) squares and square roots of positive numbers, (3) addition and subtraction of like units, (4) multiplication and division of like and/or unlike units, (5) substitution of known values into a given formula, and (6) transpositions of algebraic expressions. Performance aids are permitted in all courses but one, both during the course and during exams.

Conference Proceedings: Aptitude, Learning, and Instruction: Volume I. Cognitive Process Analyses of Aptitude; Volume II. Cognitive Process Analyses of Learning and Problem Solving. TR 81-5. January 1981. R. E. Snow, P-A. Federico, and W. E. Montague (Eds.). (AD-A099 209, AD-A099 208)

This report provides a summary of activities at a conference on Aptitude, Learning, and Instruction held March 1978 in San Diego, California.

Computer-managed Instruction in the Navy: II. A Comparison of Two Student/Instructor Ratios in CMI Learning Centers. TR 81-6. February 1981. N. Van Matre, M. Hamovitch, K. A. Lockhart, and L. Squire. (AD-A096 063)

Students at the Basic Electricity and Electronics School, San Diego were assigned to learning centers (LCs) with either an 18:1 or 30:1 student/instructor (S/I) ratio to determine the effects on student and instructor behavior in an individualized computer-managed instruction (CMI) course. Results of data analyses revealed that the 30:1 S/I ratio resulted in longer training time for students in certain career patterns than did the 18:1 S/I ratio. The S/I ratio had no consistent differential effect on first-try scores on module or phase tests, number of remediations per module, number of unsatisfactory performance tests, or student attrition from the course. Instructors in the 30:1 S/I ratio spent less time per question answering student technical questions and more time on administrative duties than did instructors in the 18:1 condition. It was recommended that CMI courses should be developed or revised to allow the computer to perform the maximum amount of administrative functions to reduce the CMI instructor workload. In any future efforts to assess the effects of S/I ratio changes, technical schools should consider performance data for

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students and instructors, and relate it to variables such as course content, testing strategies, and LC operating procedures.

Computer-managed Instruction in the Navy: III. Automated Performance Testing in the Radioman "A" School. TR 81-7. March 1981. M. Hamovitch and N. H. Van Matre. (AD-A096 721)

Automated performance testing (APT) procedures were compared with manual testing procedures during computer-managed instruction (CMI) at the Radioman "A" school to determine if APT shortened teletyping training time. The effects of computer-generated error distribution reports (EDRs) on performance progress were also studied. Results showed that APT speeded testing and scoring and shortened training time. Daily receipt of EDRs shortened the typing portion of the course by 3 days.

Computer-managed Instruction in the Navy: IV: The Effects of Test Item Format on Learning and Knowledge Retention. TR 81-8. March 1981. K. A. Lockhart, P. T. Sturges, N. H. Van Matre, and J. A. Zachai. (AD-A097 031)

The relative effectiveness of multiple-choice (MC) and constructed-response (CR) test formats in computer-managed instruction (CMI) was compared. Most CMI tests use the familiar MC format with standard answer forms because they can be machine-scored and sent directly into the computer. CR formats, which require students to generate their own written answers to each item, cannot be directly input to the computer, but they permit a more varied range of student responses. The MC format was compared with three variations of the CR format using four test groups, each consisting of 30 trainees assigned nonsystematically from the basics course at the Propulsion Engineering School, Great Lakes Naval Training Center. No measurable differences were found among the groups in amount of learning. This result implies that the MC format is preferable since it is less costly and is compatible with the current CMI system. The CR group that was given no prompts or cues as to the possible answers showed better retention of what they had learned. However, this format is least compatible with the CMI system and was more time consuming for students and staff. Before this CR format could be operationally feasible, costs would have to be controlled significantly--possibly, in part, by developing a CMI capability for automatic processing of CRs.

Generalized Maintenance Trainer Simulator (GMTS): Development of Hardware and Software. TR 81-9. April 1981. D. M. Towne and A. Munro. (AD-A098 384)

This report describes the development of the generalized maintenance trainer simulator (GMTS) and provides a preliminary analysis of its suitability for use in the school environment. The GMTS is an advanced two-dimensional trainer, developed on the basis of information gathered from field testing of a previous laboratory model. The trainer is a relatively low-cost, generalizable device capable of providing maintenance training for a wide variety of electronics equipments. Test and evaluation in the school environment are scheduled.

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Electronic Equipment Maintenance Training (EEMT) System: System Definition Phase.
TR 81-11. May 1981. S. M. Pine, C. G. Koch, and V. M. Malec. (AD-A102 200)

The electronic equipment maintenance training (EEMT) system is being developed to augment "A" school level training. The system should provide electronics trainees with hands-on practice of generic preventive and corrective maintenance procedures by means of self-paced computer-assisted and computer-managed instruction. This report summarizes the system definition phase of the EEMT program.

Effects of Performance-oriented Text Upon Long-term Retention of Factual Material.
TR 81-22. September 1981. P. T. Sturges, J. A. Ellis, and W. H. Wulfeck, II. (AD-A106 096)

Little information exists on variables affecting long-term retention of factual material in technical training. Two experiments compared a job-oriented text with a topic-oriented text. Twenty-four junior college students studied individualized booklets to learn factual material, on either metal fasteners or micrometers, to criterion. Six months later, an unanticipated retention test was given. On the test on metal fasteners, students who had received job-oriented text had significantly better retention on recall, but there were no differences on a recognition test. There were no differences for the text on micrometers. The results are discussed in terms of the role of supplementary related material on retention of factual material.

Tailoring Shipboard Training to Fleet Performance Needs: II. Propulsion Engineering Problem Analysis. TR 81-23. September 1981. C. R. Chiles, M. L. Abrams, M. R. Flaningam, and R. V. Vorce. (AD-A105 677)

A needs assessment strategy was designed to identify and assess differences between actual and desired performance of main propulsion personnel and deficiencies in the various support and administrative systems. Shipboard managers and operator personnel were interviewed aboard the "pilot" ship during a 14-day transit from Japan to the United States during November 1977. Both managers and operators reported the primary performance problem to be watchstanding; specifically, the difficulty of attaining and maintaining three fully qualified propulsion watch sections at all watch stations. Substantial deficiencies were also reported in the support and administration systems. The needs assessment strategy provided sufficient information about main propulsion performance deficiencies to initiate development of training solutions.

The Development of Four Job-oriented Basic Skills (JOBS) Programs. TR 81-24. September 1981. S. R. Harding, B. Mogford, W. H. Melching, and M. Showel. (AD-A106 370)

This report describes the development of four training courses for Navy personnel whose ASVAB scores were below the minimum required for entry into Navy Class "A" technical schools. The training courses were designed to increase their mastery of the skills and knowledge deemed to be prerequisites for success in selected Class "A" schools. This effort was directed towards preparing these low-scoring personnel to enter Class "A" schools in the following areas: propulsion engineering, operations, administrative/clerical, and electricity/electronics.

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SPECIAL REPORTS

Combat System Test Team Training Course: A Preliminary Evaluation. SR 74-4. March 1974. D. H. Sass.

The purpose of this effort was to evaluate a training course developed for prospective members of combat system test teams assigned to ships participating in the combat system program. This program is a new organizational concept being tested on a number of pilot ships. Data obtained by interviewing and surveying 22 course graduates and a number of instructors showed that the course was generally well received by all participants. Perceived benefits, however, directly related to the student's prior background and experience.

Effects of Sending Minority Personnel Classified as Nonschool Eligible to "A" School. Part I: "A" School Achievement. SR 74-6. June 1974. C. R. Bilinski, L. S. Standlee, and J. C. Saylor.

Since minority personnel are disproportionately represented in several Navy ratings, an attempt was made to correct the imbalance by assigning a number of minority students classified as nonschool-eligible to "A" school. Members of this group, together with members of a similar group of nonminority noneligibles and a control group of eligibles, were monitored throughout "A" school training. It was concluded that, although noneligible students were less effective than were school eligible students, with additional time in school and special remedial help, they could graduate.

Effects of Sending Minority Personnel Classified as Nonschool Eligible to "A" School. Part II: Performance in Fleet Assignments. SR 75-4. October 1974. C. R. Bilinski and L. S. Standlee.

This research was conducted to determine how a group of nonschool-eligible minority personnel who were assigned to and graduated from "A" schools (see NPRDC SR 74-6) performed in fleet assignments relative to a similar group of nonminority noneligibles and a control group of eligibles. Six months after these groups graduated from "A" school, it was found that the majority, in all three groups, were rated positively in most of the evaluations concerning (1) work aptitude, interest, and quality, (2) rating specific work performance, (3) predicted advancement, (4) retention desirability, and (5) adjustment characteristics. It was concluded that nonschool eligible students who graduated from "A" schools do not differ from regular eligible students in terms of initial fleet performance and adjustment.

Recommendations for Marine Corps Training Support Systems (1975-1980). SR 75-6. February 1975. E. A. Hooprich, N. H. Van Matre, R. V. Harrigan, V. M. Malec, and C. R. Chiles.

The objectives of this work were to determine training support systems requirements for the 1975-1980 time frame for Marine Corps formal schools and major field commands and to develop a plan for the procurement of such systems. The USMC has a continuing requirement to train substantial numbers of officers and enlisted personnel at both formal schools and field commands. The increasing complexity of modern weapon systems, the potential decline in the average aptitude level of

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personnel entering the Marine Corps, and the continuing restraints on defense spending will result in greater pressures on Marine Corps training systems.

A Personnel Readiness Training Program: Initial Project Developments. SR 75-8. April 1975. G. J. Laabs, R. E. Main, A. J. Abrams, and J. H. Steinemann.

Significant improvements in personnel readiness are required to meet the increasing demands of naval operations. The personnel readiness training (PRT) program is a model testing-and-training program designed to enhance personnel readiness by diagnosing job-relevant strengths and weaknesses and prescribing remedial shipboard training. Efforts conducted in support of this program will cover seven major research stages, including (1) definition of R&D boundaries, (2) determination of performance requirements, (3) task selection, (4) diagnostic test construction, (5) media and format selection, (6) development of training materials, and (7) program evaluation. The first three stages, which have been completed for the overall program, provide information regarding the applicability of the model test and training program to other technical areas.

Design of Training Systems (DOTS) Project: Test and Evaluation of Phase II Models. SR 76-10. April 1976. F. R. DiGialleonardo.

The purpose of the design of training systems (DOTS) project was to demonstrate the feasibility of applying new decision-making technologies, based on the behavioral and management of training in the Navy. Prototype applications were developed using mathematical modeling approaches. A test and evaluation was undertaken in order to determine technical, operational, and financial feasibility of prototypes as well as broader applications of technologies in question throughout Navy education and training community. Models were determined to be technically sound overall.

Computer-based Instruction for TRIDENT FBM Training. SR 76-11. June 1976. H. D. Kribs.

This report analyzes the possibilities of using computer-based instruction (CBI) as a low-cost supplement to the strategic weapon system laboratory training at the TRIDENT training facility. Three existing CBI systems were found to be adequate to meet the laboratory training requirements, one of which was identified as the most cost-effective.

Guidelines for Cost-effectiveness Analysis for Navy Training and Education. SR 76TQ-12. July 1976. P. L. Doughty, H. W. Stern, and C. Thompson. (AD-A097 132)

Procedures and guidelines were developed to aid the analyst in developing appropriate steps to conduct cost-effectiveness analyses. These procedures can be used for determining the allocation of instructional resources and other implications of competing programs.

The BASIC Instructional Program Student Manual. SR 77-2. October 1976. M. H. Beard and A. V. Barr.

The BASIC Instructional Program (BIP) is a "hands-on laboratory" that teaches elementary programming in the BASIC language. This manual is the student's main

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source of information about the BIP system and the BASIC language. The manual is organized as a reference document aimed at students with no previous programming experience. Discussions of programming concepts, such as input and variables, are followed by the specification of the BASIC statements used to implement them. The syntax and sample programs are used as illustrations. Section III lists and explains the commands that control the BIP system.

Survey, Evaluation, and Design of On-the-job Training for the Mess Management Specialist Afloat. SR 77-3. January 1977. T. B. Malone, J. DeLong, and R. Farris.

On-the-job training programs for the mess management specialist (MS) rating afloat were surveyed and evaluated. Data were obtained from interviews and observations conducted aboard a representative sampling of the Navy's ships (22 from the Atlantic Fleet and 21 from the Pacific Fleet). It was concluded that the Navy's MS training aboard ship is operating at a level that does not meet Navy food management standards. The recommended solution to this problem was that the Navy begin immediately to develop an MS-OJT individualized, self-paced training system. Such a system was described and is designed, when implemented, to provide training that is relatively standard, is responsive to trainee requirements, provides supervisors with training management and instruction techniques, and includes all required training materials and aids.

A Method of Identifying U.S. Navy School Noncurriculum Problem Areas. SR 77-4. February 1977. C. R. Bilinski.

Early detection and identification of actual or potential problems within the Navy training programs can increase training efficiency. Thus, a questionnaire was developed based on the training environment and administered to students and instructors at six Class "A" schools in the San Diego area. Based on data obtained from the questionnaires and follow-up interviews, the following possible problem areas were identified: military discipline, programmed instruction, instructor selection and training, and physical environment features. In view of these findings, a Navy school evaluation package, comprising student and instructor questionnaires and brief instructions, was prepared for use by Navy schools in identifying and assessing noncurriculum problem areas within their training programs.

Small Unit Ground Combat Training: A Bibliography and Taxonomy. SR 77-13. September 1977. A. G. Archibald, R. E. Hayes, and G. S. Crawford.

The military literature was searched to determine combat training requirements for Marine Corps rifle squads. Pertinent works are listed along with alphabetical lists of key words and authors. Also, key words are indexed and arranged hierarchically within seven major categories to facilitate cross-referencing with the other lists. This information provides the foundation for further research and development.

Interim Training Manual for the Instructional Strategy Diagnostic Profile. SR 77-14. September 1977. M. D. Merrill, R. E. Richards, R. V. Schmidt, and N. D. Wood.

The objective of this manual is to train instructional developers and evaluators to apply the instructional strategies diagnostic profile (ISDP). The ISDP is designed

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to determine whether existing or newly developed instruction accomplishes its stated objectives. It can also be used prescriptively to redesign ineffective instruction.

The BASIC Instructional Program Student Manual: MAINSAIL Conversion. SR 78-9. April 1978. M. L. Dageforde, M. H. Beard, and A. V. Barr.

As outlined in NPRDC SR 77-2, the BASIC Instructional Program (BIP) is a "hands-on laboratory" that teaches elementary programming in the BASIC language. The manual is the student's main source of information about the BIP system and the BASIC language. This report incorporates changes in the BIP manual resulting from its conversion into the MAINSAIL programming language.

Improving the Decision Training Effectiveness of Computerized Tactical Combat Simulations. SR 78-11. June 1978. E. H. Rocklyn.

Problems in computerized combat simulation training are identified and discussed. Recommendations for solving these problems are offered in an attempt to increase the decision-training effectiveness of this medium. Many of these recommendations require only the redirected employment of existing resources.

The Feasibility of Individualized Instruction in the Navy's Mess Management Specialist Class "A" School. SR 78-16. September 1978. M. R. Flaningam and C. R. Chiles.

The primary objective of this effort was to demonstrate the feasibility of using individualized instruction in the Navy's Mess Management Specialist (MS) "A" school. Such a course was designed, developed, and evaluated for the wardroom training phase of the school. The data indicated that such instruction is technically feasible for the wardroom phase, since student performance was improved and training time reduced. It was recommended that a cost benefit analysis be conducted before final decisions are made as to implementation and generalization.

Instructional Strategy Diagnostic Profile Training Manual: Workshop Evaluation. SR 78-17. September 1978. N. D. Wood, J. A. Ellis, and W. H. Wulfeck, II.

Twelve Navy civilian personnel familiar with instructional development techniques participated in a workshop on the Instructional Strategies Diagnostic Profile (ISDP) Training Manual at the Navy Personnel Research and Development Center during August 1977. Although the results indicate that the manual was generally effective, participants had difficulty with some of the more complicated concepts and procedures.

The Instructional Quality Inventory. I: Introduction and Overview. SR 79-3. November 1978. W. H. Wulfeck, II, J. A. Ellis, R. E. Richards, N. D. Wood, and M. D. Merrill. (AD-A062 493)

Instructional system development (ISD), a systematic method for developing military instruction, is used by the military services to develop or revise a large portion of the training courses. The instructional quality inventory (IQI) was developed to provide quality control/evaluation procedures for ISD. This report is designed to acquaint managers of instructional development efforts, evaluators of instruction, contract monitors, and others with the IQI process.

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The Instructional Quality Inventory. IV: Job Performance Aid. SR 79-5. November 1978.
J. A. Ellis and W. H. Wulfeck, II. (AD-A083 928)

This report provides a job performance aid for the instructional quality inventory (IQI) process (see NPRDC SR 79-3).

Interior Communications Supervised Alarm and Warning Systems: Development of Instructional Materials. SR 79-8. December 1978. W. H. Wulfeck, II and D. L. Van Kekerix.

Individualized instructional materials were developed that covered the alarm and systems warning unit of the curriculum of the Interior Communications (IC) "A" School, San Diego. Instructional modules developed covered the following areas: desuperheater high temperature alarm system, the feed pressure alarm system, the deaerating feed tank water level alarm system, and the lube oil low pressure alarm system. Procedures used to develop these modules were documented to aid subsequent development efforts.

Prospects for Low-cost Advanced Computer-based Training: A Forecast. SR 79-16. April 1979. J. H. Wolfe and M. D. Williams.

The technological opportunities for intelligent computer-assisted instruction (ICAI) that are expected from new developments in software and hardware technology over the next 10 years are discussed, as well as the advantages and disadvantages of trying to implement ICAI on time-sharing computers, personal computers, and LISP (a symbol manipulation programming language) machines. It was concluded that, by 1983, personal stand-alone LISP machines could sell for less than \$10,000 and be capable of supporting the most complex ICAI programs. Also, five areas were identified where ICAI could be used to maintain and enhance the skills of operating personnel: steam-plant casualty control, AAW tactics, ASW tactics, electronics maintenance, and EW operations.

The Instructional Quality Inventory: II. User's Manual. SR 79-24. August 1979. J. A. Ellis, W. H., Wulfeck, II, and P. S. Fredericks. (AD-A083 678)

This report provides a user's manual for the instructional quality inventory (IQI) process (see NPRDC SRs 79-3 and 79-5).

An Instructional Quality Inventory (IQI) Analysis of Some Leadership and Management Education and Training (LMET) Courses. SR 80-2. December 1979. W. H. Wulfeck, II, H. W. Stern, P. S. Fredericks, and J. A. Ellis.

At the request of the Chief of Naval Education and Training, NAVPERSRAND-CEN, using instructional quality inventory (IQI) procedures, analyzed the instructor guides for the leading petty officer and leading chief petty officer leadership and management education and training (LMET) courses. This report describes the methodology used to analyze the LMET material, the results of that analysis, conclusions drawn, and recommendations for improving the LMET curricula.

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Analysis of Marine Corps Communication-electronics Schools Computer-based Education System: An Implementation Plan and Economic Analysis. SR 80-4. December 1979. N. H. Van Matre, H. S. Pennypacker, and D. E. Bortner.

The Marine Corps Communication-electronics Schools (MCCES), Twentynine Palms, CA, is developing a computer-based education (CBE) system to support its training requirement. This CBE system is projected to provide computer-managed individualized instruction for courses concerning the operation and maintenance of communication and electronics equipment. To assist MCCES with the CBE system development, NAVPERSRANDCEN developed an implementation plan that lists those tasks that must be accomplished to enable MCCES to meet identified major milestones.

Development and Evaluation of a Comprehensive Examination for Basic Electricity and Electronics. SR 80-8. February 1980. J. A. Ellis, W. H. Wulfeck, II, J. D. Coady, and G. F. Lahey.

Procedures based on the instructional quality inventory (IQI) were used to develop test items for all objectives in modules 1 through 14 of the current version of the Basic Electricity and Electronics (BE/E) preparatory course. These items were then pilot tested on BE/E students and revised on the basis of the pilot test results. Results showed that IQI procedures were adaptable to the test development process and greatly facilitated test item production.

A Test-answer Input Device for the Navy's Computer-managed Instruction System: Preliminary Requirements and Characteristics. SR 80-13. March 1980. M. Hamovitch.

The research reported here was part of a team effort to select a test-answer input system for the Navy's computer-managed instruction (CMI) system beyond October 1981, when the current contract for testing devices expires. This Center was tasked with specifying requirements and characteristics for the input systems, identifying potential options, and providing quantity and cost information.

Five types of systems were selected for review: the optical reader, three types of test-answer input devices (TIDs), and the interactive cathode ray tube (CRT) terminal. Results of the review showed that both the current system of optical mark readers and a proposed system using numeric TIDs with link control units are instructionally feasible, can be made fully compatible with the current computer system, and require no software changes. The two types of alphanumeric TIDs and the CRT terminal, although they provide greater capabilities than the other systems, would require extensive revisions of existing courses and large-scale software changes to the CMI data base before they could be implemented.

Assuring Objective-test Consistency: A Systematic Procedure for Constructing Criterion-referenced Tests. SR 80-15. March 1980. J. A. Ellis and W. H. Wulfeck, II.

This report proposes a logically and, in some cases, empirically-based set of procedures and rules that can be used to develop criterion-referenced tests. These procedures and rules are based on a scheme for classifying objectives, instruction, and test items that was designed to meet two important conditions: (1) instructional developers must be able to make classifications reliably, and (2) the scheme must

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have clear implications for specifying test item development as prescriptions. The guidelines presented in this paper will be incorporated into a manual for test construction in Navy training.

Marine Corps Infantry Training Requirements for Map Interpretation and Land Navigation. SR 80-17. May 1980. K. D. Cross and S. P. Rogers.

Because of the wide variance in the map interpretation and land navigation tasks that an infantryman may be required to perform, it was necessary to examine the job responsibilities of a variety of infantry personnel under a variety of operational conditions. Project personnel and members of a Marine Advisory Panel defined "key" personnel within an infantry battalion whose composite job responsibilities encompassed a wide range of land navigation and map interpretation tasks. The job responsibilities of these personnel were identified by studying the field manuals and technical manuals that define the doctrine for using the Marine infantry battalion in amphibious operations and subsequent operations ashore. The listing of job responsibilities was then used to compile a list of tasks, the accomplishment of which depended directly or indirectly on the ability to use maps and map supplements for the purpose of navigation or making tactical decisions.

The Instructional Quality Inventory: III. Training Workbook. SR 80-25. July 1980. P. S. Fredericks. (AD-A092 804)

Instructional system development (ISD), a systematic method for developing military instruction, is used by the military services to develop or revise a large portion of the training courses. The instructional quality inventory (IQI) was developed to provide quality control/evaluation procedures for ISD. This report is designed to provide practice and feedback on the IQI procedures.

A Computer-based Study Management System: Implementation and Evaluation in a Navy Technical Training School. SR 80-26. July 1980. W. E. Montague, N. Van Matre, H. W. Stern, and J. A. Ellis.

The study management system (SMS) was designed to (1) individualize instruction, (2) automate testing and recordkeeping, and (3) improve student performance by controlling study behavior through frequent questioning. Because it uses existing instructional materials, its development cost is low relative to an ISD revision. In this effort, the performance of four classes of students receiving SMS was compared to that of four classes receiving conventional classroom instruction to compare the instructional effectiveness of the two modes. Results showed that SMS students performed slightly better than did conventional students.

Manual for In-service Training of Instructors. SR 80-28. July 1980. J. P. Smith.

This manual sets forth procedures for conducting in-service training of instructors in on-the-job behavior toward students. This training is achieved by means of structured peer group discussions and is applicable for all Navy instructors, including those who use computer-managed instruction (CMI). This manual can also be used by directors of instruction, training officers, and course directors as a guide for effective selection and training of peer groups discussion leaders. This training should be conducted entirely in-house (i.e., by personnel assigned to the school).

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Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): II. Objective Hierarchy. SR 80-31. September 1980. S. I. Windle, R. E. Mitchell, and L. J. Ritter.

Air antisubmarine warfare (ASW) training is currently conducted using submarine services as available, supplemented by surface ships and ground-based training devices. Training has increasingly depended upon devices that are primarily land-based, resulting in an adverse impact on acoustic readiness in deployed and reserve sites. To address this problem, a generic training system that can be delivered to all relevant air ASW platforms in a deployed setting is being developed. This system should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any pertinent on-board acoustic processor. This report provides the task analysis upon which the training objectives and curricula will be based.

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): III. Media Selection. SR 80-32. September 1980. H. D. Kribs and S. I. Windle.

As described in NPRDC SR 80-31, air antisubmarine warfare (ASW) training is currently conducted using submarine services as available, supplemented by surface ships and ground-based training devices. Training has increasingly depended upon devices that are primarily land-based, resulting in an adverse impact on acoustic readiness in deployed and reserve sites. This report addresses the four steps involved in media selection for the DASS deployable training system (DASS DTS) and presents recommendations for making the final selection of the media option.

Computer-managed Instruction in the Navy: I. Research Background and Status. SR 80-33. September 1980. N. Van Matre. (AD-A092 481)

This report, the first of a series on Navy CMI, describes the problem areas that limit the effectiveness of the CMI system and the R&D proposals that have been developed to address these problems. Problems were identified by observing the system and by administering questionnaires to and holding structured interviews with CMI management, instruction staff, and student personnel. Candidate research proposals were developed to support the major problem areas identified. Of these proposals, six were given the highest priority by CNTT and CNET. These proposals, which form the basis of NAVPERSRANDCEN's initial CMI R&D effort, are (1) effects of incentive charts on rate of progress through a CMI course, (2) instructor role in a CMI environment, (3) computer-generated reports for the management of student learning, (4) development and incorporation of automated performance tests into the CMI system, (5) development of alternate test strategies to improve mastery and retention in selected CMI courses, and (6) development of computer software to aid data summarization for research and management analysis.

Analysis of Simulated Maintenance Specifications. SR 80-34. September 1980. D. McKinley.

This Center has been tasked with developing a generic specification for a mechanical and electromechanical organization-level simulated avionics maintenance trainer (SAMT). This report provides an analysis of two existing generic specifications that have been developed for the Naval Air Development Center and the Air

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Force Human Resources Laboratory. Results of the analysis will be used in developing the SAMT generic specification.

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): IV. Ordinal Syllabus. SR 81-5. December 1980. S. I. Windle, H. D. Kribs, and J. N. Ladd. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of the project was to develop a generic training system that can be delivered to all relevant air ASW platforms in deployed settings. This system should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any pertinent on-board acoustic processor. This report provides the ordinal syllabus for this training system.

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): V. Training Support Requirements Analysis. SR 81-6. December 1980. J. N. Ladd, H. D. Kribs, and S. I. Windle. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of the project was to develop a generic training system that can be delivered to all relevant air ASW platforms in a deployed setting. This system should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any on-board acoustic processor. This report describes the training support requirements for this training system.

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): VI. Deployable Training System Requirements. SR 81-7. January 1981. S. I. Windle, J. N. Ladd, and H. D. Kribs. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of the project was to develop a generic training system that can be delivered to all relevant air ASW platforms in a deployed setting. This deployable training system (DTS) should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any pertinent on-board acoustic processor. This report identifies the tasks to be included in DASS DTS training.

Job-oriented Basic Skills (JOBS) Program: Administrator's Guide. SR 81-9. February 1981. S. I. Sander and J. Murphy.

The job-oriented basic skills (JOBS) program has been operating at the Service School Command (SSC), San Diego since July 1979. In FY81, the JOBS program will be expanded to SSCs at Memphis, Meridian, and Great Lakes. This report, which is intended for use by military personnel designated to support the program, addresses the administrative aspects of the instructional program and provides background information.

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S-3A Sensor Operator (SENSO) Course Design: Volume I. Objectives Hierarchy; Volume II. List of Objectives. SR 81-10. February 1981. Hazeltine Corporation.

The overall objective of this task was to revise instruction for the SENSO course and for parts of the copilot and naval flight officer (NFO) courses, using instructional systems development (ISD). This report provides the objectives hierarchy and the list of objectives developed for the SENSO course.

Urban Area Combat Training: Aviation Implications. SR 81-11. February 1981. O. A. Larson, S. K. Van Beenen, and P. H. McCann. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The objective of this research was to identify the aircrew training requirements for Marine aviation in support of landing force operations in urban environments. For use in this effort, an urban environment was defined as a large central city with extensive multistory building development, corresponding subterranean development, and associated suburbs. A sophisticated adversary was assumed, one who could mount an anti-aircraft threat with capabilities comparable to those of the Soviet Union. Emphasis was on the roles of attack and transport helicopters and on close air support operations of fixed-wing aircraft.

Overseas Diplomacy Support Coordinator Effectiveness: An Evaluation. SR 81-16. April 1981. I. Clelland.

The purposes of this research were to assess (1) the degree to which graduates of the Navy's overseas diplomacy support coordinator (ODSC) course were providing support to their deployed commands relative to their untrained counterparts (i.e., overseas diplomacy action officers (ODAOs)), and (2) the effect of ODSC activities in reducing overseas incidents as measured by rates of nonjudicial punishments. Results indicated that ODSC graduates do apply their training in the field and receive greater command support than do ODAOs.

Computer-based Approach to the Navy's Academic Remedial Training, Project PREST: A Cost-effectiveness Evaluation. SR 81-18. May 1981. R. A. Wisher and J. W. O'Hara.

This effort was conducted to compare the instructional effectiveness of the performance-related enabling skills training (PREST) program with that of the standard classroom approach, quantify the difference in effectiveness in terms of cost savings, chart the expected future costs of each alternative as a function of time, and predict the point at which the alternatives break even. Although the immediate impact and prolonged effect of PREST and classroom instruction was equal, PREST is not now cost effective.

Device Test and Evaluation Master Plan for the Electronic Equipment Maintenance Training System (Device 11B106). SR 81-19. June 1981. S. M. Pine, R. W. Daniels, and V. M. Malec.

The device test and evaluation master plan (DTEMP) for the electronic equipment maintenance training system (EEMT) is presented in this report.

EDUCATION AND TRAINING (Continued)

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): VII. Lesson Specifications. SR 81-23. July 1981. S.I. Windle, J. N. Ladd, and H. D. Kribs. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of this research task was to develop a generic training system that can be delivered to all relevant air ASW platforms in a deployed setting. This deployable training system (DTS) should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any pertinent on-board acoustic processor. This report describes the lesson specifications developed for the DTS testbed.

Upgraded Navy Computer-managed Instruction: Analysis of Requirements for and Preliminary Instructional System Specifications. SR 81-26. September 1981. N. Van Matre and K. Johnson.

This effort was conducted to determine current and near-term instructional requirements at the Navy's computer-managed instruction (CMI) system, to provide preliminary instructional system specifications, and to develop alternative CMI system upgrade approaches that would satisfy the instructional requirements. All components of the instructional system were surveyed to elicit information about system problems and user requirements. CMI system upgrade alternatives were developed by integrating survey results into information and problem summaries for each CMI organizational element.

EDUCATION AND TRAINING (Continued)

TECHNICAL NOTES

Information Handling Techniques and Abilities of Group IV Personnel. TN 76-1. July 1975. R. E. Main.

An experimental program was conducted to investigate training characteristics of Group IV personnel (i.e., those with pre-entry AFQT scores that fall within the 10th through the 30th percentile range). Based on instructor observations, it was conjectured that the way Group IV students approach a learning situation may limit their learning achievement. It was found, among other things, that Group IV personnel were less competent than BE/E trainees in performing a number of information-handling procedures. They made more errors in following directions, even where instructions were relatively simple and information input was slow. Their retention of rate information approximated that of BE/E trainees, but they did not make use of organizational cues to reduce retention requirements. They also were less diligent in checking for and correcting errors. Further investigation is needed to establish relationships between information handling abilities and learning deficiencies and to determine the degree to which they can be corrected in Group IV personnel.

The Effect of Adjunct Question Presentation Mode on Learning From Prose. TN 76-4. March 1976. J. A. Ellis, R. E. Main, and K. Ellis.

This report, which studied the effects of question type, placement, frequency, and presentation mode on learning incidental material, was designed to determine if the facilitative effects of asking adjunct questions in person could be replicated by asking such questions with audio tape. Contrary to previous results, no significant differences were observed among groups when they were tested on the incidental questions. For this reason, increased application of adjunct questioning in operational training was not recommended.

Feedback in Programmed Instruction and Text Material. TN 77-1. October 1976. R. W. Kulhavy.

Studies on the effect of providing feedback with text-based lessons were reviewed and results organized under five topic headings: feedback complexity, feedback as reinforcement, effect of high feedback availability, feedback and learning, and feedback and learner confidence. The section on feedback and learning describes information-processing approaches and a possible application to automated teaching systems.

Final Recall, Information Transfer, and Proactive Interference in Short-term Memory. TN 77-17. September 1977. J. A. Ellis and M. Anderson.

Two groups of Navy enlisted men participated in an experiment on memory for words. Both groups were presented with four 3-trial blocks of categorized-noun stimuli. After each block, they had a 1-minute break, followed by a free-recall (F-R) test, in which subjects were asked to recall the stimulus. The only difference between the two groups was that the first was informed about the F-R tests, and the second was not. Comparison of responses of the two groups showed that the informed group performed better than the uninformed group.

EDUCATION AND TRAINING (Continued)

Interim Training Manual for the Instructional Quality Inventory. TN 78-5. February 1978.
J. A. Ellis and W. H. Wulfeck, II.

This manual was developed according to the principles and prescriptions of the instructional quality inventory (IQI). The objective of this manual is to train instructional developers and evaluators to apply the instructional strategies diagnostic profile (ISDP). The manual is not only instructive but is an example of effective instruction based on the IQI.

Learner Control of Instructional Sequence in Computer-based Instruction: A Comparison to Programmed Control. TN 78-7. March 1978. G. F. Lahey and J. D. Coady.

Three experimental groups studied four lessons in a Basic Electricity and Electronics course using computer-based instruction. The first group could control the instructional sequence by selecting lesson segments and lesson content in any order, the second was shown the lesson author's recommendation prior to each selection, and the third went through all four lessons under programmed control. Since there were no significant differences in performance among the three groups, it was concluded that learner control of the instructional sequence in computer-based instruction is as effective as programmed control. Further, the learner control mode may be preferable because of savings in lesson development time and possible long-term benefits.

The BASIC Instructional Program: Supervisor's Manual. TN 78-10. April 1978.
M. L. Dageforde and M. H. Beard.

The BASIC Instructional Program (BIP) is an interactive problem-solving laboratory that teaches elementary programming in the BASIC language. This manual documents the goals, methods, and operation of BIP for supervisory instructors.

The BASIC Instructional Program: Conversion into MAINSAIL Language. TN 78-11.
April 1978. M. L. Dageforde.

This report summarizes the manner in which the BASIC Instructional Program (BIP) was converted from SAIL, a programming language available only on PDP-10 computers, to MAINSAIL, a language designed for portability on a broad class of computers.

The BASIC Instructional Program: System Documentation. TN 78-12. May 1978.
M. L. Dageforde.

This report documents the BASIC Instructional Program (BIP) system as implemented in MAINSAIL. MAINSAIL is a machine-independent revision of SAIL that should facilitate implementation of BIP on other computing systems. Each of the modules that make up the system is described in detail.

EDUCATION AND TRAINING (Continued)

Construction of a Criterion-referenced, Diagnostic Test for Boiler Technicians. TN 78-14. May 1978. G. J. Laabs and R. C. Panell.

A criterion-referenced test keyed to an individualized, self-paced instruction program was developed as part of a diagnostic testing/shipboard training system. The job-based test described hypothetical situations that were based on known job requirements. Under each such situation, questions were asked that required the demonstration of skills and knowledges that supported the job and were covered in the various modules of the instruction program. High face and content validity were ensured by using cards, charts, diagrams, and illustrations in presenting each job situation and by having job experts write test items.

Criteria for Evaluating a Job Analysis Training Design. TN 78-15. July 1978. E. A. Rundquist.

Criteria were developed for judging job-analysis output for training design. Requirements that must be met before applying the criteria concern the purpose of the training and the qualifications of the judge. Important independent requirements are the organization of the output and the characteristics of the job-task statements. The organizational requirement is more critical because deficiencies are less likely to be remediable.

Effects of Remedial Feedback in a Technical Training Management System: A Pilot Study. TN 78-18. September 1978. J. H. Durnin, W. E. Montague, J. A. Ellis, and W. A. King.

The purpose of this study was to determine whether elective remediation procedures are as efficient and effective as those that provide required or no remediation. It was concluded that the use of student-controlled remediation has potential, but that, because of the problem's complexity and the results of other research, further validation is needed.

Electronic Equipment Maintenance Training System: Preliminary Design Options. TN 79-3. October 1978. C. D. Wylie and G. V. Bailey.

A list of design options was developed for the electronic equipment maintenance training system that will be used in "A" schools to deliver more cost effective, flexible, and valid electronic maintenance training. From this list, a "strawman" functional design was formulated that includes a central processing and storage unit, an instructor console, a software and courseware editing station, and about 20 student carrels. Since existing technology is adequate to support the development of this system, it was recommended that a system definition phase be undertaken.

Effects of Organizational Aids on Learning From Prose Texts. TN 79-5. December 1978. R. E. Main.

The purpose of this study was to identify and evaluate strategies for organizing prose control that could facilitate learning in real-life instructional settings. Analyses of portions of high school science text resulted in the identification of three basic types of relationships: associative (AR), comparative (CR), and directed (DR). Three types of instructional treatments were prepared, based on these relationships,

EDUCATION AND TRAINING (Continued)

and tested on samples of Navy recruits. There was little difference, however, in performance for groups tested under the various treatments.

Investigation of Academic Performance Criteria in Self-paced Navy Class "A" Schools. TN 79-6. February 1979. J. A. Hermans and D. W. Bergman.

It is difficult to predict academic success in Navy instructor-managed, self-paced "A" schools because of the lack of performance criteria. Therefore, data about performance criteria were obtained by interviewing instructor and director personnel at 17 such schools. Analyses of results showed that the criteria identified across the 17 schools comprise the discrete variable of pass/fail status, and seven basic categories of continuous variables: final grade, number of attempts to reach criterion, academic time in course, final performance exam scores, final written exam scores, within-course performance exam scores, and within-course written exam scores. Since none of these categories is common to all schools, it was recommended that the one or two most promising categories identified for each school be used in predictive studies for that school.

Combining Individualized Instruction Systems with Microprocessors. TN 79-9. June 1979. J. D. Hollan (Ed.).

This report provides a case study of how the personalized system of instruction (PSI) has evolved at the San Diego and Irvine campuses at the University of California. Computer support for this form of individualized instruction is being developed on an incremental basis. Many of the problems and some of the solutions devised in this evolutionary approach to the application of computer-based instruction are expected to be directly relevant to the Navy's increasing use of individualized instruction.

Direct-dialed Tele-mail System. TN 79-10. June 1979. J. D. Hollan (Ed.).

Investigations of computer-based instruction systems indicate that such systems could provide unique benefits for Navy training. Currently available methods for delivering this instruction, however, are inappropriate for shipboard and dockside applications. Thus, the purpose of this effort was to examine the potential benefits and costs of a direct-dialed Tele-mail system. Results indicated that a direct-dialed tele-mail communications facility should be investigated as a means of providing support for computer-based instructional systems at distributed sites.

Parameter Estimation in Parameter-dependent Programs for Optimizing Learning. TN 79-11. July 1979. J. A. Paulson.

The objective of this effort was to develop techniques for estimating the unknown parameters of mathematical models of learning, assuming that the one-element model of stimulus sampling theory governs the learning process, but allowing for the possibility that the parameters of that model vary across subjects and time. Alternative models for the composition of learning parameters are presented in terms of subject and item components, and tests of hypotheses to use in identifying the most appropriate model are described.

EDUCATION AND TRAINING (Continued)

Component Research in Personalized Systems of Instruction: Implications for Computer-managed Military Technical Training. TN 80-2. November 1979. K. Lockhart.

Successful innovations of the personalized system of instruction (PSI) were investigated to determine whether they can be applied to analogous problems in military CMI systems. Specifically, literature concerning procedures to expedite student progress and use of differing mastery criteria, proctors, motivational lectures, and different testing procedures was reviewed. Results showed that, if appropriately employed in computer-managed military technical training, proven PSI innovations could have considerable positive effect. Also, several candidate research projects could be initiated involving experimental implementation of proctors, mastery criteria, and instructor training packages in CMI.

Long-term Retention of Factual Information. TN 80-5. January 1980. J. A. Ellis.

This research was designed to measure retention of information taught in a technical training course at the Propulsion Engineering "A" school over a 6- to 8-month period. Students were given a different version of the comprehensive examination for the basic portion of the course at three intervals: immediately after completing the basic course, 4 weeks later (after completion of the "A" school), and 6 to 8 months after graduation. Results showed that mean performance declined approximately 20 percent from the first to the third test (70 to 89%), but the significance of the decline could not be determined within the scope of this study. It was recommended that a research program in the area of long-term retention of factual information be initiated.

Notes on Remediation in Training. TN 80-6. January 1980. J. P. Smith.

Remediation of students who experience learning problems is needed in almost any training course and can take different forms. Several issues should be considered before a remedial approach is developed. The ideas on remediation presented in this paper were developed in a study of the problems that arise in individualized instruction. Although the study focused on computer-managed instruction, these comments also apply to traditional platform and laboratory instruction.

Handbook of Item Writing for Criterion-referenced Tests. TN 80-8. February 1980. G. Roid and T. Haladyna.

This handbook provides practical guidelines, techniques, and examples of test items to be used in military instruction. It was designed to be used in conjunction with the instructional quality inventory (IQI), which provides quality control procedures for instructional developers who are creating objectives, tests, and instructional materials. The IQI procedures help in assessing the consistency and adequacy of learning objectives and test items.

Theoretical Definition of Instructor Role in Computer-managed Instruction. TN 80-10. March 1980. B. L. McCombs and J. C. Dobrovolsky.

This report summarizes the results of literature reviewed in the areas of (1) relevant theoretical frame works for defining ideal CMI instructor roles, and (2) existing CMI system functions and definitions of CMI instructor roles. Also, it

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outlines a format for the theoretical CMI instructor role specification that will be used to identify specific instructor behaviors within each role and to assess deviations of the ideal from actual CMI instructor behaviors in selected military CMI environments.

Work Plan for the Development of a Generalized Maintenance Training Program. TN 80-11. March 1980. MYSTECH Associates, Inc.

The work plan described herein has been constructed to develop a procedure for defining requirements and specifications that may be used to improve the acquisition process for simulated aviation maintenance trainers. It describes the management controls that have been established to ensure that contractual obligations are satisfied within budget constraints and contains information on the manner in which individual tasks will be accomplished.

A Multimethod Generative CAI System for Remedial Mathematics. TN 80-12. March 1980. J. W. Cotton, J. P. Gallagher, M. Hopkins, and S. P. Marshall.

Following a literature review regarding generative CAI systems, a computer-assisted tutorial system for remedial mathematics was written in modified LISP programming language and installed on the PDP-11/45 computer in the Computer Systems Laboratory at the University of California, Santa Barbara. The new system was then compared to five generative systems and one problem-solving system to determine its suitability for assessing the four modes for teaching remedial mathematics to Navy personnel.

Royal Saudi Naval Forces, Company 11: Preliminary "A" School Evaluation. TN 80-25. September 1980. T. E. Curran, T. M. Duffy, and S. E. Barker-Ball.

Students in the Saudi Naval Expansion Program (SNEP), who have been undergoing technical training in the United States since 1974, have experienced severe failure rates and frequent disciplinary problems. To help alleviate these problems, a fundamental skills training (FTS) program was established in 1977 in an attempt to elevate the skill levels of Saudi students. This report presents preliminary data on the first class of Saudi students to receive FST.

Enhanced Training During Overhaul: Evaluation Plan for Pilot Ships I and II. TN 80-26. September 1980. J. J. McGrath, K. A. Johnson, and W. A. Nugent.

The Navy has set up a pilot ship decrewing program to evaluate the extent to which the level of personnel skills and morale can be increased by modifying existing overhaul policies. One approach, which was tested on two pilot ships (USS FOX (CG33) and USS THOMAS C. HART (FF 1093)), was to increase the crews' skill levels through enhanced training during overhaul. This report provides an evaluation plan for assessing the cost and benefits to the Navy of this approach.

A Microprocessor-based Resistance Network Simulator for Teaching Basic Electronics. TN 81-1. J. H. Wolfe. October 1980.

This report describes a prototypical system that illustrates the capabilities and the potentialities of microprocessor-based training simulators that can be used both

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in classrooms and in remote sites. This development has demonstrated that relatively sophisticated programs for computer-assisted instruction can be implemented on stand-alone microprocessors.

Premastering Formats for Videodisc. TN 81-5. December 1980. R. E. Hurlock.

The optical videodisc offers a new storage and retrieval capability for visual images and audio that is superior to any other medium. This report provides information to aid in making decisions regarding the selection and use of premastering formats for instructional materials being prepared for videodisc-delivered training. The advantages and disadvantages of using film and tape formats were reviewed, and the best premastering formats for producing original materials and for converting existing audiovisual instructional materials are discussed.

Computer-based Tactical Memorization System. TN 81-8. March 1981. T. P. McCandless.

The objectives of this effort were to develop and evaluate a computer-based gaming system to facilitate the memorization of declarative information. This system has been implemented on a small stand-alone computer and ultimately will include an automated tutor to guide student-system interactions.

Life Cycle Training Costs: A Literature Review. TN 81-10. April 1981. J. R. Skeen and A. E. Jackson.

This literature review was conducted to provide background and materials for use in the construction of a life cycle training costs model for determining the cost of training associated with the life cycle of Navy weapon systems. The literature selected for review was organized into three subject areas: (1) system-oriented life cycle training, (2) instructional systems development, and (3) costing.

Development of Antisubmarine Warfare Team Training Objectives. TN 81-18. June 1981. D. A. Slough and H. W. Stern.

This effort was conducted to develop procedures for deriving objectives for team training. The procedures were used to obtain training objectives for three types of single ship antisubmarine warfare exercises: (1) search-attack unit exercises using active sonar, (2) passive sonobuoy exercises, and (3) passive target motion analysis exercises.

Project STEAMER: I. Taxonomy for Generating Explanations of How to Operate Complex Physical Devices. TN 81-21. August 1981. A. Stevens and C. Steinberg.

This report describes an initial framework for the development of techniques to automatically generate explanations of the operation of physical devices like those found in propulsion plants. Examination of the textual materials directed at providing students with an understanding of how complex devices like propulsion plants operate revealed a diversity of explanations. Thus, a taxonomy for organizing explanations of physical devices is presented. Also, evidence for the taxonomy is provided, along with examples from current Navy engineering texts and operations manuals.

EDUCATION AND TRAINING (Continued)

Project STEAMER: II. User's Manual for the STEAMER Interactive Graphics Package. TN 81-22. August 1981. L. Stead.

This report documents the general software used to present, create, and display diagrams and accept input from users of STEAMER. This documentation is intended as a reference manual for those who write STEAMER software.

Life Cycle Training Cost Model. TN 81-23. August 1981. J. R. Skeen and A. E. Jackson.

This report describes an initial life cycle training cost model for determining the cost of all training activities required to support a Navy weapon system during its entire life cycle.

Training Technology Handbook Development: Phase I. Annotated Literature Review. TN 81-24. August 1981. J. W. Kochevar, J. M. Erickson, M. T. Kramm, K. H. Briggs, S. F. Hirshfeld, R. P. Fishburne, Jr., K. R. Laughery, and M. M. Schwartz.

This report provides an annotated bibliography of technical literature relevant to identification of major training, personnel, and cost variables to be considered in projecting future training system requirements.

Project STEAMER: III. Using Qualitative Simulation to Generate Explanations of How to Operate Complex Physical Devices. TN 81-25. August 1981. K. Forbus and A. Stevens.

This report describes a method, based on incremented qualitative simulations, for automatically generating explanations and animating diagrams to explain the operation of complex devices such as those found in propulsion plants.

Project STEAMER: IV. A Primer on CONLAN--A Constraint-based Language for Describing the Operation of Complex Physical Devices. TN 81-26. August 1981. K. Forbus.

This report describes CONLAN--a computer language that allows the description of a set of objects, the composition of these objects into complex system descriptions, and the simulation of the modelled system in a qualitative manner.

Project STEAMER: V. Mathematical Simulation of STEAMER Propulsion Plant. TN 81-27. August 1981. B. Roberts and K. Forbus.

This report describes the engine room portion of the STEAMER propulsion plant mathematical model and methods for interactively using it.

Training Technology Handbook for System Acquisition Planners: Preliminary Version. TN 81-28. September 1981. J. W. Kochevar, K. B. Collyard, K. W. Seibert, K. H. Briggs, D. J. Funke, K. R. Laughery, and R. P. Fishburne, Jr.

This effort was conducted to generate the data for, and develop, a preliminary training technology handbook. The final form of this handbook is intended to assist hardware acquisition managers, training program developers, and others in estimating the composition and cost of training required for new weapon system acquisitions.

ORGANIZATION MANAGEMENT

TECHNICAL REPORTS

Survey of Unit Performance Effectiveness Measures. TR 74-11. January 1974. O. A. Larson, S. I. Sander, and J. H. Steinemann. (AD-774 919)

The Marine Corps requires improved measures of performance effectiveness for its combat unit training program to ensure that appropriate levels of unit readiness are maintained in accordance with its assigned mission. To meet this requirement, a survey was conducted to determine the state-of-the-art of performance assessment systems and methodologies. Also, the research literature in such areas as performance evaluation, decision making, and unit training was reviewed and information was gathered about existing performance assessment systems.

A Study of the Factors Influencing Career Motivation Among Navy Physicians and Dentists. TR 74-17. February 1974. C. Braunstein. (AD-775 948)

This effort was designed to assess the factors influencing the career motivation of Navy physicians and dentists and to evaluate differential career incentives. Responses to a structured multiple-choice mail questionnaire administered in March 1973 showed that 26 job factors were related to job satisfaction among physicians and dentists. The respondents expressed satisfaction with such factors as amount of personal responsibility, relationships with colleagues, security of employment, and amount of free time. They were dissatisfied with such factors as remuneration, quality of facilities and equipment, and the amount of participation they had in making decisions affecting their careers. Both physicians and dentists expected job satisfaction to be potentially higher in civilian life than in the Navy.

The Relationship of Internal/External Control to Work Motivation and Performance in the Navy. TR 74-21. April 1974. L. A. Broedling. (AD-779 001)

The effectiveness of the naval work force is dependent in part on the motivation of its individual members to do a good job. This effort was directed toward understanding what certain of the components of work motivations are. The primary concept studied was Internal-External Locus of Control, which represents a person's perceptions of the extent to which he feels in control of his environment (internal view) vs. feeling that events in his life are a result of forces beyond his control (external view). Also, the extent to which intrinsic vs. extrinsic factors contribute to work motivation was studied. Results showed that internals are motivated to work harder, are better performers, are more likely to feel that working hard is instrumental to attaining desirable outcomes, have less role conflict and ambiguity, and tend to be in higher pay grades than are externals.

Perceptions of Discrimination in Nonjudicial Punishment. TR 74-22. June 1974. P. J. Thomas, E. D. Thomas, and S. W. Ward. (AD-784 141)

The purposes of this effort were to determine whether existing records indicate that nonjudicial punishment (NJP) is administered without regard to race and if Blacks and Whites perceive discrimination in discipline, job assignments, and advancement opportunity. A biracial pair of Chief Personnelmen boarded over 70 ships on both coasts to record disciplinary data and administer the Attitude Evaluation Form (AEF) to 324 sets of personnel. A set consisted of a Black and a

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White offender and a biracial pair of nonoffenders, all in their first enlistment and in the same division. Although the results did not reveal differences in disciplining Blacks and Whites, equality of treatment in NJP has not been established. The written comments indicated discriminatory practices may be occurring prior to filing a report of an offense.

The Effects of Leadership Style and Situational Favorability Upon the Perception of Uncertainty and Risk. TR 74-26. June 1974. D. M. Nebeker. (AD-782 520)

According to Fiedler's contingency model of leadership effectiveness, a major factor influencing the effectiveness of an organization is the appropriateness of its leadership style to its situation. The adequacy of Fiedler's approach depends upon the assessment of the leadership situation. Recent research has indicated that differences between the amount of uncertainty perceived in the situation reflects the important dimension. Since this work was based on field research, there was a need to validate the uncertainty dimension in an experimental design.

Seventy-one subjects were presented four simulated leadership situations. Based on their responses to these situations, indexes of uncertainty and risk were created. It was hypothesized that situations described by Fiedler as unfavorable would be characterized by uncertainty and high risk. A significant relationship was found between the unfavorableness of the situation and the perceived uncertainty. These results indicate that situational favorability can be interpreted as a dimension of perceived uncertainty, validating previous research and suggesting the possibility of integrating Fiedler's work with other contingency theories.

Description of an "Ideal" Change Advocate in a Technical Navy Setting. TR 74-34. May 1974. A. J. Abrams, J. P. Sheposh, and M. H. Licht. (AD-782 331)

The purposes of this effort were to determine (1) whether fleet technical personnel could accept the Change Advocate concept within their team, (2) what characteristics are deemed important for a Change Advocate in the shipboard setting, (3) whether some technical personnel presently aboard ships possess the characteristics deemed essential for the Change Advocate, and (4) whether responses from technical personnel can be generalized across platforms. Results revealed that (1) most technicians felt the Change Advocate role was very important, (2) most technicians who might be qualified for the role desired the role, (3) technicians who were nominated by team members to be the Change Advocate were described as competent and motivated, (4) the major requisites for the "ideal" Change Advocate were effectiveness and competency as a technician, skillfulness in communications, and flexibility, and (5) technicians' responses were generally not platform specific.

The Measurement of Organizational Effectiveness: A Review of Relevant Research and Opinion. TR 75-1. July 1974. J. P. Campbell, D. A. Bownas, N. G. Peterson, and M. D. Dunnette. (AD-786 462)

An extensive literature search in the area of organizational effectiveness, including theories, research, and practice, was conducted. Existing techniques to measure organizational effectiveness are catalogued and summaries of various theories and models are presented. Areas of research for the Navy to undertake and to avoid are recommended.

ORGANIZATION MANAGEMENT (Continued)

Combat System Performance Based on 3M Maintenance Data. TR 75-25. April 1975. H. L. Williams and L. S. Standlee. (AD-A008 328)

A Combat System Department was implemented aboard selected pilot ships with the goal of improving maintenance effectiveness. Pilot and control ships were compared on the basis of data collected and supplied by the Maintenance Support Office 3M reporting system. The data failed to demonstrate that improved maintenance effectiveness resulted from implementation of the new organizational structure. Limitations of the data are discussed.

Survey of Enlisted Personnel Assigned to DLG Combat System Department. TR 76-2. July 1975. D. H. Sass and L. S. Standlee. (AD-A013 225)

The combat system program was initiated to improve electronic maintenance effectiveness. The resulting shipboard reorganization brought all electronic technician ratings under the cognizance of the newly designated Combat System Department. Before Navy-wide implementation, a number of pilot ships were designated for test and evaluation. As part of the evaluation, enlisted personnel were surveyed to obtain data on work assignment, training, rating structure, and career satisfaction. Responses showed that, overall, the combat system program has had a favorable impact on the enlisted personnel and is perceived as having brought about desirable improvements. However, changes to the initial organization and in personnel management practices are indicated.

Human Resource Management and Nonjudicial Punishment Rates on Navy Ships. TR 76-5. August 1975. K. S. Crawford and E. D. Thomas. (AD-A013 226)

The Navy's human resource management (HRM) survey is administered to Navy personnel in an attempt to diagnose a Navy unit's organizational "state of affairs." The purpose of this effort was to determine the relationship between indices of the HRM survey and rates of nonjudicial punishment (NJP) on Navy ships. It was hypothesized that the more effective the HRM system within a ship, the lower the NJP rate.

Results showed that all correlations between HRM survey indices and NJP rates were in the predicted direction (i.e., the better the organizational conditions, the lower the NJP rates). Comparison of extreme groups on the HRM Survey indices revealed that the NJP rates among the high-scoring ships were about half the magnitude of the low-scoring ships. These findings suggest that NJP rates are related to the type of HRM system present within a ship.

Feasibility of and Design Parameters for a Computer-based Attitudinal Research Information System. TR 76-9. August 1975. D. M. Ramsey-Klee, V. Richman, and G. Wiederhold. (AD-A014 551)

This report discusses the feasibility of developing a computer-based attitudinal research information system (RIS) for the field of Navy personnel research. The requirement for an RIS is generated from the fact that most data bases for Navy personnel and attitude research are not now retrievable and usable for secondary analysis or trend analysis. In addition to making an assessment of overall

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feasibility, this report contains recommendations regarding how such a system should be designed, implemented, and administered.

The Use of Evidence in Influencing Technician Attitudes. TR 76-10. September 1975. A. J. Abrams, J. P. Sheposh and M. H. Licht. (AD-A017 602)

This report describes the second phase of a larger research effort to assess the effect of a Change Advocate role and a change model in the introduction of a new hardware system. Previous research has shown that specific negative attitudes of technicians negatively affect system utilization. This effort focused on a practical means of enhancing experienced technicians' awareness of the existence and adverse effects of their negative attitudes, while not discrediting the existence of other causative factors that technicians correctly recognize. Objective evidence in the form of shipboard observations on the ASROC system was used to bring about the desired end. Results revealed that technicians initially blamed implementation problems on causes that were external and rejected internal causes such as their attitudes. However, after technicians were exposed to the ASROC observations, they agreed that their attitudes, as well as the external factors, had a negative effect on implementation, maintained positive expectations of new hardware systems (with some decrement), and were less positive in their evaluations of the effectiveness of Navy hardware systems.

Development of Unit Performance Effectiveness Measures Using DELPHI Procedures. TR 76-12. September 1975. O. A. Larson and S. I. Sander. (AD-A015 963)

A research effort to develop measures of effectiveness for unit performance was undertaken in support of the Marine Corps Tactical Warfare Analysis and Evaluation System (TWAES) requirements. The DELPHI, a technique for eliciting judgments, was used as the primary research approach. Performance evaluation items of both a contextual and response nature were developed. These items were tentatively categorized by unit level and type of performance.

Department of Defense Family Housing Preference Survey: Attitudes and Preferences of Military Personnel and Spouses Concerning Housing and Basic Allowance for Quarters. TR 76-20. November 1975. S. S. Stumpf and W. F. Kieckhaefer. (AD-A018 146)

Questionnaires were administered to a sample of 16,961 married military personnel and 13,625 spouses in the continental United States. The sample was designed to control for pay grade, urbanization level (rural, urban, or metropolitan), and type of housing occupied (government quarters, rented civilian housing, or personally owned housing). Detailed information was obtained on housing style preferences, housing type preferences, potential impact of a fair market rental policy for government quarters, housing satisfaction, attitude toward various proposed policy changes, career motivation, and perceived quality of life. Results showed that personal/situational factors and housing attitudes were associated with perceived quality of life and career intention.

ORGANIZATION MANAGEMENT (Continued)

Problem Drinking and Attitudes Toward Alcohol Among Navy Recruits. TR 76-21. November 1975. K. P. Durning and E. Jansen. (AD-A018 754)

An Alcohol Experiences Questionnaire was administered to 2045 Navy recruits to determine usage patterns, attitudes, and incidence of self-reported drinking problems for the period before their entry into the Navy. Comparisons were made between this incoming sample and naval personnel, particularly enlisted men, reporting drinking practices on a separate Navy-wide survey. Recruits reported extensive alcohol use, adverse consequences of drinking, and permissive attitudes toward drinking and intoxication prior to their initiation into Navy life. The data suggest that a large proportion of individuals who choose to join the Navy already evidence drinking problems.

Human Resource Management and Operational Readiness as Measured by Refresher Training on Navy Ships. TR 76-32. February 1976. S. J. Mumford. (AD-A022 372)

The Navy's human resource management (HRM) survey is administered to Navy personnel in an attempt to diagnose a Navy unit's organizational "state of affairs." The purpose of this effort was to determine the relationship between a ship's combat effectiveness or readiness for combat, as measured by scores earned by ships during refresher training (REFTRA), and the indices on the HRM survey. It was hypothesized that the more effective the HRM system within a ship, the higher the REFTRA scores.

REFTRA scores were obtained for 34 ships that had been surveyed as part of the HRM program. Sixteen of these ships had undergone a full REFTRA; and the rest, an interim REFTRA. Results for the 16 ships that had undergone full REFTRA strongly supported the research hypothesis. However, the strongly positive relationships between REFTRA scores and HRM indices were not sustained for the ships that had undergone interim REFTRA.

An Evaluation of the Factor Structure of the HRM Survey, Forms 9 and 11. TR 76TQ-40. July 1976. J. Sachar. (AD-A028 090)

Two factor analyses were performed on responses to the HRM survey, sea and shore versions. The following five factors emerged on both versions: (1) supervisory leadership, (2) work group processes, (3) command climate, (4) satisfaction with the Navy as an occupation, and (5) equal opportunity. In addition, drug and alcohol usage emerged on the sea survey, and bureaucratic practices, on the shore survey. Based on results, it was recommended that the HRM survey forms be revised using emerging factors as new dimensions.

Determination of Criteria of Operational Unit Effectiveness in the U. S. Navy. TR 76TQ-41. August 1976. S. E. Bowser. (AD-A029 387)

Operational unit management personnel were interviewed and information obtained was content analyzed. The resulting content categories were cross-compared by unit type, position in the organization, rank of respondent, and question answered. The results show that military managers are performance-oriented and supportive of objective type criteria for evaluation.

ORGANIZATION MANAGEMENT (Continued)

Differential Perceptions of Organizational Climate Held by Navy Enlisted Women and Men. TR 76TQ-43. August 1976. K. P. Durning and S. J. Mumford. (AD-A209 756)

This effort addresses the interaction of sex and pay grade on responses of nonrated and rated shore personnel to the Navy's human resource management (HRM) survey, which measures a Navy unit's organizational "state of affairs." Results showed that, initially, women tend to respond optimistically to the survey. However, as they advance to the petty officer levels, women become disproportionately disillusioned on certain dimensions. This is consistently true in the area of attitudes toward peers. With increases in pay grade, women appear to feel less a part of the work group team, whereas the opposite trend is true for men. This suggests that the harmonious assimilation of women into the Navy is not adequately sustained as their careers advance.

Preservice Drug Usage Among Naval Recruits: A 5-year Trend Analysis. TR 76TQ-45. September 1976. K. S. Crawford, P. J. Thomas, and E. D. Thomas. (AD-A030 598)

A questionnaire was developed and administered to over 9,000 recruits at San Diego, California from 1971 to 1975. Items tapped both preservice drug involvement and relevant background and demographic characteristics. Analyses of responses indicated that the percentage of preservice drug users had increased from 42 percent in 1971 to 53 percent in 1975. Marijuana was the most commonly used drug over the 5 years. Significant increases were found in rates of usage of marijuana, amphetamines, and barbiturates between 1971 and 1975. Also, strong relationships were found between drug involvement and various demographic factors. This finding generally supported the contention that drug users possess other characteristics that predispose them to lower rates of military effectiveness.

Work Performance: A New Approach to Expectancy Theory Predictions. TR 76TQ-47. September 1976. D. M. Nebeker and M. C. Moy. (AD-A030 451)

Research was conducted to develop and test a model of performance based upon a reconceptualization of Vroom's (1964) expectancy model. A questionnaire was administered to individuals employed as proof machine operators. The questionnaire was designed to estimate components of the new model such as the probability that the individual will be able to work at particular performance levels, the value of specific work outcomes, and the probability that performance at each of the performance levels will lead to the various work outcomes. Theoretical implications are given as to the conditions under which an expectancy model is useful.

Combat System Maintenance Effectiveness Based on 3M Data. TR 77-1. October 1976. L. S. Standlee and D. H. Sass. (AD-A031 994)

A Combat System Department was implemented aboard selected pilot ships with the goal of improving maintenance effectiveness. Pilot and control ships were compared on the basis of data collected and supplied by the Maintenance Support Office 3M reporting system. An initial evaluation, covering only three pilot ships, is described in an earlier report (NPRDC 75-25, April 1975). The present evaluation replicates the data gathered on these three ships and includes data from four additional pilot ships. As in the earlier effort, the data failed to demonstrate that

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improved maintenance effectiveness resulted from implementation of the new organizational structure.

Combat System Personnel Training and Management Evaluation: Final Report. TR 77-17. February 1977. L. S. Standlee, and D. H. Sass. (AD-B016 696L)

This report summarizes the findings of a series of 15 studies performed concerning the maintenance effectiveness of ships having experimental combat system organizational structures. Overall, the centralized administration of electronics maintenance assists in, but is not sufficient for, resolution of a problem concerning the electronics readiness of Navy combatant ships.

Sonar Operator's Attitudes and Beliefs: Effects on Introduction of New Systems. TR 77-18. February 1977. M. L. Abrams, J. P. Sheposh, P. A. Cohen, and L. E. Young. (AD-A036 480)

This effort assessed the extent to which 41 sonar operators used the various functions and features of new systems properly, their evaluations of various aspects of the system, and the relationship of these evaluations to their performance on the system. Results indicated that (1) none of the operators successfully performed all of the operations necessary to solve the problem, (2) the higher the level of operators' performance, the more routine their orientation toward the system, and (3) general indices, such as satisfaction with leadership or organization, were not related to performance.

Why Women Enlist: The Navy as an Occupational Choice. TR 77-20. March 1977. P. J. Thomas. (AD-A037 340)

There is a popularly held belief, and some evidence, that the motives for joining and work values of females and males enlisting in the military differ. In this effort, an experimental questionnaire was used to measure the background, motivation, and occupational values of 1000 recruits of each sex. Results indicated that women and men have different backgrounds but enlist for the same reasons. The sexes differed, however, on two-thirds of the occupational value items. Men were more interested in getting ahead in their jobs and women placed a higher value on a clean, cheerful environment and in helping others. It was concluded that these feminine values were not consistent with the nontraditional jobs to which they were apt to be assigned.

Combat System Program: Personnel Survey. TR 77-22. March 1977. D. H. Sass and L. S. Standlee. (AD-B017 365L)

Personnel assigned to pilot program ships employed in the combat system program were surveyed to evaluate the impact of the experimental organizational concept upon their opinions, attitudes, and morale. The combat system program did not receive a fair and complete test as two of the primary concepts in the plan--the system test officer and ship's electronics readiness team--were not fully implemented on most of the pilot ships. Two newly developed billets for the Combat System Department--the battery control officer and the electronic warfare officer--were implemented on all pilot ships but appeared to contribute little to the efficiency of the combat system organization.

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Organization Development in the Navy: A Strategy for Addressing Disciplinary Problems. TR 77-38. July 1977. K. S. Crawford. (AD-A042 486)

The nonjudicial punishment (NJP) rates of ships that had participated in the human resource management (HRM) Cycle were compared with those of a group of matched control ships. No evidence was found to suggest that mere participation in HRM activities affected NJP rates.

The Effects of Feedback and an Implied Standard on Work Performance. TR 77-45. September 1977. S. L. Dockstader, D. M. Nebeker, and E. C. Shumate. (AD-A045 430)

Locke's hypothesis that individuals will spontaneously set performance goals when their feedback is related to a standard performance was tested in an actual work setting by comparing the performance rate of keystroke operators who received feedback and a standard with that of a control group who received only feedback. Performance comparisons over a 3-month period provided strong statistical support for the hypothesis. The outcome is discussed in terms of goal theory and the use of work standards to improve productivity.

Predictions of Key Entry Performance Using the Reconceptualized Expectancy Model. TR 78-11. January 1978. D. M. Nebeker, S. L. Dockstader, and E. C. Shumate. (AD-A050 583)

Research was conducted to replicate and extend the earlier development of the reconceptualized expectancy model, which predicts individual performance based on (1) the individual's value of outcomes, (2) the probability that these outcomes would be obtained through alternative performance levels, and (3) the individual's expectancy that he could perform at these alternative levels. Results of an earlier study showed that the model had substantial empirical validity.

A questionnaire was administered individually to 30 data entry operators at the Long Beach Naval Shipyard. The questionnaire was designed to estimate the components of the reconceptualized expectancy model. In addition, the questionnaire provided for estimates of the expectancies that specific effort levels would result in specified performance alternatives. These estimates were used to construct predictions of individual performance. It was assumed that the best predictions of performance would be obtained by using the expectancy that the performance levels would be reached at maximum effort. Although results of the earlier study were replicated almost in their entirety, problems were found with the model.

Women at the Naval Academy: The First Year of Integration. TR 78-12. February 1978. K. P. Durning. (AD-A052 878)

A study was made of the first year of integration of women midshipmen at the U.S. Naval Academy. The degree of traditionalism of males of the Class of 1980 toward rights and roles of women in society was evaluated as a function of level of contact with female plebes. A small effect on the Attitudes Toward Women Scale was found after 5 months of integration, with men in mixed-sex platoons or squads expressing the most equalitarian attitudes. Irrespective of company assignment, the male plebes became more equalitarian by the end of the academic year. In general, these men were least equalitarian in areas that will affect them most closely as naval

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officers, as in their opinions about shipboard and other military roles for women. Upperclassmen were most resistant to the integration of Annapolis (19% were neutral or favorable toward coeducation, vs. 26% of plebe men).

Females and males had very different perceptions of treatment of the sexes in the 1976-77 year, with the majority of men perceiving favoritism to women and women denying they received such treatment. Women generally felt resented and less accepted than did male peers. Greater numbers of women in more varied roles (e.g., upperclassmen) should partially alleviate several problems by reducing the overvisibility of the women and resultant performance pressures, as well as by allowing more peer contact to challenge the stereotypes held by men.

A Performance-contingent Reward System that Uses Economic Incentives: Preliminary Cost-effectiveness Analysis. TR 78-13. February 1978. G. E. Bretton, S. L. Dockstader, D. M. Nebeker, and E. C. Shumate. (AD-A059 830)

A performance-contingent reward system (PCRS) that uses economic incentives was evaluated based on performance of federal civil service data transcribers in the Management Information System Department of the Long Beach Naval Shipyard. Evaluation of the PCRS was conducted primarily from the following perspectives: (1) the cost-effectiveness of the proposed PCRS, (2) issues involving the generalizability of the test-site results to other Navy activities, and (3) projections of PCRS-induced cost savings.

Performance Contingent Reward System: A Field Study of Effects on Worker Productivity. TR 78-20. May 1978. E. C. Shumate, S. L. Dockstader, and D. M. Nebeker. (AD-A055 796)

The Performance Contingent Reward System (PCRS), an incentive program designed to improve individual productivity, was developed, based on behavioral principles and federal guidelines, and implemented in the data entry section of a data processing center at the Long Beach Naval Shipyard. The employees participating in the study were Navy civilian key entry operators. Production standards were developed based upon keying speed and the amount of time spent working. A monetary bonus was awarded for high individual productivity, the amount of which was directly proportional to the amount of work exceeding a production standard. Results showed that production for the 12-month trial period improved substantially, both in keying speed and in the time spent working. Excessive overtime and a heretofore perpetual backlog were virtually eliminated. Although the work force decreased in size through natural attrition, productivity was not affected. A rigorous cost-effectiveness analysis showed that the set-up cost of the program were recovered in the first 3 months of operation.

Voluntary Release Pilot Program: Effects on Attrition of General Detail Personnel. TR 78-27. July 1978. R. V. Guthrie, R. A. Lakota, and M. W. Matlock. (AD-A057 832)

The attrition rates, performance, and discipline of first-term general detail (GENDET) personnel holding a voluntary release option were compared with those of a matched control group not holding such an option. Both groups included a sample of recruits who ordinarily would not meet minimum recruiting standards (DELTAs) to assess the impact on attrition of recruiting such persons. After 23 months, 73

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percent of the voluntary release eligibles had attrited, compared to 48 percent of the control group. Attrition rates for DELTAs were comparable to those of the total group. The majority of those who voluntarily separated from the Navy expressed dissatisfaction with Navy life. It was concluded that a blanket voluntary release option is not a prudent mechanism for controlling attrition of GENDET personnel. Analysis of interviews held with both groups yielded information potentially useful in addressing the attrition problem.

Preenlistment Drug Experiences of Navy Women and Men: A Comparison. TR 78-28. August 1978. M. S. Olson and P. J. Thomas. (AD-A058 640)

The purpose of this effort was to replicate, with female respondents, a 1975 survey of male preservice substance abuse and its correlates. The Navy's Drug Experiences Questionnaire (DEQ) was administered in June 1976 to 519 women at the Recruit Training Command, Orlando, FL. Responses were compared to those of the 1975 male sample. Results showed that female and male preservice drug experiences were similar. No significant differences were found in the proportions of female and male nondrug users (49.8 vs. 47.0% respectively), marijuana-only users (22.2 vs. 25.8%), and other drug users (28.0 vs. 27.2%). Upon analyzing the "other drug" category in more detail, however, significantly more men than women were found to have used hallucinogens, such as LSD, STP, and DMT. The relationships between substance abuse and demographic characteristics were similar for both sexes. However, frequency of drunkenness during the previous year was significantly higher for men than for women.

Pregnancy in the Navy: Impact on Absenteeism, Attrition, and Workgroup Morale. TR 78-35. September 1978. M. S. Olson and S. S. Stumpf. (AD-A061 321)

Because of objections to the optional discharge and leave provisions of the Navy's present pregnancy policy, a study was conducted to determine the impact of pregnancy on Navy absenteeism, attrition, and workgroup productivity and morale. Data were obtained by analyzing administrative records for and conducting a survey of a previously identified longitudinal sample and by interviewing an aviation squadron sample. Results showed that abolishment of the present discharge option would increase the number of days lost by women, lower women's attrition rates, and increase the impact of pregnancy on workgroup productivity and morale. Further, if mandatory discharge for pregnancy were reinstated, it would decrease female absenteeism, increase female attrition, and increase workgroup turnover. Finally, if the policy's leave provisions were changed, it could reduce workgroup efficiency, while not improving morale of male Navy members, since interview results showed that most were not aware of them.

Selective Retention: A Longitudinal Analysis. I. Factors Related to Recruit Training Attrition. TR 79-5. December 1978. S. Landau and A. Farkas. (AD-A062 516)

The purpose of the present effort, the first in a series of longitudinal turnover investigations, was to assess the impact of individual and organizational variables as multivariate predictors of attrition during recruit training. A sample of 4911 recruits was administered a questionnaire on the fourth day of recruit training to obtain information about various demographics, enlistment motivations, general Navy attitudes, personality variables, and work outcomes. Results showed that there were

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important differences between eventual attrites and nonattrites. The best predictor of attrition was the reported intention to complete one's enlistment. Also, attrites were more influenced to join the Navy because of reactions to events in their civilian environments; and nonattrites, because of opportunities to obtain various "self" needs. Also, attrites perceived work outcomes as less desirable and did not expect them to occur within a Navy setting to the same extent as did nonattrites. It was concluded that, during recruit training, individual-type variables were more significant predictors of attrition than were organizational variables.

A Cross-cultural Investigation of Organizational Functioning. TR 79-9. February 1979. J. Riedel, J. Sheposh, and L. Young. (AD-A066 190)

This effort was conducted to determine how cultural and work-related values and attitudes of employees at the Navy's Public Works Centers (PWCs) relate to organizational functioning. Each of the six PWCs studied serves a distinct geographic area providing rehabilitation construction and maintenance for U.S. Navy shore establishments worldwide. Results revealed that (1) both personal and job values of workers at the overseas centers differed from each other as well as from those of workers in the U.S. centers, (2) centers differed with respect to organizational attributes, but these differences were not systematically related to value profiles, (3) supervisors' and managers' values were homogeneous across center locations, and (4) values were not predictive of job satisfaction nor did they moderate the relationship between job attitudes and job satisfaction.

Personal and Organizational Determinants of Enlisted Attrition. TR 79-11. March 1979. A. Lau. (AD-A065 386)

This effort was conducted to determine the relative influence of various individual and organizational factors on first-term enlisted attrition. A longitudinal design was employed whereby a cohort of first-term recruits (both "A" school and apprentice school personnel) was tracked over a 12-month period. Results indicated that: (1) first-year attrition was significantly higher for personnel who were eligible for voluntary separation than for those who were not, (2) attrition rates were higher for apprentice personnel than for "A" school personnel, (3) separation decisions were related to preservice demographic characteristics, family and home problems, attitudes toward the Navy formed during recruit training, and in-service discrepancies between expectations and experiences, and (4) the work environment explained more variance in later separations; and individual characteristics, more variance in early separations (i.e., within the first 6 months).

Relation of Officer First Assignment and Education Major to Retention. TR 79-12. March 1979. D. Robertson and J. Pass. (AD-A067 666)

The relationship to retention of two factors--initial duty assignment and precommission education major--was investigated for the unrestricted line officer with the surface warfare designator. The five commission sources analyzed included two regular sources--the Naval Academy and the NROTC Scholarship Program--and three reserve sources--the Officer Candidate School, the NROTC College, and Reserve Officer Candidate Programs. Results showed that, generally, both the officer's first duty assignment and education major were associated with retention, across as well as within separate commission sources. Retention was found to be

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lowest in staff and supporting shore activities and highest in type of ships (i.e., small combatant ships) in which officers probably experienced the most arduous conditions of deployment, but also probably have the best opportunity to achieve essential shipboard qualifications. Although retention was associated with assignment type, the absolute values of the retention percentages varied substantially across commission sources. Alternative allocation strategies should be developed to identify the relative mix of allocations from each commission source that maximizes retentions.

The Nature of the Navy Civilian Executive Job: Behavior and Development. TR 79-27. July 1979. A. Lau, L. Broedling, S. Walters, A. Newman, and P. Harvey. (AD-A072 373)

The Navy lacks information needed to develop selection, training, and performance appraisal systems for its civilian executives (GS-16, 17, 18, or equivalent Public Law positions). This effort investigated the skills, activities, and training needs of 370 Navy civilian executives by means of interviews, work activity diaries, observations, and questionnaires. Results indicate that (1) policies for the management of civilian executives must consider the complexity, centralized authority, and military/civilian job-sharing of the Navy/DoD system, and (2) systems for executive selection, training, and performance evaluation can be based on a common core of skills, activities, and training needs for those in executive jobs. An integrated list of these characteristics and specific recommendations for its use are provided.

Surface Warfare Junior Officer Retention: Problem Diagnosis and a Strategy for Action. TR 79-29. August 1979. R. Holzbach. (AD-A073 463)

The surface warfare community has missed its retention goals since FY76 and projections suggest that this trend will continue. To identify factors related to retention of surface warfare junior officers (JOs), previous research on retention was reviewed and a sample of JOs at the Naval Postgraduate School was interviewed. Information obtained was used to develop a research plan designed to address critical areas affecting retention. A survey questionnaire covering the research questions to be addressed by the research plan was developed and pretested. Future reports will describe results obtained by analysis of questionnaire data.

Relationship Between Perceptions of Role Stress and Individual, Organizational, and Environmental Variables. TR 80-8. December 1979. L. E. Young, J. A. Riedel, and J. P. Sheposh. (AD-A079 541)

This research investigated the relationships between various individual and organizational variables and perceptions of role stress. Role stress can be of two types: (1) role conflict, which results when an individual has incompatible demands made upon him; and (2) role ambiguity, which exists when an individual is uncertain of what is expected of him. Results revealed that (1) workers perceived more role ambiguity than did supervisory personnel, (2) perceptions of role stress differed across cultures, but differences were not related to specific cultural values, (3) role stress was related to organizational climate, job characteristics, and managerial and supervisory practices, (4) role ambiguity was strongly related to organizational climate and general job characteristics, whereas role conflict was strongly related to specific job characteristics, (5) role ambiguity, unlike role conflict, was useful in predicting intrinsic satisfaction, and (6) role ambiguity was related to workers' perceptions of work center performance.

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Role Affiliation and Attitudes of Navy Wives. TR 80-10. January 1980. P. J. Thomas and K. P. Durning. (AD-A079 630)

This research was conducted to investigate Navy wives' acceptance of social obligations associated with a military career, to measure their attitudes toward the increased utilization of Navy women, and to determine whether they hold traditional or contemporary beliefs about the role of women.

A questionnaire was designed and administered to 463 wives associated with aviation commands throughout the Pacific. Items on women's role (WR) were also administered to a sample of 482 active duty women. In the analyses, comparisons were made of the responses of officers' wives (OW) and enlisted men's wives (EW), and of responses of Navy wives and Navy women. Also, analyses were conducted to see how responses related to education, number of children, employment status, years with the Navy, and age. Responses of OW and EW to items measuring attitudes toward social life and military commitment were very similar. Also, the feminine role orientation of the two groups of wives was similar, with half subscribing to a contemporary role, 40 percent choosing a traditional role, and 10 percent undecided. OW, however, gave fewer traditional responses to WR items than did EW. Women officers gave more contemporary responses than did OW, but the comparison of responses of EW and enlisted Navy women yielded mixed results.

Surface Warfare Junior Officer Retention: The Assignment Process. TR 80-13. February 1980. R. L. Holzbach, R. F. Morrison, and D. A. Mohr. (AD-A081 794)

In this report, the second relating to the surface warfare junior officer (JO) retention study, a sample of 691 surface warfare JOs was surveyed to identify JO experiences with and attitudes toward assignment process variables and to determine whether these experiences and attitudes related to career intent and/or officer quality. Results showed that JO career intent was positively related to satisfaction with informal notification time for new assignments, obtaining desired assignments, evaluation of the assignment process, evaluations of detailers' interpersonal skills, and use of both local superiors and headquarters sources for career guidance. Officer quality was not related to outcomes or evaluations of the assignment process.

Selective Retention--A Longitudinal Analysis: II. Experiences and Attitudes of Recruit Training Graduates. TR 80-18. April 1980. S. B. Landau, A. J. Farkas, and P. L. Wagner. (AD-A084 033)

The objectives of this effort were to determine how the attitudes and perceptions of first-term enlisted personnel changed between the beginning and end of recruit training, and to assess their perceptions of recruit training, commitment to the Navy, and future expectations. Results showed that recruits (1) were not required to engage in as many undesirable activities as they expected at the beginning of training, (2) felt positively about company commanders and peer relationships in boot camp, (3) experienced many desired work outcomes to a greater degree than expected, (4) had achieved certain desired outcomes that they had given in boot camp as their motivation for joining, (5) were generally satisfied with the Navy, and (6) felt positively about future expectations. These results indicate that, if recruits are made aware of the fact that their experiences will improve over the course of recruit training, more of them will remain in the Navy.

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Participation in the Navy Human Resource Management Cycle: Effect on Reenlistment Rates. TR 80-19. April 1980. K. S. Crawford, E. D. Thomas, and E. W. Curtis. (AD-A083 976)

This study investigated the effect of the Navy's human resource management (HRM) cycle on retention of personnel in operational Navy units. The first-term reenlistment rates of units that had participated in HRM cycle organizational development activities were compared with those of matched control units who had not participated. Results showed substantial positive changes in reenlistment rates for HRM cycle units during the 6-month period in which they participated in HRM activities. Significant improvements were not sustained over longer periods of time, however. It was recommended that future evaluation studies attempt to isolate those variables that may be critical to the effectiveness of the HRM cycle.

A Cross-cultural Comparison of Managerial Practices and Their Relationship to Organizational Outcome Variables. TR 80-22. April 1980. J. A. Riedel, L. E. Young, and J. P. Sheposh. (AD-A083 984)

This research addressed the relationships between employee perceptions of organizational effectiveness and managerial, organizational, and satisfaction variables. Questionnaires designed to measure work center effectiveness, organizational climate, job characteristics, supervisory influence, managerial practices, job satisfaction, role stress, and work occurrences were administered to a sample of 1607 employees drawn from all hierarchical levels at four Public Works Centers (PWCs) in the U.S. (including Pearl Harbor); the PWC in Yokosuka, Japan; and the PWC at Subic Bay, PI. Results indicated that (1) managers and supervisors were generally more positive toward work center performance, management efficiency, and organizational character than were workers, (2) perceptions of management effectiveness are affected more by specific job-related concerns than they are by non-job-related managerial practices, (3) well defined job responsibilities and feelings of esprit de corps contribute most to employee satisfaction, and (4) employees are motivated by work occurrences that reflect personal concerns (e.g., feelings of accomplishment) and demotivated by those that reflect task-related concerns (e.g., equipment problems).

Contingency Management: Development of Management Problems x Techniques Matrix. TR 80-25. May 1980. L. M. Doherty, S. L. Dockstader, B. Feher, and R. L. Holzbach. (AD-A085 029)

A contingency management framework, which focuses on the usefulness of a management technique when applied to a particular problem, served as the basis for this study. About 500 Navy middle management problems were identified, analyzed, and systematically reduced to eight clusters of problems through hierarchical clustering and factor analysis. Next, 31 relevant management techniques were classified, based on implementation tasks required, and reduced to six clusters through a multidimensional analysis. The six management technique clusters and the eight management problem clusters were then incorporated into a Problems x Techniques Matrix, where each cell represents organizational outcomes prior to and following application of a specific management technique to a particular management problem.

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A Study of Flexitime Effects in a Government Research Organization. TR 80-27. May 1980. G. D. Kissler, R. H. Brown, and K. G. Smith. (AD-A085 597)

This effort examined the effects of variable work hours upon employee attitudes and behavior in a large government research organization. Employees at experimental sites--where flexitime was implemented--were compared with those at matched (control) sites on attitudinal and behavioral measures taken before and after flexitime began. Results showed that flexitime is not related to improved employee attitudes and work behaviors, or to changes in perceptions of their work roles. Although subordinates were generally more favorable toward flexitime than were supervisors, the views of both groups become more positive over time. Productivity did not change as a result of flexitime, but reduced use of sick leave resulted in a projected annual savings of nearly \$400,000.

Incentive Management Training: Use of Behavioral Principles for Productivity Enhancement. TR 80-29. July 1980. S. L. Dockstader, D. M. Nebeker, J. Nocella, and E. C. Shumate. (AD-A087 489)

Managers and supervisors from six management information offices were (1) given training in the theory and practice of incentive management and (2) provided with a measurement system that contained both performance and diagnostic information. Following the training, the trainees implemented incentive management programs within their own key entry operations sections. This report summarizes the effects of these implementations as they relate to well-established behavioral principles.

Job Satisfaction Measures as Predictors of Retention for Navy Enlisted Personnel. TR 81-2. December 1980. M. H. Royle and D. W. Robertson. (AD-A093 244)

Responses made by members of four representative ratings to the job satisfaction items on the Navy Occupational Task Analysis Program (NOTAP) surveys were analyzed to determine the relationship between job satisfaction and intent to reenlist. Response data obtained from enlisted personnel in a survey of career counselor effectiveness were analyzed to determine actual reenlistment behavior, since this information could not be obtained from NOTAP data. Results showed that enlisted personnel were most satisfied with aspects of the work itself and their relations with others and least satisfied with aspects related to military life. Those in lower pay grades and those nearing the end of their first enlistment were least satisfied with aspects of both work and military life. Aspects related to the work itself predicted overall job satisfaction, while those related to military life predicted reenlistment intent. Reenlistment intent was highly related to actual reenlistment, while other variables (including job satisfaction) added little to prediction of enlistment.

Selective Retention: A Longitudinal Analysis. III. A Comparison of Recruit Training Attrites, Delayed Graduates, and Graduates. TR 81-3. December 1980. A. J. Farkas. (AD-A093 807)

The objective of this effort was to compare the attitudinal responses, collected during the first and last weeks of recruit training, of recruits who were discharged

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during recruit training (attrites), those who graduated from recruit training after a delay for remedial or medical treatment (delayed graduates), and those who graduated from recruit training without delay (graduates). At the beginning of recruit training, the attitudes of delayed graduates and graduates were similar and were significantly more positive than were those expressed by the attrites. At the end of training, delayed graduates and graduates exhibited a large number of attitudinal differences. The delayed graduates reported more negative experiences during recruit training, less intention to complete their enlistment, less satisfaction with the Navy, and less commitment to the Navy than did the graduates. The delayed graduates also experienced a higher rate of post recruit training attrition during the first 20-21 months of the first enlistment than did the graduates.

Surface Warfare Junior Officer Retention: Spouses' Influence on Career Decisions. TR 81-17. August 1981. D. A. Mohr, R. L. Holzbach, and R. F. Morrison. (AD-A103 425)

Information obtained from a questionnaire to which 312 male surface warfare junior officers (JOs) responded was used to determine how JOs felt their wives influenced their intent to pursue a Navy career, and how their wives felt about separations, relocations, pay, and benefits of Navy life. Officers, in general, felt their wives were supportive of their Navy careers. Separation was considered the worst aspect of Navy life and had the most pronounced influence against a Navy career. Wives who were most supportive of a Navy career were most socially and emotionally involved in the career. Wives who worked outside the home were less supportive of a Navy career than were those who worked within the home. Wives who were teachers or Navy officers found relocations more difficult to accommodate and were more reluctant for their husbands to remain in the Navy than were wives in other types of jobs. Few Navy wives attended detailer field trip meetings, but those who did were more supportive of a Navy career than those who did not. The assistance of superior officers in helping wives adjust to new duty stations was rated most helpful, and Navy Family Services least helpful, indicating that COs and XO's should recognize their influence on officer retention, and that officers and their wives should be educated on the value and use of Navy Family Services to alleviate stresses of relocation and separation.

A Practical Methodology for Identifying Impediments to Productivity. TR 81-18. August 1981. M. A. White, L. Y. Atwater, and D. A. Mohr. (AD-A104 577)

The methodology followed by NAVPERSRANDCEN in conducting an investigation of impediments to productivity at five Navy industrial facilities in 1980 is described in detail. The methodology included unstructured individual interviews, structured group interviews (using the nominal group technique), and open-ended questionnaires. General instructions for conducting interviews, preparing questionnaires, obtaining samples, and evaluating responses are also provided.

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SPECIAL REPORTS

BTFN Attitudes Towards the Shore Support Group Concept. SR 74-1. December 1973. C. Braunstein.

Boiler technician firemen (BTFN) based at San Diego were surveyed to assess the impact of the shore support group (SSG) concept on BTFN work satisfaction and retention. The SSG consists of a group of BTFNs and supervisory petty officers that provides repair and maintenance assistance to ships on short-term notice. Results showed that (1) both SSG and shipboard BTFNs think highly of the SSG concept, (2) the two groups do not differ as to their career intentions, and (3) the SSG concept has had a positive effect upon the BTFN reenlistment rate.

Problems Reported by Officer Personnel Assigned to the Combat System Department. SR 74-5. April 1974. H. L. Williams and D. H. Sass.

Officer personnel assigned to ships participating in the combat system program were interviewed to assess their opinions on and attitudes toward the program. The majority indicated that centralization of electronics maintenance under a Combat System Department represents an improvement over the way maintenance is handled in the conventional shipboard organization. Suggested modifications for improving the program included the following: (1) define more adequately the functions and duties of the system test officer, (2) develop solutions to organizational and rating boundary problems, and (3) define more adequately the functions of the test team.

Combat System Division of Labor (Enlisted): Identification of Problems. SR 75-1. July 1974. H. L. Williams, L. S. Standlee, and D. H. Sass.

In an attempt to improve maintenance effectiveness aboard Navy ships, new concepts in maintenance management and shipboard organization were developed and promulgated by BUPERS in the Combat System Personnel Training and Management Plan. This plan featured a Combat System Department composed largely of enlisted men in the major electronic ratings. Since Navy practices concerning the division of labor among enlisted personnel may contribute to the effectiveness of the Combat System Department, available data were examined in an attempt to identify specific problem areas. Six potential problem areas were identified: (1) assignment of nontechnical duties to personnel in technical ratings, (2) rating boundary restrictions in cross-utilization of personnel, (3) overlapping of skill requirements among ratings, (4) merging of service ratings into general ratings, (5) number of equipments assigned a rating, and (6) effect of Navy enlisted occupational classification system (NEOCS) study. It was recommended that these problem areas be considered in subsequent phases of the combat system developmental effort.

Combat System Division of Labor: Officer Personnel. SR 75-7. April 1975. D. L. Van Kekerix, D. H. Sass, and L. S. Standlee.

The Combat System Personnel Training and Management Plan Provided new concepts in shipboard maintenance management and organization. Under this plan, all responsibility for electronics maintenance and combat systems testing was placed with a Combat Systems Department instead of dividing the responsibility between the operations and weapons departments. This report compared the advantages and

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disadvantages of the new system with those of previous systems by evaluating combat system officer billets in terms of job requirements, training and experience requirements, and patterns of career development.

Longitudinal Studies of Attitude Change: Issues and Methods. SR 75-9. April 1975. L. A. Broedling, M. Wiskoff, and J. Herbert.

This report describes the theoretical issues associated with longitudinal research, the designs and statistical methods available, examples of such research, and the practical problems encountered. It can serve as either an introduction to longitudinal techniques for social scientists or as a useful reference of those more acquainted with such techniques.

The Development of a Navy Human Resource Information System Questionnaire. SR 76TQ-16. August 1976. J. L. Franklin.

This report describes a questionnaire useful for assessing and monitoring changes in critical social-psychological factors affecting the performance of Navy units.

Attitudes of Enlisted Men Toward Existing and Proposed Male Enlisted Uniforms. SR 77-6. March 1977. C. Braunstein and E. P. Somer.

Due to numerous complaints expressed by enlisted men regarding their present service dress blue uniform, the Chief of Naval Personnel requested that a survey be conducted to determine the feasibility of returning to the jumper/bell bottom type uniform. Although there appeared to be overwhelming support to return to this uniform, it was recommended that the Navy proceed with caution in making this change.

Enlisted Men's Attitudes Toward Methods of Sea Pay Computation. SR 78-1. January 1978. C. Braunstein and E. P. Somer.

This endeavor compared and evaluated the current, cumulative, and consecutive methods of computing sea pay for all enlisted men stationed aboard ships. The survey revealed that (1) the implementation of the consecutive method would have an adverse impact on morale and retention, and (2) the cumulative method was not strong enough to warrant its implementation without further study.

Performance Contingent Rewards and Productivity: A Summary of a Prototype Incentive Management System. SR 78-7. April 1978. S. L. Dockstader, D. M. Nebeker, and C. Shumate.

A performance contingent reward system (PCRS), an incentive management system that uses economic incentives to increase productivity, was tested on data-entry processors at a naval shipyard. Measures of individual productivity and efficiency were obtained over a 12-month test period and compared with those for an earlier period. Results showed that (1) keystroke rate, the basic measure of productivity, increased by 25 percent, (2) the chronic problem of overtime was eliminated, and (3) individual productive time had increased.

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Role of Women in the Military: Australia, Canada, the United Kingdom, and the United States. SR 78-10. May 1978. P. J. Thomas. (AD-A055 044)

The purpose of this effort was to review the research conducted in The Technical Cooperation Program (TTCP) member nations on the women in their armed forces. Because of the similar roots and social evolution of these countries, issues of mutual concern are inevitable. Thus, research and development performed in one member's military has great applicability in the services of the others.

The research papers were organized into five topical areas: enlistment, attrition/retention, attitudes impinging on assignment, interpersonal factors, and utilization and job performance. A short historical overview and a description of the more important sex-specific laws and regulations were included to foster understanding of the antecedent events and constraints affecting the use of women in the armed forces of Australia, Canada, the United Kingdom, and the United States.

Evaluation of the 3-M System as Implemented by the Naval Surface Forces in the San Diego Area. SR 78-12. June 1978. H. L. Williams and J. S. Malone.

This research was conducted to evaluate the 3-M System as implemented by naval surface forces in the San Diego area. Results of the evaluation indicate that gaps and omissions in the data flow make the data of questionable value for analytical purposes.

Military Productivity and Work Motivation: Conference Proceedings. SR 78-15. August 1978. L. A. Broedling and R. Penn (Eds.) (AD-A057 760)

This document consists of the presentations given at a conference on "Productivity and Work Motivation in the Navy and Other Military Services." This conference, which was held in April 1978, was cosponsored by the Navy Personnel Research and Development Center and the Office of Civilian Personnel. It was conducted in cooperation with the Work in America Institute, Inc.

Crisis Management and Managerial Innovation in the Navy Shipboard Setting: A Preliminary Study. SR 79-2. November 1978. B. Feher, L. M. Doherty, and S. L. Neuman.

Under the Navy's human goals plan, all Navy ships are scheduled to go through the human resources management (HRM) cycle, a chronologically sequenced series of overlapping action steps to assist a ship's CO in improving mission effectiveness. When USS PAUL F. FOSTER (DD 964) was going through this cycle, the CO decided to implement management action planning (MAP) to address (1) middle management issues revealed in a HRM survey and (2) the disturbing level of crisis management. With this management technique, all FOSTER managerial and supervisory personnel met at 3- or 6-month intervals away from the ship to plan the upcoming period. These periodic sessions proved to be very effective in producing department and division plans for accomplishing scheduled events and in improving lateral and vertical communication. Also, MAP had a slightly positive effect on milestones met and goal achievement, a slightly negative effect on crisis management and work group morale, and little or no effect on performance indices. It was concluded that,

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although MAP cannot prevent crises, it can, through improved efficiency and resource utilization, put the ship in a better position for dealing with them.

Military Productivity and Work Motivation: Conference Recommendations. SR 79-6. December 1978. D. M. Nebeker, L. A. Broedling, and L. M. Doherty.

The Navy Personnel Research and Development Center and the Navy's Office of Civilian Personnel cosponsored a conference on "Productivity and Work Motivation in the Navy and other Military Services" in New York, NY in April 1978, which was reported in NPRDC SR 78-15. This report summarizes common productivity problems identified at that conference and provides recommended solutions for those problems.

Executive Summary: Navy Civilian Executive Study. SR 79-10. January 1979. L. A. Broedling and A. W. Lau.

An investigation was conducted to determine the nature of the Navy civilian executive job and the training and development needs of current and future executives. Navy civilian executives were defined as those occupying GS-16, 17, 18, or equivalent Public Law positions. This summary was prepared to provide the study findings to all civilian executives in the Navy, especially those who participated in the study. Findings will be fully described in a subsequent report (see NPRDC TR 79-27).

Professional Development of Aviation Warfare Junior Officers: Survey Results. SR 79-14. March 1979. B. Feher and E. P. Somer.

A proposal was made to establish an Aviation Warfare Officers School (AWOS) for junior aviation warfare officers (13XX). This school was intended to prepare these officers for middle management and staff assignments by offering courses in naval warfare and management of human and material resources. In this project, a sample of 13XX junior officers was surveyed to determine their perceived professional development needs and their attitudes toward the proposed AWOS. Results indicated that the respondents did perceive a need for the professional development that the proposed AWOS would provide and that they approved most of the school's concepts.

Navy Officer Exit Statement Analysis. SR 79-15. April 1979. W. H. Githens.

For several years, Navy officers who leave the service have provided written statements listing their reasons for doing so. To assist BUPERS in analyzing these data, an experimental categorizing scheme was developed that is more precisely defined and thus more accurate than the old scheme. Also, because of the extensive amount of time required to analyze open-ended statements, an improved exit questionnaire was developed.

Keyprocessing Performance: A Method for Determining Operator Performance Standards. SR 79-22. June 1979. D. M. Nebeker and J. F. Nocella.

Although it has been shown that performance contingent reward systems (PCRSs) significantly improve productivity for key entry operators in data processing, such

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systems cannot be applied until performance standards have been established. For key entry operators, standards must be stated in terms of keystrokes per hour and percent of time in production. To develop these standards, historical data were obtained on over 160 different tasks performed by key entry operators. For each task, over 40 characteristics were analyzed to determine their effect on keystroke rate. Results showed that only six characteristics were required to set accurate performance standards: (1) the size of the document, (2) the color contrast of the document, (3) the maximum number of strokes per source document, (4) the maximum number of strokes per record, (5) the total number of punched fields per record, and (6) the number of records processed per year per operator. The keystroke standard for a document/procedure is computed by rating it on these six characteristics. Keystroke standard rating forms were developed to facilitate this process.

Energy Conservation Attitudes and Behaviors of Navy Family Housing Residents. SR 79-23. July 1979. M. White, P. Magnusson, and E. P. Somer.

Navy housing residents in six areas were surveyed to obtain information on their attitudes toward and perceptions, values, and knowledge of energy conservation practices. Results indicated that respondents are uncertain about the causes of the present energy situation, feel that conservation can improve the situation, endorse economic incentives to conserve, and are more likely to engage in conservation practices that affect them directly rather than indirectly. Age of the service member, pay grade, and length of service all appear to be positively related with energy conservation behavior. Also, behavior seems to be affected by location, with respondents from locations with milder climates practicing more energy conservation than those from locations with harsher climates. This information will be used to design experimental approaches intended to decrease energy consumption.

Factors Related to Naval Aviator Career Decisions. SR 80-3. December 1979. J. P. Sheposh, M. White, P. Magnusson, and P. Harvey. (Revised and reissued in August 1980.)

Pilots and naval flight officers in ranks 0-1 through 0-4 (ensign through lieutenant commander) in 70 commands (primarily air squadrons) were surveyed to determine the reasons for the high rate of pilot resignations and to identify actions to improve pilot retention. Responses were analyzed by career intention, rank, and aviation community to identify factors that related, both positively and negatively, to Navy career decisions. Factors most often seen as negative influences fall into four major areas: lack of professional challenge as an aviator, career development or career path (e.g., assignment to nonflying tours), pay and benefits, and family related factors.

Factors Influencing First-Term Reenlistment of Women and Men. SR 80-21. June 1980. P. J. Thomas.

Because of the growing number of women entering military service during the past decade, factors influencing their retention are becoming more important to military planners. Therefore, a sample of 1000 women and 1000 men was surveyed to determine whether women reenlist or leave the Navy at the end of their first enlistment for the same or similar reasons as men do. Results showed that the intentions of men and women at the end of their first enlistment were very similar.

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The reasons most frequently given by both men and women for planning to reenlist were opportunities in the Navy, job satisfaction and security, and fringe benefits and travel. Women do not reenlist because of role stress and better opportunities as a civilian. Men do not reenlist because of inadequate pay and incentives, lack of opportunity, rigid policies, stress, poor supervisors, and job dissatisfaction.

Factors Related to Stress Perceptions of Navy Recruits. SR 80-29. August 1980. L. Broedling, A. Newman, C. Carter, and T. Kuncik.

This work was conducted to determine how Navy recruits perceive stress and how these perceptions relate to motivational, personal, and behavioral variables. Measures of perceptions of fate control (internal-external), preferences for extrinsic or intrinsic job motivators, and perceptions of boot camp stress obtained for a sample of recruits were correlated with each other and with background data (demographics and Navy test scores). Also, scores for attrites and nonattrites (during boot camp and the first year of enlistment) were compared to identify any differences between the two groups. Results showed that recruits who felt they had control over their own fate (internally-oriented) perceived less stress than those who felt they had no control (externally-oriented). Also, analyses showed that attrites are more likely to be externally-oriented and to perceive stress during boot camp than nonattrites.

Executive Report: A Cross-cultural Investigation of the Navy Public Works Centers. SR 81-1. October 1980. J. A. Riedel and L. E. Young.

A survey was conducted at six of the Navy's Public Works Centers (PWCs) in the summer of 1977 to determine how Navy civilian employees' perceptions of various aspects of the work environment differ across cultural and ethnic groups and across hierarchical levels. A better understanding of these differences should enable Navy planners and policymakers to improve civilian personnel management. Previous reports on the study described the relationships between (1) cultural and work-related values and attitudes and organizational functioning, (2) employee perceptions of role stress and individual, organizational, and environmental variables, and (3) employee perceptions of organizational effectiveness and managerial, organizational, and satisfaction variables. This report provides an executive summary of the previous findings.

An Examination of Productivity Impediments in the Navy Industrial Community. SR 81-2. October 1980. L. A. Broedling, K. S. Crawford, G. D. Kissler, D. A. Mohr, A. R. Newman, M. A. White, H. Williams, L. E. Young, and T. J. Koslowski.

The purposes of this effort, which was conducted jointly with the Western Regional Office of Personnel Management, were to identify impediments to productivity within the Navy's industrial community, determine the source of these impediments, and, where possible, provide recommendations for removing them. Five Navy Material Command field activities (shipyard, weapons station, supply center, public works center, and air rework facility) were selected as representative of the major types of organizations in the Navy's industrial community. Impediments were identified through one-on-one interviews, group interviews, and questionnaires. Impediments to productivity common to more than one activity were identified in such diverse areas as supply support, automated data processing equipment, erratic workloads, inadequate capital investment, micromanagement, military rotation,

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pay/position management, staffing, technical/managerial training, and employment restrictions. Impediments unique to a particular type of organization (e.g., propeller waivers for shipyards) were also identified. Specific recommendations are provided, where possible, for removing or further assessing the impact of identified impediments.

Male Black College Students: Their Views of the Navy and Characteristics of a Navy Career. SR 81-4. November 1980. J-M. B. Mayas and M. O. Smith-Waison.

To determine how Black college males perceive the Navy and Navy careers, a survey questionnaire was administered to 1233 undergraduate males (904 Blacks and 329 Whites) at 12 colleges and/or universities. Half of the institutions were predominantly Black; and half, predominantly White. Half had NROTC units and half did not. Results showed that the Air Force was rated highest by Black respondents, followed by the Navy, Coast Guard, Army, and Marine Corps. Both Black and White respondents reported that (1) television and radio advertisements, news reports, and military recruiters contributed most to the way they think and feel about the Navy and (2) military literature and billboards, nonveteran friends, and school counselors, in that order, conveyed the most positive sentiments about the Navy. Significantly more Blacks than Whites believed that "affirmative action programs broaden the opportunities for success for both majority and minority officers" in the Navy. Also, respondents' perceptions of the relative success of affirmative action activities were significantly related to both overall attitude toward the Navy and aspects of Navy life. Blacks were significantly less positive toward the Navy and Navy career aspects than were Whites and (2) significant differences existed between students attending institutions with and without NROTC.

Human Resource Management (HRM) Cycle: Effect on Readiness Status of Navy Ships. SR 81-12. March 1981. E. D. Thomas and E. W. Curtis.

This effort was conducted to determine how participation in the human resources management (HMS) cycle affects the readiness of Navy ships. Readiness ratings from the Naval Force Status (NAVFORSTAT) report--in which each ship's ability to perform its mission is rated in five areas by its commanding officer--were analyzed for 103 ships that had participated in the HRM Cycle and 103 that had not. Results show that participation in the HRM cycle has a measurable, albeit modest, effect on a command's overall and equipment readiness rating.

Investigation of Operating Problems in Division 640, NARF, Alameda. SR 81-15. April 1981. H. L. Williams, G. Rowe, and N. Brownberger.

A special methodology was used to investigate the operations of Division 640, NARF, Alameda. Problems and their causes were identified by interviewing engineers and technicians and by investigating 24 major projects to which division personnel had been assigned. Recommended changes were developed by a working group made up of Division 640 supervisory personnel and the NAVPERSRANDCEN analyst assigned to the program.

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Quality Circles in the Navy: Productivity Improvement or Just Another Program? SR 81-21. July 1981. L. Y. Atwater. (AD-A101 873)

One attempt to overcome declines in productivity and product quality by means of employee involvement is the quality control circle (QC) program. Under this program, groups of employees from the same work area meet regularly on a voluntary basis to identify and analyze work-related problems and recommend solutions to management. Interest in implementation of QCs is spreading rapidly in both the public and private sectors. This report (1) provides information concerning QCs, (2) presents the results of a questionnaire that assessed the interest and involvement of Navy organizations in productivity improvement programs in general and QCs in particular, and (3) presents a plan, based on the results of the questionnaire, for implementing QCs in Navy organizations.

The Effects of Unmet Expectations, Satisfaction, and Commitment on the Reenlistment Intentions of First-term Enlisted Personnel. SR 81-25. August 1981. A. J. Farkas.

This effort was conducted to determine how unmet expectations, changes in satisfaction, and changes in commitment relate to changes in the intention to reenlist. Subjects consisted of 575 male, first-term enlisted personnel who responded to questionnaires administered (1) during the 8th week of recruit training (Time 1), (2) 8 to 10 months after the beginning of recruit training (Time 2), and (3) 20 to 21 months after the beginning of recruit training (Time 3). Results showed that (1) respondents' expressed intention to complete their enlistment decreased slightly from Time 1 to Time 2, but held steady after that point, (2) respondents' expressed intention to reenlist or to have a Navy career decreased steadily from Time 1 to Time 3, (3) the general attitudes of these recruits toward the Navy (e.g., general satisfaction) became progressively more negative, (4) organizational commitment to the Navy declined steadily from a high point at the end of boot camp, (5) the recruits had more positive expectations concerning supervision, peer relations, and job characteristics in the Navy at Time 1 than at Time 3, and (6) there was no causal relationship between general satisfaction and organizational commitment.

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TECHNICAL NOTES

Computer Simulation: A Technique for Studying Psychosocial and Sociotechnical Systems. TN 76-3. January 1976. P-A. Federico.

Results of a comprehensive review of the literature on psychosocial and sociotechnical systems indicated that computer simulation methodology could be used to overcome obstacles impeding man's understanding of, and scientific advancement in, such systems. It was concluded that the accrued advantages and potential payoffs resulting from using simulation techniques far outweigh any pitfalls that may be encountered in the implementation.

Utilization of Enlisted Women in the Military. TN 76-7. May 1976. P. J. Thomas.

This report discusses the status of American military women from a historical perspective and the way that recent changes have affected their utilization. Comparisons were made to the role of women in the Israeli Defense Force. This report presents material on (1) attitudes of men toward women in combat, (2) job-relevant stereo types, and (3) female enlistees, their occupational goals, and apparent later disillusion. Finally, case histories of the integration of Navy women into all-male units are presented. It was concluded that, until the laws and regulations preventing full utilization of military women are repealed, such women will experience discrepancies between their expectations and experiences.

The Impact of Computer-based Management Information Systems Upon Managerial Performance and Decision Making: A Literature Review. TN 76-8. June 1976. P-A. Federico, K. E. Brun, and D. B. McCalla.

Projected and present problems resulting from the implementation of computer-based management information systems (MISs) were identified, and the impact of these systems upon managerial performance and decision making was discussed. Results of a review of the relevant literature suggested that many of the allegations ascribed in the impact of MISs upon managerial behavior are inconclusive and contradictory. This underscores the urgent requirement for further research regarding the implications of MISs for managerial performance and decision making.

Enlisted Manning Levels and Ship Performance. TN 76-9. June 1976. R. L. Holzbach, Jr. and H. L. Williams.

The relationship between manning levels and ship performance on 105 naval ships was studied over a 3-year period. The ratio of the numbers of personnel allocated to the ships to the number authorized was used as the measure of manning level; and scores achieved on final battle problems, as the measure of performance. Results showed that the manning level of enlisted personnel by pay grade was related to ship performance in engineering, communications, navigation, and electronics. In general, an increase of personnel in the lower pay grades was associated with lower performance; and an increase in the higher pay grades, with higher performance. Thus, caution should be used in reducing the manpower allocated to ships, especially in the higher pay grades.

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The Human Resource Management Survey: A Factor Analysis of Each Component Dimension. TN 77-2. December 1976. G. L. Wilcove.

In this study, each dimension of the human resource management survey (Fleet Survey, Form X) was factor analyzed to determine if obtained factors correspond to those identified by a sample of enlisted personnel in the San Diego area to whom the survey had been administered. Of the questionnaire's six dimensions, only one was replicated; the rest received no or mixed statistical support.

Development of a Manual Archive for Existing and Future Navy Personnel Survey Data. TN 77-3. December 1976. D. M. Ramsey-Klee, and V. Richman.

Because of the lack of a systematic method for storing and retrieving past or ongoing survey response data, an attempt was made to organize, document, and catalog data bases important to the conduct of attitude and motivation research in the Navy. This effort involved the development of a usable manual archive for existing and future Navy personnel survey data. This archive consists of (1) an indexing vocabulary for attitude and motivation surveys (IVAMS), (2) an index to the coordination and control of personnel surveys (CCOPS) and archival personnel survey data base at NAVPERSRANDCEN (in the form of an edge-notch card system) (3) a user's manual, and (4) comprehensive documentation of selected magnetic disc files.

The Implications of Computer-based Management Information Systems for Organizational Structure and Processes: A Literature Review. TN 77-6. February 1977. P-A. Federico, D. B. McCalla, and K. E. Brun.

Projected and present problems resulting from implementation of computer-based management information systems (MISs) were identified and the impact of these systems upon organizational structure and processes was discussed. Results of a review of the relevant literature suggested that many of the allegations ascribed to the impact of MISs upon organizational behavior are inconclusive and contradictory. This underscores the urgent requirement for research regarding the implications of MISs for organizational structure and processes.

Combat System Research Program: Impact on Organizational Climate, Leadership, and Group Process. TN 77-8. March 1977. R. R. Vickers, Jr.

Pilot and standard organizations of weapons and operations departments were compared in terms of leadership, organizational climate, and group processes. Although the pilot organization produced better communication and higher integration of men and mission, it was also associated with lower leadership scores. The two organizations did not differ in terms of satisfaction and group processes. Since there was no consistent trend to the data, however, no strong recommendations were justified.

Review of Career Expectations Research: Australia, Canada, United Kingdom, and United States. TN 77-9. March 1977. M. F. Wiskoff.

This report provides (1) descriptions of recent and ongoing studies conducted by The Technical Cooperation Program (TTCP) member nations on the subject of career expectations, (2) a summary of major findings across nations, and (3) implications for

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researchers and managers. Findings indicated that R&D in career expectations should continue, in order to better understand the dynamics of expectancy formulation, change, and influence within the military assimilation process.

Development of a Management Techniques Inventory. TN 77-12. April 1977. L. A. Broedling, W. H. Githens, and J. A. Riedel.

The management techniques inventory was developed and administered to a sample of Navy and civilian managers. Respondents were to rate the familiarity and usefulness of 12 management techniques, the appropriateness of these techniques in solving 10 specific problems, and their own skill in solving these problems. Results showed that techniques rated as most familiar were also rated as most useful. In spite of this finding, however, they were not the techniques most frequently chosen as appropriate for solving the problems presented.

Perceptions of Shipboard Duty--Their Structure and Modification. TN 77-15. August 1977. A. I. Siegel, M. G. Pfeiffer, and C. Braunstein.

A sample of enlisted personnel was surveyed in an attempt to isolate and define the factors that comprise the basic structure of perception of shipboard duty held by such personnel. Nine factors were identified that were common to all personnel, regardless of (1) whether or not they had prior shipboard duty, (2) their attitude towards shipboard duty, or (3) their length of Navy service. Thus, it appears that perceptions of shipboard duty are formed early in one's career and tend to persist regardless of subsequent exposure to Navy life or to shipboard duty.

Personal Values of Naval Officers and Their Relationship to Time in Service and Job Complexity. TN 77-19. September 1977. R. R. Vickers, Jr., L. M. Doherty, and S. L. Dockstader.

The Rokeach value survey, which has been used to assess terminal (ends) and instrumental (means) values of the general public, was administered to a sample of naval officers. The responses were (1) compared with normative data available on the value survey, and (2) analyzed with time in service and job complexity as independent variables. Developmental trends consistent with a "need fulfillment" hypothesis were found in the time in service analysis. The relationship between personal values and job complexity was mediated by age and/or time-in-service factors, with increasing age/time resulting in self-oriented career patterns.

Economic Production Analysis and Ship System Resource Tradeoffs. TN 78-9. April 1978. M. W. Rowe and G. Ruptier.

The purpose of this effort was to determine the feasibility of using economic production analysis to identify and measure resource tradeoffs within a Navy ship system. A case study of one system, the ship communications center, was undertaken. Production functions of various forms depicting message handling processes in 14 ships were estimated using recent fleet operations data.

ORGANIZATION MANAGEMENT (Continued)

Expectancy Theory Measures: A Review of Issues and Methods Related to the Measurement of Instrumentalities, Expectancies, and Valences. TN 80-9. March 1980. D. R. Ilgen, R. D. Pritchard, W. E. Matte, Jr., and D. M. Nebeker.

The literature on expectancy theory was reviewed to (1) identify the issues and variables related to the theory, (2) evaluate the variables in terms of their usefulness of future productivity studies, and (3) choose several sets of approaches that fit into conceptually sound research frameworks. Summaries in tabular form were compiled on productivity research reported since 1974. Information provided included definition of the sample, nature of the work studied, and the reliability and validity of the measures used in the studies (where available). Based on this review, a research approach to be tested in a simulated organization setting was constructed. Four methods for measuring individual instrumentalities and expectancies and seven methods of measuring outcome valence were identified for future testing.

Factors Affecting the Management of Navy Women. TN 80-17. June 1980. P. J. Thomas.

The plan to double the number of women in the Navy between 1980 and 1985 raises a number of questions for management. In this effort, the literature on military research was reviewed to address some of these questions. The evidence that was presented indicated that women's propensity to enlist is equal to that of men. However, their occupational preferences have not been tested because of past and current restrictions on their assignment. Psychological differences between men and women were not established, except that there are differences in aptitude patterns due to the Navy's test battery. Pregnancy and its conjectured effect on productivity were discussed. Finally, from cost effectiveness data presented, it was concluded that women do not cost more to acquire, sustain, and retire than do men.

The Installation of Utility Meters on Military Family Housing: Guidelines for Future Projects. TN 80-18. June 1980. R. F. Morrison.

This report is designed as a reference for DoD members who may be required by Congress to manage the installation of energy metering systems for military family housing. It is not intended as a comprehensive aid, because the parent project was designed to test the feasibility of metering military family housing and not to establish the optimum method of metering such units.

An Empirical Study of the Effectiveness of Several Expectancy Theory Measures in an Experimental Work Simulation. TN 80-20. July 1980. D. R. Ilgen, R. D. Pritchard, B. L. Dugoni, W. H. Matte, Jr., and D. Nebeker.

Productivity and performance of federal employees, especially of the military services, need to be improved. Before this can be done effectively, however, it is necessary to understand what variables control performance and how they interact. Although expectancy theory has been suggested as a model that identifies these variables and how they interact, most tests of expectancy theory have not allowed validation because of problems with the measurement of its constructs. Therefore, it is necessary to develop and test measures of the theory so its validity can be determined. The objective of this effort was to evaluate the effectiveness of several measures of the components of expectancy theory (i.e., expectancies, instrumentalities, and valences) in a work simulation.

ORGANIZATION MANAGEMENT (Continued)

Family Housing Metering Tests: A Combined Study. TN 80-21. July 1980. R. F. Morrison, B. A. Feher, R. Sykes, and W. A. Simmons.

In Public Law 95-82 (1 Aug 1977), Congress directed the Secretary of Defense to examine strategies available for conserving energy in military family housing. Commander, Naval Facilities Engineering Command (NAVFAC 08A) was responsible for providing a report to the Office of the Deputy Assistant Secretary of Defense (Installation and Housing), who would then submit the report to Congress.

The final DoD report, entitled Family Housing Metering Test and dated 1 March 1980, covered a 2½-year test program designed to determine the feasibility of installing utility meters in military housing and of charging families for any excess usage over a ceiling that reflects good energy conservation practices. The DoD report included nine chapters, six of which included significant contributions from NAVPERSRANDCEN. These chapters, essentially as they were submitted for NAVFAC, are provided in this report.

Evaluation of the Navy Drug and Alcohol Program Guide. TN 80-22. July 1980. R. A. Langford and H. W. Lambert.

The command drug and alcohol program guide, described in 1977, was examined to determine (1) if the guide was readily available to commands, (2) the extent to which the guide was being used, and (3) the extent to which the guide provided effective suggestions for addressing drug and alcohol abuse problems at the command level. Of the commands that responded, most felt the guide was helpful. Respondents most often mentioned that the guide was concise and provided a good, workable outline. Conversely, nearly two-thirds felt there was a need for greater detail. It was noted that the guide needed a cross-referenced table and more detailed listing of applicable drug-alcohol instructions and guidelines.

The Influence of Extended In-Port Working Hours: HRM Survey Supplemental Items. TN 80-23. July 1980. E. D. Thomas and K. S. Crawford.

Items developed to examine the effects of in-port working hours on morale and personnel retention were administered along with the regular Human Resources Management survey to 2678 crew members of six Atlantic Fleet ships between July and September 1978. Responses indicated that long working hours appear to be more related to the overall morale of a ship and to unauthorized absences (UAs) than to retention. Lowered morale in lower-ranking personnel is caused by their failure to understand the need for longer in-port working hours and the failure of higher-ranking personnel to effectively communicate the reasons for such hours. Living conditions and job stress were chosen as the most important factors influencing decisions to leave the Navy.

First-term Navy Attrition Research: A Study of Ongoing and Future Research Directions. TN 81-2. October 1980. G. D. Kissler.

This report includes a review of past attrition research, an assessment of current attrition research at NAVPERSRANDCEN, and a suggested framework for use in future counterattrition efforts.

ORGANIZATION MANAGEMENT (Continued)

Workflow in Production Shops at NARF, Alameda. TN 81-12. April 1981. H. L. Williams and D. A. Mohr.

This report describes (1) the work processes in selected shops of the NARF Power Plant Division, (2) existing conditions that could adversely affect the success of the productivity enhancement program being implemented, and (3) features of the work processes that may be reducing shop productivity.

Women in the Military: Gender Integration at Sea. TN 81-13. May 1981. P. J. Thomas.

In October 1978, the Federal Code was modified to permit the assignment of women to U.S. Navy ships, overturning several hundred years of tradition. This study was conducted to measure and observe factors hypothesized to be associated with the integration process. Results showed that the attitudes measured in the preintegration survey were highly related to both the individual and organizational variables of interest. Although nonrated men held the most traditional beliefs about women's roles in the workplace, they liked working with women more than did any other group. On the postintegration survey, petty officers were the least positive of any group about the success of integration. Department effects were also evident. Women felt more performance pressure than men and experienced more problems aboard ship.

Performance Contingent Monetary Rewards for Individual Productivity: Principles and Applications. TN 81-14. May 1981. E. C. Shumate, S. L. Dockstader, and D. M. Nebeker.

The purpose of this effort was to provide detailed information concerning a performance contingent reward system (PCRS), an incentive management program aimed at increasing individual productivity. The report describes the critical elements required for such a program and shows how these elements were "engineered" into management practices in several different organizations. Although the PCRS was developed primarily to help find answers to research questions concerning relationships between motivation and productivity, it is hoped that a description of methods used by applied scientists may be of value to those supervisors who desire to improve the productivity of their organization.

PERSONNEL ADMINISTRATION

TECHNICAL REPORTS

Occupational Scales of the Navy Vocational Interest Inventory: I. Development. TR 74-4. October 1973. J. E. Dann and N. M. Abrahams. (AD-770 558)

Each year, thousands of enlisted recruits enter the Navy who, with little or no Navy experience, must indicate the ratings they would like to pursue for most of their military careers. The Navy Vocational Interest Inventory (NVII) was constructed to help these recruits determine the ratings that correspond most closely with their vocational preferences and in which they would probably be most satisfied. This report describes the development of 15 occupational scales for the NVII that yield scores based upon a modification of the point-biserial correlation and reflect the extent to which an individual's interests resemble the interests of satisfied people in 15 different Navy ratings.

Occupational Scales of the Navy Vocational Interest Inventory: II. Reliability. TR 74-5. October 1973. J. E. Dann and N. M. Abrahams. (AD-770 557)

This report, which is a continuation of the work described in NPRDC TR 74-4, describes the evaluation of the test-retest reliability of profiles of scores based on the lambda scales. This was done for 179 reenlistees and 136 nonreenlistees, who were first tested in 1964 or 1965 prior to entering one of seven class "A" schools and retested 4 to 6 years later. Information on the scale's internal consistency reliability was also obtained using a representative sample of Navy recruits. Based upon the reported results, lambda scales of the NVII are considered sufficiently stable for use in recruit classification. However, the scales' ability to differentiate between individuals in different ratings and to predict such criteria as job satisfaction must be evaluated using currently available data before they can be recommended for operational use.

Evaluation of Occupational Choices in the Marine Corps. TR 74-7. September 1973. A. C. F. Gilbert and T. M. I. Yellen. (AD-773 349)

The purpose of this effort was to determine the occupational preferences of Marine recruits with regard to occupational fields other than aviation. The Marine Assignment Preference Schedule (MAPS), which includes 28 military occupational fields, was administered in May 1972 to approximately 850 Marine recruits who were in their third week of training. Analysis showed that the five most preferred military occupational fields were (1) motor transport, (2) military police, (3) construction, equipment, and shore party, (4) utilities, and (5) infantry.

Noncognitive Factors as Predictors of Individual Suitability for Service in the U.S. Navy. TR 74-13. April 1974. S. E. Bowser. (AD-780 438)

This is a pilot effort to use noncognitive data sources in predicting individual suitability for service in the U.S. Navy. A methodology was developed that enables a logical selection of subsets of categorical predictors to optimize the prediction of suitability for service. The results support the contention that noncognitive data sources are important and useful in prediction of success in the U.S. Navy.

PERSONNEL ADMINISTRATION (Continued)

Electronics Technician Direct Procurement Petty Officer (DPPO) Pilot Program: Phase I.
TR 74-20. March 1974. L. S. Standlee, C. R. Bilinski, and J. C. Saylor. (AD-778 029)

Direct Procurement Petty Officer (DPPO) program trainees, who were recruited after they had acquired technical training in civilian schools (associate or comparable degree in electronics), were compared with regular "A" school trainees in terms of academic performance, job performance, and cost of training. The DPPO trainees were judged by their immediate supervisors in the fleet to be slightly better than regular trainees in terms of length of time required to learn their job and probable advancement in the Navy. The regular trainees were rated slightly better than the DPPO trainees in ability to use schematics and wiring diagrams. These differences tend to lose their significance, though, in view of the 21 comparisons wherein there was no statistically significant difference in the performance of DPPO and regular trainees. The cost to the Navy of DPPO trainees was lower than that of regular trainees.

An Evaluation of Computerized Tests as Predictors of Job Performance in Three Navy Ratings: I. Development of the Instruments. TR 75-2. August 1974. C. H. Cory. (AD-782 527)

An experimental battery of eight computerized tests, which were constructed to measure five personal attributes identified in previous research as being important to job performance, and nine previously developed tests was administered to 385 enlisted personnel. Test results and interrelationships were analyzed in conjunction with operational written test and biographical variables. Results showed that computerized tests had advantages over paper-and-pencil tests in measuring sequential information processing, movement detection, and short-term memory skills, but not in measuring perceptual speed. Findings relative to measuring perceptual closure were ambiguous.

A Comparison of the Influence of Instructional Set on Test Results for Mental Level and Racial Groups. TR 75-5. October 1974. C. H. Cory. (AD-787 619)

The purpose of this effort was to determine whether differences in motivational conditions associated with test administration affect individual performance. Previous research has shown that conditions of administration can influence group performance on written tests. An experimental battery was administered under four different instructional conditions to Category IV, non-IV, Black, and non-Black subgroups. Analysis of responses showed that lack of motivating instruction significantly lowered the test performance of Category IV personnel on the most cognitive experimental tests. However, it did not affect the performance of any of the subgroups on more noncognitive tests.

The Unobtrusive Measurement of Racial Bias Among Recruit Classification Specialists.
TR 75-6. October 1974. D. C. Atwater, E. F. Alf, Jr., and N. M. Abrahams. (AD-A000 065)

Historical data documenting decisions made in the Navy's recruit classification process were used to determine whether there were significant differences between Black and White classification interviewers in their treatment of Black and White recruits. The nature of the classification procedure results in the essentially random

PERSONNEL ADMINISTRATION (Continued)

assignment of Black and White recruits to Black and White classifiers. This permits a number of interesting comparisons and obviates numerous problems inherent in racial bias studies. The major hypothesis that Black and White classifiers would be differentially biased in their treatment of Black and White recruits was not supported. Also, a second hypothesis--that classifiers within either racial group would be differentially biased in their treatment of Black and White recruits--was not supported.

Identification of Naval Academy Applicants With Engineering and Science Interests. TR 75-7. October 1974. I. Neumann and N. M. Abrahams. (AD-787 062)

This effort investigated the use of the Strong Vocational Interest Blank (SVIB) to identify individuals more likely to select an engineering or science program at the Naval Academy. An engineering-science (E-S) scale for the SVIB was developed and cross-validated over several academy class years. Based on results, it was recommended that the E-S scale be used by the Naval Academy to make selection decisions.

Impact of Increasing Preference Options in the Marine Corps. TR 75-12. November 1974. A. Katz and B. A. Rafacz. (AD-A003 452)

The Marine Assignment Preference Schedule (MAPS) was administered to all recruits entering the Marine Corps between October 1972 and April 1973 to whom no special training commitment had been made. Enlistees indicated their occupational preference on MAPS administered at entry to recruit training, at completion of recruit training, and 6 months after the completion of recruit training. The third administration of MAPS included self-evaluations on job satisfaction and service plans. Concurrently with the third MAPS administration, supervisory evaluations were obtained on job performance. Occupational preferences were found to be rather unstable (inconsistent) from one administration of MAPS to another. Statistically significant differences were observed on supervisory and/or self-evaluations between individuals in an occupational field/area they preferred versus those in the same field/area who had chosen some other field/area. The differences between groups based on preferences expressed at entry into basic training are statistically significant. However, they are so small that the association between granting preference options and job satisfaction/job performance has not been clearly demonstrated.

The Cross-cultural Interaction Inventory: Development of Overseas Criterion Measures and Items that Differentiate Between Successful and Unsuccessful Adjusters. TR 75-27. April 1975. T. M. I. Yellen and S. J. Mumford. (AD-A009 362)

A Biographical, Interest, Attitude Inventory (BIAI) was constructed and administered with the Strong Vocational Interest Blank (SVIB) to Navy personnel stationed in Japan. The 38 BIAI items that differentiated with high accuracy between successful and unsuccessful adjusters were incorporated into a predictor instrument called the Cross-cultural Interaction Inventory (CCII). Results of concurrent validation analyses indicated that: (1) selected BIAI items differentiated with high accuracy between successful and unsuccessful overseas adjustments, (2) BIAI attitude items were more useful in differentiating between successful and unsuccessful adjustment than were the biographical and interest type items, and

PERSONNEL ADMINISTRATION (Continued)

(3) SVIB items, as a whole, did not differentiate between successful and unsuccessful adjusters.

Electronics Technician Direct Procurement Petty Officer (DPPO) Pilot Program: Phase II. TR 75-37. June 1975. L. S. Standlee and C. R. Bilinski. (AD-A011-051)

The effectiveness of electronics technicians who were sent to civilian schools for a major part of their training and those who had gone through normal Class "A" school training was compared in terms of academic performance, job performance, and training costs. No significant differences in performance were found, but civilian training costs were lower.

Racial Differences in the Prediction of Class "A" School Grades. TR 75-39. June 1975. P. J. Thomas. (AD-A012 319)

Based on the findings of a 1972 effort, which concluded that the Navy's selection tests are not as valid for minority personnel as they are for the majority group, the utility of alternative test composites of the Basic Test Battery (BTB) was investigated. Results indicated that minority assignment to technical training can be improved by implementing new selection composites that are valid for both Whites and Blacks.

Validation of the Delinquent Behavior Inventory as a Predictor of Basic Training Attrition. TR 76-3. August 1975. T. M. I. Yellen. (AD-A015 281)

The Delinquent Behavior Inventory (DBI), which was designed to identify Navy applicants likely to display delinquent behavior (including illicit drug use while in the Navy), was administered to 2500 Navy recruits during their first week of basic training in San Diego, California. Of the 2500 recruits, 101 were discharged for detrimental causes. Analysis of responses of graduates and attrites showed that the attrites tended to be younger and less educated than graduates. Also, they were more inclined not to like themselves; to have a liberal attitude toward drugs, a negative attitude toward authority and discipline, a general disregard for law and order, and a lack of drive or motivation; and to exhibit antisocial behaviors.

Attitudinal and Demographic Characteristics of Company Commanders: A Comparative Analysis Across Recruit Training Centers. TR 76-4. August 1975. W. R. Manese, M. Skrobiszewski, and N. M. Abrahams. (AD-A013 991)

To provide background information for an ongoing effort to develop psychometric measures predictive of company commander effectiveness, a survey questionnaire was administered to company commanders at the Navy's three recruit training centers (RTC's). The survey compared the RTC's centers in terms of the demographic characteristics, satisfaction levels, and job-related attitudes of onboard company commanders. Data obtained were compared with similar data collected in a 1957 survey.

Comparative Racial Analysis of Enlisted Advancement Exams: Item Difficulty. TR 76-6. July 1975. D. W. Robertson and M. H. Royle. (AD-A014 549)

Items in 24 Navy enlisted advancement exams were analyzed to determine which test characteristics might account for the higher promotion rate of White over Black.

PERSONNEL ADMINISTRATION (Continued)

Specific questions addressed included (1) whether it is feasible to construct exams containing only items that are similar in difficulty for both Blacks and Whites, (2) what types of items are similar in difficulty, and (3) whether the same items are relatively easy or difficult for Blacks and Whites. The development of advancement exams containing items similar in difficulty for Blacks and Whites was not recommended for two reasons: (1) the concentration of similar-difficulty items in the difficult range would degrade test quality, and (2) items largely limited to factual content might not cover all necessary content for a particular occupational specialty.

Evaluation of Revised Navy Occupational Information. TR 76-8. August 1975. L. Swanson. (AD-A015 283)

The exiting Navy Occupational Handbook, called Careers, was reviewed, and a revised version, called Navy Ratings Review, was developed. Revisions included (1) making job duties more explicit, (2) improving readability, (3) giving a truer picture of job duties, (4) including information on rating size and advancement opportunities, and (5) enlarging sections on related Navy ratings and civilian jobs. It was recommended that (1) the Navy Ratings Review be printed and distributed to Navy recruiters and classification personnel, and (2) recruiters be informed of the importance of being completely honest with applicants.

An Evaluation of Computerized Tests as Predictors of Job Performance: II. Differential Validity for Global and Job Element Criteria. TR 76-28. January 1976. C. H. Cory. (AD-A020 867)

This report presents data concerning the validity of a set of experimental computerized and paper-and-pencil tests for measuring on-job performance of global and job elements. It reports how useful 30 experimental and operational variables are for predicting marks on 42 job elements and on a global criterion for electrician's mate, personnelman, sonar technician, and apprenticeship rating groups.

Development of Behaviorally-based Rating Scales For Evaluating the Performance of U.S. Navy Recruiters. TR 76-31. February 1976. W. C. Borman, L. M. Hough, and M. D. Dunnette. (AD-A022 371)

This report describes development and field testing of job performance rating scales for the job of Navy recruiter. Over 800 critical incidents describing different facets of effective and ineffective recruiting performance were obtained from field recruiters and recruiter supervisors representing all seven recruiting areas. These incidents were classified into the following nine dimensions: (1) locating and contracting qualified prospects, (2) gaining and maintaining rapport, (3) obtaining information from prospects and making good person-Navy fits, (4) salesmanship skills, (5) establishing and maintaining good relationships in the community, (6) providing knowledgeable and accurate information about the Navy, (7) administrative skills, (8) supporting other recruiters and the command, and (9) dedication to the job. Analysis of the field test results showed that self and peer ratings contained impressive convergent and discriminant validity. Future use of these Navy recruiter performance rating scales should be restricted to self and peer ratings to assure highest reliabilities and most valid performance appraisals.

PERSONNEL ADMINISTRATION (Continued)

Comparative Racial Analysis of Enlisted Advancement Exams: Relative Item-difficulty Between Performance-matched Groups. TR 76-34. April 1976. D. W. Robertson, and W. E. Montague. (AD-A024 801)

This is the second in a series of research efforts investigating the relative item-difficulty levels in enlisted advancement examinations between Black and White racial groups. Relationship between item-difficulty of racial groups was measured by the Rho value--the correlation between the two rank-orders of the Black and White item-difficulty levels. Rho values were calculated across race and within race of the two groups. The across-race Rho values are slightly but consistently lower than within-race values, suggesting that some small amount of bias (as defined for this analysis) may be present. The findings were considered only suggestive and tentative, since the analysis employed internal and conceptual criteria of test bias, rather than external criteria.

A Comparison of the Job Performance and Attitudes of Category IVs and I-IIIs in 16 Navy Ratings. TR 76-35. May 1976. C. H. Cory. (AD-A024 642)

This research was intended to provide objective data on the performance abilities of Category IV personnel in a representative sample of Navy ratings. Supervisory evaluation, biographical information, and attitude data were collected on samples of IV and non-IV personnel in 16 Navy enlisted ratings. Comparisons of IVs and non-IVs in each rating were made in terms of job performance, personal characteristics, and attitudes. *t* tests were used to identify the distinguishing characteristics of high performing IVs in five ratings; and multiple-regression analyses, to investigate the predictability of performance of IVs in three ratings. Results showed that, in the ratings covered, IVs exhibited generally widespread but small deficits in on-job performance when compared with non-IVs. Deficits in the global performance of IVs were generally statistically significant for the Boiler Technician, Machinery Repairman, and Quartermaster-Signalman ratings/rating groups. Test scores and educational attainment were associated with high on-job performance of IVs. There were few consistent differences in motivation and outlook between IVs and non-IVs.

Empirical Weighting of Predictors for the Naval Academy Selection Program. TR 76-37. June 1976. I. Neumann and N. M. Abrahams. (AD-A027 275)

A selection composite, called the Candidate Multiple, has been used for a number of years to select midshipmen for admission to the U.S. Naval Academy. Although this composite is a consistently good predictor of academic success, it is not as effective in predicting other Academy success criteria. Since composite components tend to be less valid for present classes, new measures should be considered as additional or replacement components. The purpose of this effort was to find the optimal combination of present and experimental predictors.

Experimental Procedures for the Classification of Naval Personnel. TR 77-3. January 1977. A. I. Siegel and J. P. Wiesen. (AD-A035 744)

Two concepts--miniature job learning and evaluation and assessment center methodology--were woven into a technique for evaluating and classifying personnel for technically oriented jobs. The concepts are presented and the resultant

PERSONNEL ADMINISTRATION (Continued)

evaluative methodology described. Trial work indicated acceptable internal psychometric characteristics and considerable acceptability for the methods and approach.

Selection Criteria for Recruit Company Commanders: Development and Validation. TR 77-9. December 1976. W. R. Manese, M. F. Skrobiszewski, and N. M. Abrahams. (AD-A033 993)

The purpose of this effort was to develop procedures for use in selection of prospective recruit company commanders. An experimental battery of paper-and-pencil tests was developed and evaluated against a variety of measures of company commander effectiveness. Results indicated that an interest inventory was the most accurate predictor of effectiveness. Recommendations concerning its use were made.

Psychobiological Predictors of Success in a Navy Remedial Reading Program. TR 77-13. December 1976. G. W. Lewis, B. Rimland, and E. Callaway. (AD-A037 339)

Early discharge of enlisted men for unsuitability is a serious and growing problem for the military services. The presently available methods of screening are not adequate. The purpose of this research were to investigate newly developed computer-based methods of recording and analyzing brain waves and to determine their value in screening out failure-prone recruits. Visual evoked potentials were used to derive measures of brain amplitude, asymmetry, variance, and latency for 73 high-risk recruits who had been assigned to remedial academic training. Correlational and discriminant analysis of the data found that several brain wave measures appeared to be effective in predicting recruit graduation or failure.

Comparative Racial Analysis of Enlisted Advancement Exams: Item Differentiation. TR 77-16. February 1977. D. W. Robertson, M. H. Royle, and D. J. Morena. (AD-A035 672)

Enlisted advancement exams for pay grades 4-7 were analyzed for racial differences in test quality in terms of item differentiation and reliability, including the effects from alternative item selection techniques. Item differentiation levels were found to be lower for Blacks than for Whites, partly because item-difficulty levels were lower for Blacks. Alternative tests with items of similar difficulty for Blacks and Whites reduced Black-White score differences as well as test quality, while tests with easier or more highly correlated items improved test quality with little change in Black-White score differences. The "best" items, selected for their high correlations with an internal criterion, were not the same as those selected with an external criterion. Empirical validation of present tests and alternate construction procedures were recommended.

Vocational Interests and Their Relationships to Academic Major Areas at the U.S. Naval Academy. TR 77-30. April 1977. W. A. Sands and N. M. Abrahams. (AD-A038 815)

The objective of this effort was to develop and evaluate interest scales designed to provide an index of similarity between a midshipman's interests (as measured by the Strong Vocational Interest Blank) and the interests of Naval Academy graduates in each of three broad academic areas. The validity for each scale was significant in each cross-validation sample. Four alternative strategies for using the interest scales were evaluated and compared.

PERSONNEL ADMINISTRATION (Continued)

Screening Male Applicants for Navy Enlistment. TR 77-34. June 1977. W. A. Sands. (AD-A040 534)

The Prediction Of Enlisted Tenure--Two Years (POET-2) model is designed to estimate an enlisted applicant's chances of completing the first 2 years of service. Applicants with a low probability of survival could be screened out by Navy recruiters in the field, resulting in a decrease in premature attrition. The POET-2 model was developed and evaluated on data collected on 68,616 nonprior service males enlisting in CY 1973.

Evaluation and Prediction of Navy Career Counselor Effectiveness. TR 77-35. June 1977. D. W. Robertson, S. W. Ward, and M. H. Royle. (AD-A042 032)

Selection procedures were developed to identify senior petty officers who would be most concerned and effective as Navy career counselors. Criterion data, collected from multiple counselees per counselor, included ratings of perceived warmth, problem-solving effectiveness, and helpfulness. The best single predictor instrument was the Comrey Personality Scale ($r = .34$), with a specially tailored scoring key; while the best predictor multiple was the locally developed Biographical and Attitudinal Inventory and the Dole Ideal Counselor Adjective Check List ($r = .41$). Most counselors were evaluated favorably, with the 32-34 year age counselors rated highest by the youngest counselees. The counselors' helpfulness was rated highest by the low aptitude (as measured by the Basic Test Battery) counselees. Although the keys were validated primarily for the selection of career counselors, their potential usefulness was discussed for selection to other occupations also, such as Recruiting, which involves substantial amounts of counseling activities.

Occupational Scales of the Navy Vocational Interest Inventory: III. Relationship to Job Satisfaction, "A" School Grades, and Job Performance. TR 78-3. November 1977. J. E. Dann and N. M. Abrahams. (AD-A046 754)

The Navy Vocational Interest Inventory (NVII) is an interest measure that was developed to help guide recruits into the ratings corresponding most closely to their vocational preferences and in which they would probably be most satisfied. Previously, occupational scales were constructed for the NVII to reflect the degree of relationship between an individual's interest and the interests of men in 15 specific Navy ratings. The present effort evaluated these scales in terms of their classification accuracy and ability to satisfy certain logical relationships and their association with "A" school performance, job satisfaction, and job performance for individuals in 15 ratings. The scales were also compared with more traditional occupational and homogeneous scales developed several years ago. Results indicated that the scales were quite effective in a cross-sectional sample in relating to job satisfaction, in classifying individuals into ratings where they were known to be satisfied, and in conforming to certain logical relationships. The scales were less promising, however, in a longitudinal sample in terms of all of these criteria and showed little relationship to either "A" school grades or job performance. They also failed to improve upon the previously developed NVII scales.

PERSONNEL ADMINISTRATION (Continued)

Determinants and a Measure of Navy Recruiter Effectiveness. TR 78-21. June 1978. J. K. Arima. (AD-A055 800)

This research sought to develop a practical means of objectively measuring recruiter productivity. An equation was developed to predict productivity based on characteristics of the recruiter's geographic location and management policy. Using such an equation, production not under the direct control of a recruiter could be isolated. Results showed that total recruiter production is determined approximately equally by (1) the personal characteristics and abilities of the recruiter and (2) the potential of the recruiting station territory and the Naval Recruiting District (NRD) in which the station is located. Accordingly, individual recruiter effectiveness can be conceived as the ratio of actual productivity to expected productivity. The differential effects of NRDs on expected recruiter productivity and the variability among stations in the expected production of their individual recruiters suggest that improvements in goal assignment, resource allocation, and other management practices can be realized.

Navy Vocational Information System. TR 78-22. June 1978. T. M. I. Yellen and P. P. Foley. (AD-A055 805)

As part of a program to develop computerized Navy techniques for recruit assignment, counseling, and testing, a computer-based occupational counseling system has been developed, based on useful features of existing information retrieval systems. Not only does the system acquaint individuals with various civilian careers that they might want to explore, but it also provides occupational information concerning various Navy ratings that are related to those civilian fields.

Armed Services Vocational Aptitude Battery, Forms 6 and 7: Validation Against School Performance--Interim Report. TR 78-24. June 1978. L. Swanson. (AD-A056 700)

Two validation efforts, one concurrent and one predictive, were conducted to evaluate the effectiveness of the Armed Services Vocational Aptitude Battery (ASVAB), used since January 1976 as the basis for acceptance of applicants into the Armed Services and for initial assignment to school after completion of recruit training. ASVAB subtest and current selector composite validities against a final school grade or days-in-training criterion were determined for each school sample. Validities of many other two-, three-, and four-test sets of ASVAB composites were also determined to discover more valid composites than those operationally used. In addition, in the predictive study, revised composites developed in a related study on basic electricity and electronics courses were validated in several follow-on "A" schools.

Identification of NROTC Applicants with Engineering and Science Interests. TR 78-31. August 1978. I. Neumann and N. M. Abrahams. (AD-A059 343)

Due to the Navy's increasing need for high quality officers with technical training, the NROTC program must increase the number of midshipmen selecting engineering or science (E-S) majors. In an attempt to meet this goal, students entering the program in 1970 and 1971 were used to develop and validate an interest scale, based on their responses to the Strong Vocational Interest Blank, for predicting choice of major. Validation results indicated that the scale was effective in

PERSONNEL ADMINISTRATION (Continued)

predicting choice of major and was stable over time. Further, midshipmen scoring high on the scale were no more likely to disenroll than were those scoring lower. Thus, it was highly recommended for use in selecting NROTC midshipmen with E-S majors.

Hemispheric Asymmetry as Related to Pilot and Radar Intercept Officer Performance. TR 79-13. March 1979. G. Lewis and B. Rimland. (AD-A068 087)

This report describes the application of a relatively new technology, the visual evoked potential (VEP) method of brain wave analysis, as a possible means of improving the prediction of performance in an area that has proven intractable to more conventional testing procedures--the military aviator. The subjects were 28 pilots and 30 radar intercept officers (RIOs) assigned to a Navy Readiness Training Squadron. VEP data were obtained from eight scalp electrode sites for each aviator. Ratings by the operations officer served as the criterion of performance. It was hypothesized that: (1) VEP amplitude differences would be found between the pilot and RIO groups, and (2) within the pilot and RIO groups, individual performance ratings would be related to VEP hemispheric asymmetry (amplitude differences between the right and left hemispheres). The results indicated that the technology under development seems promising as a means for improving the selection and classification of applicants for aviation training.

An Inventory Battery to Predict Navy and Marine Corps Recruiter Performance: Development and Validation. TR 79-17. May 1979. W. Borman, J. Toquam, and R. Rosse. (AD-A069 371)

The objectives of this effort were to develop paper-and-pencil predictors of Navy and Marine Corps recruiter performance and to evaluate their validity. Accordingly, several measures of personality, vocational interests, and background were prepared (or selected) and administered to a geographically representative sample of 329 Navy and 118 Marine Corps recruiters. Scores on the predictor battery's items and scales were correlated with performance scores developed from supervisory, peer, and self ratings and from production data (i.e., number of recruits enlisted). Estimated cross-validities for predictor composites were significantly different from zero for four of the five performance criteria in the Navy sample, and for all of the performance criterion in the Marine Corps sample. Therefore, it was recommended that the predictive validity of the predictor composites developed in this project be examined, the potential fakability of the predictor composites be assessed, and additional paper-and-pencil measures of constructs that this effort suggests are valid indicators of Navy and Marine Corps recruiter success be developed.

Peer and Supervisory Ratings of Research Scientists. TR 79-31. September 1979. G. Kissler and D. Nebeker. (AD-A074 842)

Supervisory ratings and peer ratings, which are currently used in a federal agency to rate its research personnel, were compared in terms of their respective reliability and validity. The results showed that the peer ratings were more stable over time and related more highly to scientific "productivity" than do the supervisory ratings. Also, productivity was found to be significantly related to occupational levels resulting from peer evaluations. A discussion of these results and possible

PERSONNEL ADMINISTRATION (Continued)

explanations for the differences between the two evaluation processes are given along with other considerations for organizations that contemplate alternate evaluation processes similar to peer ratings.

Armed Services Vocational Aptitude Battery, Forms 6 and 7: Validation Against School Performance in Navy Enlisted Schools (July 1976-February 1978). TR 80-1. November 1979. L. Swanson. (AD-A077 158)

This predictive validation effort was conducted to evaluate the effectiveness of the Armed Services Vocational Aptitude Battery (ASVAB), Forms 6 and 7, used since January 1976 for acceptance of applicants into the Armed Services and for initial assignment to school after completion of recruit training. ASVAB subtest and current selector composite validities against a final school grade or days-in-training criterion were determined for each school sample. Validation of many other two-, three-, and four-test sets of ASVAB subtests was also determined in an attempt to discover more valid composites than those operationally used. Recommendations were made for changing selector composites in 10 schools to lower academic attrition.

Taxonomic Approaches to Enlisted Occupational Classification (Volumes I and II). TR 80-7. December 1979. D. M. Ramsey-Klee. (AD-A078 667)

Task inventory data for five representative Navy enlisted ratings (i.e., AB, AD, ET, TM, and YN) were studied to (1) define the taxonomic structure underlying the design of the Navy Occupational Task Analysis Program's task inventory booklets and (2) develop alternative taxonomic methodologies that will extend the usefulness of the task inventory data and shorten the task inventories, thereby reducing time demands on operational units during their administration.

Evaluation of Alternative ASVAB Composites for Selected Navy Technical Schools. TR 80-15. February 1980. D. C. Atwater and N. M. Abrahams. (AD-A081 744)

The purpose of this research was to determine whether alternate selection test composites from the ASVAB could be used to reduce academic attrition in certain Navy technical schools. Students were assigned to a test selection or a hold-out sample. Using multiple regression, the most valid test composites were identified for each school in the test selection sample and validated, along with the current selector composite, in the hold-out sample. Results indicated that using a new selection composite for the Basic Electronics and Electronics Preparatory School for aviation support equipment technicians (ASE) would reduce attrition in that school and improve performance in the follow-on ASE "A" school. No other recommendations to change selection composites were made.

Selection of Marine Corps Drill Instructors. TR 80-17. March 1980. L. S. Standlee and N. M. Abrahams. (AD-A082 966)

The purpose of this effort was to assist the Marine Corps in more accurately predicting the success of prospective drill instructors (DIs). Students entering DI school (N = 759) were administered an experimental test battery that covered both intellectual and motivational factors. Analyses of responses showed that a composite score of volunteer status, General Classification Test score, and level of education,

PERSONNEL ADMINISTRATION (Continued)

and a biographical questionnaire score were predictive of performance in DI school. Performance in DI school was the best single predictor of performance on the job.

Evaluation of Officer Accessions at Surface Warfare Officer School. TR 80-24. April 1980. A. M. Crawford and S. K. Van Beenen. (AD-A085 028)

The purpose of this effort was to determine whether Black and White Surface Warfare Officer School (SWOS) students differed as to performance and attrition. Data gathered on Black and White students who had attended SWOS during a 2-year period were compared. Results showed that Blacks had a significantly higher attrition rate and lower performance levels than did Whites. For both racial groups, students who are commissioned through NROTC sources have a significantly greater chance of failing SWOS than do those commissioned through other sources. This is particularly true for Blacks who are commissioned through NROTC units at predominantly Black, Southern colleges. Also, Blacks who come from schools rated as less competitive are more likely to fail than those who come from schools rated as more competitive. For both groups, attrition rates can be reduced considerably by allowing students to "roll back" and attempt SWOS a second time.

Psychobiological Measures as Predictors of Sonar Operator Performance. TR 80-26. May 1980. G. W. Lewis and B. Rimland. (AD-A085 030)

This report describes the application of a relatively new technology, the visual event related brain potential (VERP) method of brain wave analysis, as a possible means of improving the prediction of performance of sonar operators. The subjects, 26 trainees at the Fleet Antisubmarine Warfare School, were assigned to a high or low group based on their performance on a sonar simulator task. Eight channels of VERP data were recorded for each subject from scalp contact electrodes, and microvolt root mean square amplitude measures were computed for the wave forms at each of the eight electrode sites. To assess relationships between the brain's right hemisphere (RH) and left hemisphere (LH), asymmetry measures were computed by subtracting the LH amplitude value from the RH value for each of the homologous sites. Results of discriminate analysis performed to discriminate the high and low groups showed smaller VERP amplitudes for the high group than for the low group. Also, hemispheric asymmetry was greater for the low than the high group, especially in the occipital (visual processing) area of the head. Aptitude tests used by the Navy in selecting recruits for sonar training showed no differences between the two performance groups.

Methods to Evaluate Scales and Sample Size for Stable Task Inventory Information. TR 80-28. May 1980. J. J. Pass and D. W. Robertson. (AD-A085 600)

Methods were developed to determine: (1) the stability and redundancy of responses to two job task scales--the continuous Relative Time-Spent scale and the dichotomous Task-Performed scale, (2) the stability of "job types" (i.e., clusters of job incumbents) derived from scale responses, and (3) the change in stability when sample size is reduced. Results indicated that the Task-Performed scale yields stable, meaningful task information (i.e., percentages of personnel performing tasks) from responses by job incumbents, but no practical gain in information is achieved from the Relative Time-Spent scale. A better way to collect time-spent data is proposed. Findings also demonstrate that highly stable scale data and cluster

PERSONNEL ADMINISTRATION (Continued)

solutions are obtainable from samples substantially smaller than those presently administered. The study's empirically developed relationship between sample size and stability can be usefully employed to determine cost-effective sampling for task inventory surveys.

Validity of a Battery of Experimental Tests in Predicting Performance of Navy Project 100,000 Personnel. TR 80-35. September 1980. C. H. Cory, N. E. Neffson, and B. Rimland. (AD-A091 243)

This report summarizes results of a four-phase study that originated as part of the Project 100,000 research effort. The purpose was to develop "culture fair" aptitude tests that would permit the Navy to identify potentially successful recruits from those who scored low on conventional tests. Nineteen experimental tests/questionnaires were developed to measure practical (as opposed to academic) mental abilities. The experimental instruments were divided into four batteries, each of which was administered to a separate sample ranging in size from 5,000 to 12,000 recruits. The instruments were validated against supervisory performance ratings, rating progression, and retention criteria for sample members. Separate analyses were done for Mental Level IVs, Blacks, and for apprenticeship level (nonrated, undesignated strikers) and technical rating groups.

New Criteria for the Selection and Evaluation of Sonar Technicians. TR 81-13. July 1981. R. R. Mackie, R. R. Ridihalgh, and T. E. Shultz. (AD-B059 973L)

To improve selection and evaluation procedures for operator personnel of current and future sonar systems, standardized and experimental selection tests were administered to a sample of students undergoing sonar operator training at the Anti-submarine Warfare Training Center, Pacific. The predictor tests were later validated against typical academic (written test) criteria as well as against measures of operational performance, including target detection, report timeliness, target classification, and target tracking and localization. It was shown that presently used selection tests are totally inadequate as predictors of operational performance, although they do predict academic performance. Use of a number of the experimental predictor tests would substantially improve the selection process as measured by either academic or operational criteria.

Performance Evaluation Narratives of Navy Women and Men: An Examination for Bias in Promotion. TR 81-14. July 1981. V. F. Nieva, S. M. Mallamad, E. J. Eisner, S. H. Mills, and P. J. Thomas. (AD-A102 701)

The narrative sections of performance ratings for 52 men and 52 women eligible for promotion to chief petty officer were analyzed to determine whether statements included in the narrative section or the manner in which the statements were interpreted by the selection board were subject to sex bias. Results showed that there was no significant difference in the number of positive statements made on the performance of men and women. However, significant interactions between sex and selection status (selected for promotion or not selected) were found in two evaluation categories: (1) motivation and personality traits and (2) dimensions of concern to the Navy (awards, oral communication skills, appearance). Women who were not selected had more positive statements related to motivation and personality than did either men or women who were selected, indicating that positive performance in this

PERSONNEL ADMINISTRATION (Continued)

dimension did not enhance promotion prospects. Men who were not selected had more positive statements on dimensions of concern to the Navy than did men who were selected.

Relationship Between the Armed Services Vocational Aptitude Battery (ASVAB) and Surface Sonar Technician Performance. TR 81-19. August 1981. R. R. Mackie, R. R. Ridihalgh, M. L. Seltzer, and T. E. Shultz. (AD-B059 929)

In the interest of determining the effectiveness of the Armed Services Vocational Aptitude Battery for identifying recruits who have a high probability of becoming effective surface sonar operators, the validity of the current surface sonar technician ASVAB standard for predicting the performance of sonar operators was compared with that of two experimentally identified alternative ASVAB composites. The criterion was a comprehensive performance test comprising 40 aspects of sonar operator performance. An improved ASVAB composite was identified and certain deficiencies in the currently used selection standard were pointed out. The possible difficulty of using a single ASVAB composite for selecting both the most efficient operators and the most efficient maintainers of sonar equipment was discussed.

Development and Validation of a Recruiter Selection Battery. TR 81-20. September 1981. W. C. Borman, R. L. Rosse, J. L. Toquam, and N. M. Abrahams. (AD-A104 681)

At a time when the military forces are largely dependent on the quantity and quality of volunteers, the criticality of the role played by recruiters in meeting manpower supply requirements cannot be overemphasized. This report describes the development and validation of a battery of primarily paper-and-pencil instruments to identify those individuals most likely to become successful recruiters. Instruments contained in this battery include self-description inventories, biographical data, and vocational interest measures. This recruiter selection battery was administered to a geographically representative sample of Navy recruiters. Two primary measures of success were used: Ratings gathered from supervisors and peers and production data (i.e., enlisted accessions) compiled over a 6-month period. The magnitude of the relationship observed between the scores on the experimental battery and the various performance criteria, particularly that of production, was sufficiently high to recommend that the battery be operationally implemented.

Evaluation of Aptitude and Achievement Composites for the Initial Classification of Marine Corps Officers. TR 81-21. September 1981. R. D. Hetter and N. M. Abrahams. (AD-A107 772)

As part of an ongoing project to develop a classification system for Marine Corps officers, aptitude, background, and performance data routinely collected by the Marine Corps were analyzed to determine their usefulness as predictors of performance in 12 follow-on specialty schools. Four schools had samples large enough for the development and cross-validation of multiple regression composites. Evaluation of manual and computer-assisted optimal assignment methods based on the composites indicated that the composites are effective in differentially predicting follow-on school performance.

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SPECIAL REPORTS

Navy Enlisted Occupational Classification System Alternatives Survey. SR 74-2. February 1974. P. Magnusson.

A sample of Navy enlisted personnel was surveyed to assess their attitudes toward new aspects of two proposed occupational classification systems being considered by the Navy Enlisted Occupational Classification Study Group (NEOCS). Results indicated that respondents felt that (1) the compression of naval enlisted classification (NEC) codes and introduction of broad systems ratings would increase the interest and challenge of jobs, individual prestige, and chances for good civilian jobs after leaving the Navy, (2) a lump-sum reenlistment bonus would be the best reenlistment motivator, followed by accelerated advancement without petty officer status, (3) up-or-out reenlistment limits to speed up advancement in overmanned ratings would have negative effects, and (4) grouping E-4s with apprentices (i.e., removing their petty officer status) would be undesirable.

Task Data Gathering Sampling Techniques Statistical Analysis. SR 74-3. March 1974. H. C. McDowell.

This Center was tasked with developing job analysis tools and techniques for determining the actual work being performed by engineering and hull enlisted personnel. Thus, to determine if it was necessary to sample engineering and hull personnel in both the Atlantic and Pacific Fleets, job task inventories were constructed and administered to samples of personnel in these ratings in both fleets. Analyses of responses of personnel in the two fleets showed that they did not differ significantly. Therefore, it was recommended that personnel in ships assigned to one fleet only be sampled when conducting Navy occupational data surveys.

A Prototype Computer-assisted Distribution and Assignment (CADA) System for Application in the Bureau of Naval Personnel. Part I: System Description; Part II: Programming Listing and Documentation. SR 75-2. July 1974. J. S. Malone, R. P. Thorpe, M. W. Tate, and R. R. Pehl.

This effort was made to determine if the centralized enlisted distribution and assignment process could be automated within existing data base and computer system constraints. A prototype computer-assisted distribution and assignment (CADA) system was developed to determine if the computer could: (1) assist the detailer in hand matching men to billets, and (2) provide a model for distribution and assignment policy testing. It was concluded that: (1) the computer can be used more extensively in the detailing process, (2) the magnitude of the detailing problem varies with the size of the rating, and (3) the computer CADA system would enhance the likelihood of meeting men's duty preferences and provide a means for standardizing and monitoring the detailing processes. It was recommended that the prototype system be installed on the BUPERS computer for further test and evaluation.

Impact of NEOCS Forward Plan on Interim Combat System Organization. SR 75-10. April 1975. H. L. Williams.

The Navy Enlisted Occupational Classification System (NEOCS) Forward Plan could have significant impact on the feasibility of the interim combat system

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organization. Thus, the proposed division of labor under the plan was compared with that employed by the interim combat system organization and the impact of the proposed changes were assessed. Results showed that the NEOCS Forward Plan leads to fragmentation of several ratings assigned to the combat system organization. If the NEOCS Forward Plan is implemented, it was recommended that a study be conducted to develop a combat system organization based on the new rating structure.

A Systems Analysis of Navy Recruiting. SR 76-9. April 1976. J. K. Arima.

This report provides a systems analysis of Navy recruiting. It includes (1) a description of the Navy Recruiting Command (NAVCRUITCOM), including its functions and staff responsibilities, (2) flow charts depicting the flow-paths of qualified military availables (QMAs) who are interested in officer programs and of those who are interested in Navy enlisted programs, (3) a discussion of the important decision points in these flowpaths, (4) an examination of NAVCRUITCOM as a system in its own right, and (5) recommendations for further research.

Selector Composite Developed From the Armed Services Vocational Aptitude Battery (ASVAB): A Tool for Predicting Attrition From the Basic Electricity and Electronics School. SR 78-4. February 1978. J. Dann.

This research was designed to develop an ASVAB selector composite that would reduce attrition in the Basic Electricity and Electronics (BE/E) School. Three trial composites were constructed: One used individuals from all ratings that attend BE/E; the second, those who are presently selected using an electronics composite; and the third, those selected with a mechanical composite. The equation based on the total group was most valid for the electronics and mechanical BE/E ratings and for eight ratings with unacceptably high attrition in BE/E. The composite was recommended for operational use in conjunction with the present ASVAB selectors.

Criteria for Selecting U.S. Marine Corps Drill Instructors. SR 78-5. January 1978. L. S. Standlee, N. M. Abrahams, and H. H. Rosen.

Immediately before attending drill instructor school at Parris Island or San Diego, students were administered an experimental battery of selection instruments consisting of the Strong-Campbell Interest Inventory, the Leadership Opinion Questionnaire, and a biographical questionnaire. Early results indicate that an empirically developed biographical questionnaire scale provides the most accurate prediction of school success. A number of other variables--including education, length of service, volunteer status, and a score from the Leadership Opinion Questionnaire measuring preference for structured leadership roles--also were significantly related to school success. A final report, based upon a larger, more reliable sample, will include job performance criteria.

Postenlistment Mental Qualification Verification. SR 78-6. February 1978. C. I. Hodges.

This report deals with a program for verifying the mental test scores recorded for enlistees on the Armed Services Vocational Aptitude Battery (ASVAB). The scores are verified by retesting recruits at the NTCs with an alternate form of the

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ASVAB and comparing initial and retest scores. This report is the first of a series dealing with the program of test score verification.

Validation of NROTC Selection Procedures. SR 79-12. January 1979. I. Neumann and N. M. Abrahams.

This effort was conducted to evaluate the effectiveness of the measures used to select applicants to the NROTC scholarship program. All available selection measures were obtained for the midshipmen entering the program in September 1977 and related to various measures of success collected at the end of their first year of college. The composite currently derived from these measures was evaluated, and a new composite was developed using regression procedures. Results showed that, across selection measures, high school rank is the most effective predictor of performance; and the interviewers' rating, the least effective. The currently used composite is a moderately effective predictor of first year performance. The revised composite is more effective in predicting academic performance but not for the other aspects of performance. Thus, it was recommended that use of the present composite be continued.

Postenlistment Mental Qualification Verification: The First Year of Retesting. SR 79-19. May 1979. C. I. Hodges.

To verify the accuracy of mental test scores (ASVAB scores) of recruits obtained during enlistment processing, about 20 percent of the recruit input at each NTC were retested on an alternate test form. Initial test scores and retest scores were compared by sex, by recruiting source, and by test form used for test and retest. Although retest scores tended to be lower than initial test scores, there was no indication that initial scores were artificially inflated. Also, test and retest scores varied for different test forms, which suggests that the norms for the tests are not equivalent.

The Use of Preenlistment Variables to Predict the Attrition of Navy Female Enlistees. SR 79-25. September 1979. G. L. Wilcove, P. J. Thomas, and C. Blankenship.

Because of the high attrition rate for first-term enlisted Navy women, exploratory research was conducted to develop a questionnaire for screening female applicants. Attrition factors were identified and included in two experimental questionnaires (QUEST 1 and QUEST 2). These questionnaires were administered, on a random basis, to a sample of female recruits. Analyses of results showed that 38 of the items were significantly related to attrition.

A Controlled Experimental Application of the BCS/Cleff Technique for the Navy. SR 79-26. September 1979. C. H. Cory and N. E. Neffson.

This investigation was conducted to determine whether the Cleff job matching system (CJMS) can be used (1) to reduce the attrition rate during recruit training, and (2) to increase the number of "A" school eligibles by permitting lower selection standards. Results of using the CJMS to assign nonschool eligibles to "A" school were compared with those of using the ASVAB scores to select recruits for "A" school.

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Results showed that, although the CJMS was predictive of behavioral and nonacademic attrition during recruit training, it will probably not be useful in reducing the general level of attrition during this time.

Broadened Opportunity for Officer Selection and Training (BOOST): Selection Criteria. SR 80-16. April 1980. S. K. Van Beenen and A. M. Crawford.

The broadened opportunity for officer selection and training (BOOST) program was established in 1969 to help minority enlisted personnel acquire the scholastic skills and academic credentials required to pursue a commission in the Navy. Since then, however, the program has been expanded to include more and more majority students. In April 1979, it was decided that BOOST should be used to prepare educationally and culturally deprived minorities for entry into officer programs, and that 70 percent of participants should be minorities. A primary concern in meeting this goal was the selection criteria to be applied to program applicants. Therefore, to determine whether previous selection procedures were related to success in BOOST, predictor variables for all members of the 1978-79 BOOST class were correlated using a pass-fail criterion. Also, Black and White students were compared on predictor and performance variables. Results showed that selection variables were related to failures due to academic failure and voluntary withdrawal, but not to those due to military conduct. The best predictors of success for both groups appeared to be those that tested skill and experience in mathematics. An interim selection procedure was recommended for use pending further analyses.

Validation of the Learning Ability Profile Test for Navy Recruiters. SR 80-24. July 1980. N. M. Abrahams.

The learning ability profile (LAP), a paper-and-pencil instrument commercially developed for industrial and academic use, was evaluated as a potential tool for screening Navy recruiters. Selection of the most qualified personnel for recruiting duty is critical in meeting the highly demanding quotas for enlisted personnel. However, since no single score or combination of LAP scores yielded a statistically reliable or practically useful relationship to recruiter production, LAP should not be considered further for this purpose.

Counterattrition in Basic Underwater Demolition/SEAL Program: Selection and Training. SR 81-13. March 1981. L. M. Doherty, T. Trent, and G. E. Bretton.

Attrition patterns at the Basic Underwater Demolition/SEAL (BUD/S) School and relationships between attrition and student selection variables, "hellweek," and instructor/leader selection and training were identified, and recommendations were made to reduce attrition rates. Analysis of attrition and performance data for classes held before and after the implementation of some of these recommendations showed substantial reduction in attrition with no decrease in performance.

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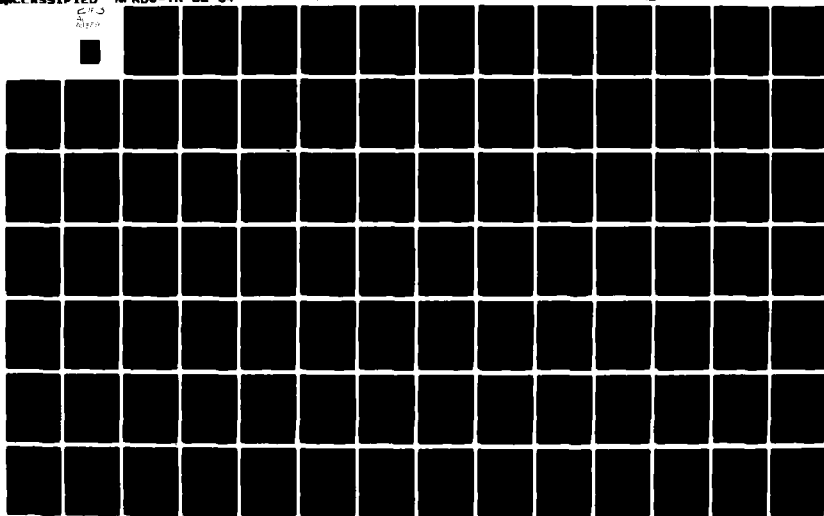
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PERSONNEL ADMINISTRATION (Continued)

Relationship Between the Armed Forces Vocational Aptitude Battery and Aviation Antisubmarine Warfare Operator Performance: A Pilot Study. SR 81-14. March 1981. R. M. Bearden.

The relationship between Armed Services Vocational Aptitude Battery (ASVAB) standards and actual job performance measures for aviation antisubmarine warfare operators (AWs) was examined. For both AW performance tests--acoustical performance test (APT) and cognitive acoustical test (CAT)--alternative composites were identified that were significantly more valid than the current AW selector composites.

Ranking the Density and Criticality of Enlisted Navy Ratings. SR 81-27. September 1981. W. A. Nugent.

The Navy and the other services have been requested to develop standards for enlistment and assignment to military specialty that are predictive of successful performance on the job. Further, it has been proposed that each service establish and validate these standards for 75 percent of the enlisted accessions entering vocational training. This effort was conducted to (1) identify a set of candidate ratings to be considered for the proposed validation effort, (2) develop methods to rank-order ratings based on the number of persons in the rating (i.e., rating density), and (3) rank-order ratings based on mission criticality of the rating within air, surface, and subsurface type commands. The ranking based on rating density yields the most economical approach to accomplishing the objective of the proposed validation effort.

PERSONNEL ADMINISTRATION (Continued)

TECHNICAL NOTES

Manual for a Remote-terminal Computer Analysis of the Navy Vocational Interest Inventory. TN 75-1. April 1975. B. A. Rafacz.

As part of the Navy's effort to obtain sufficient numbers of qualified enlistees, NAVPERSRANDCEN has developed the Navy vocation interest inventory (NVII). This manual outlines the procedures needed for a recruit to become knowledgeable in the usage of remote access computer terminals so that he may obtain NVII profiles for potential recruits in the shortest possible time.

Development of a Revised Odds for Effectiveness (OFE) Table for Screening Male Applicants for Navy Enlistment. TN 76-5. April 1976. W. A. Sands.

This study was conducted to develop a revised Odds For Effectiveness (OFE-2) table that would not require arrest information for enlistment applicants as was previously required. A multiple regression equation was developed on a sample of 3649 people. This equation was then used to produce a probability of success in the Navy table, which became OFE-2. It was recommended that OFE-2 be adopted and it become operational on 1 October 1975.

A Preliminary Selection of Biographical Items for Predicting Recruit Attrition. TN 76-6. May 1976. D. C. Atwater, M. Skrobiszewski, and E. F. Alf, Jr.

The objective of this study was to identify biographical items, in addition to those used currently, that would enhance the validity of current selection criteria. Seven recruit background questionnaires (RBQ) were administered to 7963 recruits at NTC San Diego, and the 82 most valid items from these questionnaires selected to form the final RBQ. It was recommended that this RBQ be administered at recruiting stations and a continuing analysis in terms of recruit attrition be conducted.

Matrix Transformations for Optimal Personnel Assignments. TN 77-5. December 1976. P. Horst and R. C. Sorenson.

The optimal assignment problem was discussed, and the present methods for optimal assignment were reviewed. The rationale was then developed for a matrix solution to transform performance scores or variables predictive of performance on criterion activities, C, to assignment matrix values, L, such that L has the same means and covariance as a binary matrix of assignments satisfying specified quotas, and the corresponding vectors of C and L are maximally related given the constraints. Results obtained by evaluating this matrix in an experimental situation showed that it provides nearly optimal assignments, with resulting proportions assigned to criterion activities approximating the quotas specified.

Psychobiological Correlates of Aptitude Among Navy Recruits. TN 77-7. February 1977. G. W. Lewis, B. Rimland, and E. Callaway, III.

Since conventional paper and pencil testing does not provide adequate information about the unique capabilities of the individuals tested, an attempt was made to determine if psychobiological procedures can be used to supplement the personnel

PERSONNEL ADMINISTRATION (Continued)

information now provided largely by such testing. Recently developed computer-based methods of recording and analyzing visual evoked potentials (VEPs), a measure of psychobiological functioning, were used to test two groups of Navy recruits, one comprised of low performers; and the other, of high performers. Measures of brain wave activity (evoked potential amplitude, asymmetry, variance, and latency) were analyzed by various statistical methods. Findings showed that the brain VEP and performance rating were significantly related.

The Sequential Assignment Problem. Phase I: The Development of a Computer Simulation Program to Evaluate a Sequential Assignment Strategy. TN 77-13. May 1977. B. A. Rafacz and D. Halstead.

A computer simulation was developed and used to compare a sequential assignment strategy with a first-come, first-served policy and an optimal assignment technique based on a linear programming scheme. Results of the simulation exercises indicate that a sequential assignment policy can more closely approximate an optimal assignment situation (where all applicants are available at one time for assignment) than a first-come, first-served policy.

New Criteria for Selection and Evaluation of Sonar Technicians. Phase II: Trial Administration of Experimental Predictor Tests. TN 78-13. May 1978. R. R. Mackie, M. E. McCauley, and J. F. O'Hanlon.

In the interest of improving selection procedures for the operators of future sonar systems, candidate predictor tests were administered to incoming submarine sonar students at the ASW School. Included in the test battery were a number of biochemical measures hypothesized to be related to stress tolerance and achievement motivation, as well as several new tests related to visual search, monotony tolerance, and interest in electromechanical systems. A factor analysis of the trial test battery produced a number of factors that potentially tap areas of sonar operator performance not well covered by current selection tests. These were tentatively identified as predicted sonar operator performance, electromechanical aptitude, adrenal medullary tone, resting sympathetic tone, work motivation, personal confidence, and maintaining visual alertness.

Integrated Personnel Systems Approach (IPSA): The Enlisted Personnel Individualized Career System (EPICS) Model. TN 80-14. R. E. Blanchard and R. J. Smillie. May 1980.

The purpose of the effort described here was to complete the development of an enlisted personnel individualized career system (EPICS) model with performance aiding as a principal component. Primary objectives of model development were (1) to get the individual on the job as quickly as possible, allowing him to contribute to ship's work with minimum initial investment in formal training, (2) to ensure that the system provides for advancement of qualified, career-oriented personnel, (3) to improve utilization of lesser-aptitude personnel, and (4) to provide ultimately for development of a trained career force.

PERSONNEL ADMINISTRATION (Continued)

The Manpower Quality Decline: An Ecological Perspective. TN 81-4. B. Rimland and G. E. Larson. November 1980.

This paper was begun as an attempt to resolve the conflicting and controversial reports issued from various sources on a perceived drop in the quality of military manpower in the middle and late 1970s. However, because a decline in the quality of military manpower might simply reflect a decline in civilian youth, the scope was enlarged to encompass various indices of the quality of civilian youth.

In studying the purported civilian decline, the authors examined the various hypotheses that have been advanced to account for the drop in Scholastic Aptitude Test (SAT) scores and in other criteria of civilian quality. The various approaches that might be used to correct or cope with the military quality decline are discussed, and recommendations made for research on the approaches regarded as most promising.

HUMAN PERFORMANCE

TECHNICAL REPORTS

Personnel Subsystem Criteria and Standards for the Amphibious Assault Landing Craft (AALC) Navy Trials. TR 74-30. April 1974. R. H. Gaylord. (AD-919 313L)

This report is the first in a series concerned with personnel subsystem test and evaluation of two experimental air cushioned amphibious assault landing craft. It provides the basis for developing the test plan and memoranda to be employed during Navy trials of the experimental craft with the objective of developing information necessary to optimize personnel subsystem considerations during design of a production prototype. Specific measurement, information gathering, and analytical techniques appropriate to this objective are identified and recommended for use in the Navy trials of the experimental craft.

Recognition Memory for Shapes as a Function of Encoding Strategy TR 75-3. September 1974. P-A. Federico and W. E. Montague. (AD-787 641)

The primary purpose of this research was to determine how imaginal and verbal encoding strategies interact with various stimulus characteristics to either enhance or retard recognition performance; the secondary purpose was to test the "conceptual coding hypothesis." Two experiments were conducted: (1) a between-groups multivariate factorial analysis of covariance and (2) a within-subjects (Ss) multivariate factorial analysis of variance. In Experiment I, it was found that low codability (LC) shapes were better recognized under the verbal encoding set than under the imaginal encoding set; and high codability shapes were equally recognized under the imaginal and verbal encoding sets. However, in Experiment II, where instructional set was a within-Ss factor, it was found that LC shapes were not better recognized under the verbal encoding set than the imaginal encoding set.

Advancing the Application of Job Performance Aids Within the Navy: II. Mailout Surveys of Machinery Repairman and Commissaryman Ratings. TR 75-14. September 1974. R. E. Main. (AD-A001 688)

Job performance aids (JPAs) are devices or materials that provide information to assist workers on the job. In this effort, mail-out survey forms were evaluated as a method for determining whether current uses of JPAs are adequate, for identifying requirements for increased utilization of such aids, and for soliciting suggestions for JPA applications. Forms were sent to groups of machinery repairman and commissaryman personnel who differed in pay grade level and duty assignment. Results showed that using mail-out survey forms is an effective method for identifying characteristic practices of JPA implementation within ratings. A general need for furthering the utilization of JPAs was identified, both in terms of developing new aids and of improving distribution of present aids.

A Test Approach for Evaluating the Ship Controlman Reduced Manning Concept. TR 75-17. November 1974. R. A. Sniffin. (AD-B001 020L)

A new bridge manning concept has been developed that should improve bridge performance, morale, motivation, and training levels of the bridge watchstanders. The concept, which is known as the ship controlman concept, is based on a new division of labor, organizational structure, and training. A test approach has been developed to evaluate the technical feasibility of the concept in a fleet operational

HUMAN PERFORMANCE (Continued)

environment. The approach includes evaluation of the change in skill/knowledge, job attitudes, work motivation, and at-sea bridge watch performance. The overall test approach developed is to conduct a longitudinal-operational experiment using two DE 1052 class destroyers.

A Comparison of the Effects of Individual and Team Performance Feedback Upon Subsequent Performance. TR 75-35. May 1975. D. M. Nebeker, S. L. Dockstader, and R. R. Vickers, Jr. (AD-A010 131)

This effort sought to determine the effects of performance feedback presented to subjects acting singly or as members of a team. The experimental questions addressed were whether being identified as a team member enhances performance and whether individual performance in groups is affected by variation in the amount and specificity of the feedback provided. Results indicated that (1) subjects who were a part of a team, and felt so, did not perform at significantly higher levels than did nonteam members when the effects of feedback were controlled, and (2) any sort of feedback resulted in increased performance. Increasing the amount or specificity of the feedback provided had no additive effect.

Shipboard Facilities Maintenance and Manpower Utilization: Problem and Approach. TR 76-22. November 1975. M. A. Schwartz. (AD-B008 194L)

New concepts for accomplishing shipboard facilities maintenance have been developed that should improve performance, morale, motivation, and training level of shipboard personnel. The concepts involve a new division of labor, specialized training, and the use of new equipment, material, and procedures. Also, a test approach has been developed to demonstrate the technical feasibility of the concepts in a fleet operational environment. The approach includes evaluation of changes in cleanliness and appearance of shipboard spaces, attitudes toward condition of spaces, and skill/knowledge of facilities maintenance personnel.

Personnel Characteristics Relevant to Navy Technical Manual Preparation. TR 76-26. December 1975. W. H. Githens, W. A. Shennum, and W. A. Nugent. (AD-A019 366)

Since the effectiveness of alternative presentations of technical material may depend on the technicians' characteristics, this study attempted to identify technician personnel characteristics that should be considered by technical manual writers/editors during TM preparation. Data were obtained by reviews of the literature, consultation with experts in the area, and interviews with Navy technicians. Results showed that personnel characteristics could be grouped into aptitudes, background factors, and attitudes, which could, in turn, be related to reading comprehension and technician job performance. A method was proposed that would enable technical manual writers/editors to determine the characteristics of the group of probable users of a specific TM.

Facilities Maintenance Demonstration Study. TR 76-29. January 1976. M. A. Schwartz. (AD-B009 681L)

Due to a number of problems and practices, shipboard facilities maintenance (FM) is not performed efficiently. As a result, man-hour expenditures are excessively high; ship's condition, cleanliness, and appearance deteriorate; crew morale and motivation are undermined; and cost to the Navy is increased. Potential solutions to

HUMAN PERFORMANCE (Continued)

underlying problems were studied in an operational ship of the FF 1052 class. The solutions included a team approach to FM work, an information management system for scheduling work, audiovisual training program in FM, improvements in FM equipment and materials, and environmental improvements. Results indicated that (1) FM man-hours and Navy cost can be significantly reduced, (2) skills and knowledge of FM team personnel can be significantly improved, and (3) shipboard spaces will be cleaner and better maintained through FM innovations. However, solutions did not positively affect the attitude and motivation of FM personnel.

Ship Motion Effects in the Human Factors Design of Ships and Shipboard Equipment. TR 77-2. November 1976. R. A. Newman. (AD-A031 978)

Although ship motion can degrade task performance even when the personnel are not actively seasick, it is not presently considered in the design of ships and shipboard equipment. This report discusses physical, physiological, and behavioral background of how motion affects personnel, and provides a design guide for human factors personnel and design engineers to minimize the effects of ship motion on task performance. The design guide covers ship characteristics and personnel location, workplace and environment, equipment characteristics and design, task characteristics and design, and personnel factors. A brief discussion of ant motion-sickness drugs, and recommendations for research on ship motion are included.

Measurement of Job Performance Capabilities. TR 77-6. December 1976. E. J. Pickering and A. V. Anderson. (AD-A033 992)

This Center is planning an advanced development effort aimed at the development of a comprehensive system for obtaining and reporting Navy job performance capability information. In preparation for that effort, performance measurement techniques that might support the proposed system were reviewed and analyzed. This report presents the results of that effort and suggests a general approach to meeting the Navy's requirements for incumbent capability information relative to critical tasks. The approach that is suggested is based upon the use of quality control techniques analogous to those utilized in the manufacturing of industrial products.

Significance of Risk in Navy Tactical Decision Making: An Empirical Investigation. TR 77-8. December 1976. C. F. Gettys, M. C. Moy, and M. W. O'Bar. (AD-A033 583)

Research was conducted to determine the importance of risk factors in the use of operational decision aids. The performance of individuals when using a decision-aiding display developed by a contractor and when using a display developed by the Navy Personnel Research and Development Center (NAVPERSRANDCEN) was compared. The contractor-developed display was primarily designed to convey information about subjective expected utility (SEU) and does not explicitly present information about the "risk" associated with each of the alternative acts the decision maker might select. The display contrived by NAVPERSRANDCEN was designed to present information about risk as well as SEU.

HUMAN PERFORMANCE (Continued)

Historical Antecedents and Contemporary Trends in Literacy and Readability Research in the Navy. TR 77-15. January 1977. J. D. Fletcher, T. M. Duffy, and T. E. Curran. (AD-A035 582).

This report includes three papers presented at the Conference on Reading and Readability Research in the Armed Services held on October 28-30 in Monterey, California. The papers cover the history of reading and readability research in the Navy, contemporary literacy research in the Navy, and research dealing with the readability and comprehensibility of written materials used in training or on the job.

Visual Search Times for Navy Tactical Information Displays. TR 77-32. May 1977. J. R. Callan, L. E. Curran, and J. L. Lane. (AD-A040 543)

An experiment was conducted to determine the time and accuracy with which an operator could find target items in each of six preformatted information displays. The displays corresponded to two versions (long and short) of three CRT formats proposed for the Naval Tactical Data System (NTDS).

Symposium Proceedings: Invitational Conference on Status of Job Performance Aids Technology. TR 77-33. May 1977. H. R. Booher (Ed.) (AD-A040 540)

This report includes seven papers assessing the state-of-the-art in job performance aids (JPA) technology presented at an invitational conference on 23-25 February 1977. The papers cover (1) perspectives in JPA technology base, (2) selection of formats and media for presenting maintenance information, (3) problems in procuring, producing, and evaluating JPAs, (4) user problems in JPA utilization, (5) new directions for information transfer research, (6) JPA/job-oriented training impact on personnel systems, and (7) analysis and conclusions on status of JPA technology.

Survey of Technical Manual Readability and Comprehensibility. TR 77-37. June 1977. T. E. Curran. (AD-A042 335)

This report (1) traces the historical development of readability and comprehensibility assessment, (2) proposes clarifications in terminology in this field, (3) examines the application of knowledge in this area to the production of more readable and comprehensible Navy writing, (4) discusses the particular problems associated with technical writing, and (5) surveys the area of comprehensibility of graphics.

The Role of Reading in the Navy. TR 77-40. September 1977. T. G. Sticht, L. C. Fox, R. N. Hauke, and D. W. Zapf. (AD-A044 228)

This report describes a study of the role of reading in the Navy enlisted environment. The Navy Job Reading Task Interview was administered to 178 personnel (68 students, 32 instructors, and 78 job performers). Results provided information on the nature and extent of reading in the Navy, the reading skills of Navy personnel, and their attitudes regarding the Navy's current job training and reading training programs.

HUMAN PERFORMANCE (Continued)

Measuring Submarine Approach Officer Performance on the 21A40 Trainer: Instrumentation and Preliminary Results. TR 78-9. January 1978. J. R. Callan, R. T. Kelly, and A. Nicotra. (AD-A049 434)

This report describes a method for providing unobtrusive performance measurement of submarine approach officers and fire control parties while they train on the 21A40 Advanced Submarine Attack Trainer. The 21A40 computer (UYK-7) is coupled to a desktop computer with graphics capability (Tektronix 4051) to sample fire control parameters for display in post-training critique and evaluation. Values of target range and course were taken at fixed time intervals from the status registers of the main computer. From these values, differences between actual and fire control solution values were determined and graphically displayed. Additionally, a method for determining probability of counterdetection was derived from the existing sound conditions and plotted as a function of time. Examples of these profiles, the computer interface schematic diagram, and the software necessary to plot the graphs are provided. Suggestions for further use of such a performance measure are included along with recommendations for other applications.

Health and Safety Implications of Diesel Locomotive Emissions. TR 78-17. April 1978. M. S. Sanders and J. M. Peay. (AD-A053 455)

Relevant literature was reviewed to determine whether long-term exposure to low concentrations of diesel emissions within the ranges reported in actual railroad operations affect health and/or safety. No consistent evidence was found linking low concentrations of diesel emissions to long-term health effects or short-term respiratory function. Evidence was found linking emissions to eye irritation. Interviews with union officials and operating crews, letters from union members, union file material, and miscellaneous locomotive and caboose inspection reports indicated that diesel emissions are not a widespread or frequent problem in the railroad environment. There may be short-term, infrequent occurrences of burning eyes, headache, and nausea, but any safety consequences of such symptoms could not be determined.

Reading Skill Levels in the Navy. TR 78-19. April 1978. T. M. Duffy and W. A. Nugent. (AD-A054 859)

The purpose of this research was to provide information on reading skill levels in the Navy. A standard reading test was administered to all recruits entering the Recruit Training Command, San Diego over a 1-year period (about 31,000). A significant proportion of the sample was found to have reading skills well below the difficulty of the manuals used in training. Reading skills were examined in relationship to rating assignments, the difficulty of rate training manuals, race, education, and Basic Test Battery Scores.

Job Performance Aids: Research and Technology State-of-the-art. TR 78-26. July 1978. H. R. Booher. (AD-A057 562)

This report describes and compares the various job performance aid (JPA) techniques and identifies and categorizes factors important to selection, design, cost-performance trade-off, conduct of future research, and implementation of performance aiding technology. More than 100 JPA systems and techniques are classified under five categories: (1) format/content, (2) display media, (3) applied training, (4)

HUMAN PERFORMANCE (Continued)

peripheral test/diagnostic, and (5) delivery systems. Major factors are identified as critical to the development of a JPA algorithm, including personnel aptitude and experience, type and complexity of task, type and complexity of equipment, and degree of proceduralization required. A conceptual model is presented for use by the JPA community in cost trade-off analyses, JPA selection algorithms, and the grouping of theoretical trends.

User Performance with a Natural Language Query System for Command Control. TR 79-7. January 1979. R. Hershman, R. Kelly, and H. Miller. (AD-A064 695)

Natural language query systems have been developed as potential aids to command control data retrieval processes involving large data bases. One such system, called LADDER (for Language Access to Distributed Data with Error Recovery), was studied to identify significant performance characteristics associated with its use in a Navy command control environment. Ten officers received moderate training in LADDER and subsequently employed it in a search and rescue scenario. Both system and user performance were examined. Basic patterns of usage were established, and troublesome syntactic expressions were identified. Design recommendations for the man-computer interface in command control query systems were discussed.

Use of Performance Measurement Data from the 14A2 ASW Team Trainer Complex in a Performance Proficiency Assessment System. TR 79-15. March 1979. J. Bell and E. Pickering. (AD-A067 401)

A project is underway to investigate the feasibility of a Performance Proficiency Assessment System (PPAS) that would provide decision makers with information concerning the degree to which fleet personnel are capable of performing the critical aspects of their jobs. The objectives of this study were to (1) identify surface sonar technician performance measures obtainable from the 14A2 ASW team trainer complex that might provide data useful to Navy personnel managers, (2) identify procedures for obtaining such data during training exercises, (3) develop appropriate procedures for data analysis and summarization, and (4) evaluate methods of automating the collection of the required information. Appropriate performance measures were selected for investigation and computer data collection programs were developed. Data were collected and analyzed from six ASW teams on three separate exercises per team. It was concluded that (1) data from the 14A2 complex can provide inputs to an assessment system, (2) procedures can be developed for collecting and summarizing proficiency/deficiency data so that they can be readily understood by personnel managers, and (3) procedures can be developed for automating the collection and analysis of the desired information.

Evaluation of LVA Full-scale Hydrodynamic Vehicle Motion Effects on Personnel Performance. TR 79-16. April 1979. W. Stinson. (AD-A068 683)

A full-scale hydrodynamic vehicle (FSHV) has been constructed with size, height, and speed characteristics corresponding to projected requirements for a future landing vehicle assault (LVA) of planning hull type. Field test operations were conducted at Camp Pendleton to evaluate the effects of high-speed landings aboard the experimental LVA/FSHV on the performance of Marine infantrymen. The results provide a basis for DSARC I approval of LVA ride suitability for delivering Marines to battle positions without degrading their fighting capabilities.

HUMAN PERFORMANCE (Continued)

Hybrid Job Performance Aid Technology Definition. TR 79-25. July 1979. T. J. Post and M. G. Smith. (AD-A072 445)

Hybrid aids and enriched hybrid aids were evaluated to determine whether Navy technicians would rely more heavily on the new aid forms than on conventional aids and whether their learning would be enhanced by using the new aid forms. The evaluation comprised a pilot study and the collection of expert and user opinion data. The experimental results and opinion data were used as the basis for selecting the most promising enriched hybrid aids for more rigorous testing.

Toward More Comprehensible Technical Manual Graphics. TR 79-28. July 1979. T. Curran and M. Mecherikoff. (AD-A074 967)

Although technical manuals often consist primarily of graphic material, there is a virtual absence of empirical data on how technical writers and artists might improve the comprehensibility of graphics. This project, sponsored by the Navy Technical Information Presentation Program, evaluated several alternate methods of presenting written material within a graphic. The number, location, and sequence of "callups" were systematically varied in a series of drawings and tried out experimentally on samples of Navy trainees. The major finding was that arranging callouts sequentially provides for good comprehension, even when the number of callouts is large.

Data Entry Times for Navy Tactical Information Displays. TR 80-6. November 1979. L. A. Friedman. (AD-A078 582)

The menu and page methods of data entry and display format are candidates for possible use on a cathode ray tube (CRT) display on the Navy Tactical Data System. The menu method presents all possible category choices at a given level of data hierarchy; the operator enters the number that corresponds to his choice of categories from the displayed "menu" of choices. The page method displays only a subset of possible choices at each level of the hierarchy. If the desired category does not appear, the operator sequences the next "page" of categories until he finds the required category.

Reaction time measures were used to assess the relative speed of data entry in the two methods using six different types of problems. Results showed that both methods took longer for problem types requiring deeper hierarchical structure and that there was a significant practice effect, which was independent of method. Neither method was preferred by the operators. It was recommended that the page method be pursued since it makes more efficient use of CRT screen areas. Further, this method can be improved by organizing the categories so that more frequently occurring items appear on earlier "pages."

A Performance Proficiency Assessment System for Surface Sonar Technicians: Identification of Critical Tasks. TR 80-14. February 1980. E. J. Pickering, G. D. Kissler, G. J. Laabs, and J. D. Winchell. (AD-B044 745L)

NAVPERSRANDCEN is carrying out an advanced development effort to determine the feasibility of a Performance Proficiency Assessment System (PPAS) that will provide personnel managers with diagnostic information concerning the capability of fleet personnel in performing the critical aspects of their jobs. A prototype

HUMAN PERFORMANCE (Continued)

system is being developed under this effort for the surface sonar technician (STG) rating.

All shipboard tasks performed by STGs were identified and clustered under a set of 50 higher order tasks or performance domains, and a card-sort technique was used to identify the task/domains that experts consider of greater importance in surface ASW. Concurrently, existing fleet and school evaluation procedures were reviewed to determine what information they might yield concerning performance capabilities for this rating. Results were used to determine which tasks/domains should be included in the prototype system, and whether methods for measuring proficiency in those domains were available or could be developed.

A Performance Proficiency Assessment System for Surface Sonar Technicians: Shipboard Data Gathering Procedures. TR 80-16. February 1980. T. Athnos. (AD-B044 746L)

In this report, the ASW Operational Readiness and Training System (ORATS) and several other shipboard training and evaluation programs were examined to determine whether they can provide information on the detection, classification, and tracking skills of surface sonar technicians (STGs). Results showed that ORATS could be adapted to all surface sonar equipments that include a target signal generator. The only other program that could be adapted to provide useful diagnostic data for STGs is the Rooftop Trainer Program.

Relationships Among Selected Measures of Cognitive Styles, Abilities, and Aptitudes. TR 80-23. April 1980. P-A. Federico and D. B. Landis. (AD-A090 729)

Measures of cognitive styles, abilities, and aptitudes for a sample of 166 graduates of the Basic Electricity and Electronics (BE/E) School were analyzed to determine the magnitude and nature of their relationships. Canonical analyses established that measures of cognitive styles were significantly related to measures of aptitudes and of abilities, but their common variance was not large enough to be of practical value. Measures of aptitudes were significantly related to measures of abilities, and the two sets of measures do have a considerable amount of shared variance. When the various measures were factor analyzed, three significant factors were extracted--which appeared to reflect measures of technical aptitude, verbal ability, and problem-solving mode. Since these factors accounted for much of the variability among the various measures of cognitive characteristics, it was concluded that cognitive styles are relatively independent of abilities and aptitudes.

Austere Manning in the Guided Missile Frigate (FFG 7 Class): Lessons Learned. TR 81-10. April 1981. M. A. Schwartz. (AD-A099 215)

A manpower constraint imposed on designers of the FFG 7 influenced equipment design, maintenance and support strategies, training requirements, and ship organization. Results of a brief examination of the impact of this constraint on FFG 7 design, maintenance strategy, and training needs indicated that the original manpower accommodation constraint was premature and led the ship acquisition manager to make manpower, personnel, and training assumptions that could not be realized. An important deficiency in early system planning was the failure to consider projected manpower availability for critical skill areas. The attempt to design systems for austere manning can result in low tolerance of the system for degradation to personnel levels, especially highly skilled personnel in short supply.

HUMAN PERFORMANCE (Continued)

Air Defense: A Computer Game for Research in Human Performance. TR 81-15. July 1981. R. T. Kelly, F. L. Greitzer, and R. L. Hershman. (AD-A102 725)

A laboratory simulation system was developed for research on human performance in anti-air warfare threat analysis. Major elements of the threat analysis problem were embedded in an interactive air defense game controlled by a desktop microcomputer. The problem for the player is to decide when to launch "missiles" at hostile targets that approach at different speeds; the task load is manipulated by varying the number of targets and their arrival rate. The specification of a mathematically ideal information processor provides a standard of optimal performance. Feedback is given to the player after each engagement, and performance data are automatically stored for subsequent analysis.

Navy enlisted men served in a demonstration experiment that confirmed the feasibility of the system. Approximately 3 hours of practice produced proficient levels of performance. The course of skill acquisition was largely insensitive to training manipulations. Effects of task load were evidenced by a decline in performance as the number of targets and the pace of operations were increased. Performance was also impaired by the introduction of a concurrent auditory monitoring task. Test subjects found the game challenging and sustained their attention to the task for extended periods.

HUMAN PERFORMANCE (Continued)

SPECIAL REPORTS

Language Skills: A Prospectus for the Naval Service. SR 76-3. October 1975. T. M. Duffy, J. F. Carter, J. D. Fletcher, and E. G. Aiken.

Widespread concern has been voiced over an apparent mismatch between the reading ability of naval personnel and the reading requirements they encounter in a naval career. Since reading is a skill prerequisite to all naval careers, a mismatch of skills and requirements could have widespread consequences for fleet effectiveness. This study provides a review of the area with suggestions for an R&D program as well as management actions that would help reduce the problem of matching skills and requirements. While these recommendations are directed to the naval services, many should be applicable to a variety of settings.

Preliminary Analysis of Hydrofoil Noise, Vibration, and Motion Effects on Personnel Performance. SR 76-8. March 1976. W. J. Stinson.

The degree of seriousness of hydrofoil environmental effects, such as noise, roll/pitch motion conditions, vibrations, and restricted habitability, must be assessed throughout the ship development process so that offsetting improvements can be considered where warranted. It was found that gas turbine noise transmitted to crew-occupied spaces during foil-borne operations may be noticeably disturbing to crew members. Vibration conditions were found to be of relatively minor concern; roll/pitch motion in rough sea conditions, particularly when "cresting" and/or foil broaching, had a noticeable effect on job performance. It was recommended that adequate soundproofing be installed in engine room bulkheads in future ships and that analysis of environmental factors in these ships continue throughout their development phase.

Container Offloading and Transfer System (COTS): Human Engineering Evaluation of Candidate Off-the-shelf Cranes. SR 77-1. October 1976. H. C. McDowell, H. L. Williams, D. Meister, and W. M. Spencer.

To enable containerships to serve as Navy auxiliaries, heavy-duty cranes were installed aboard ships to transfer cargo. This research evaluated and ranked candidate commercial cranes for potential Navy use and recommended operational and safety features needed in a shipboard environment. The research team observed cranes in action, conducted interviews with crane operators, and analyzed operating and maintenance manuals. Three of the candidate cranes were rated as essentially equivalent. Since these cranes did not include sufficient human engineering capabilities to meet naval operating requirements, it was recommended that crane safety, functions, and components be further evaluated and tested in a shipboard environment.

Container Offloading and Transfer System (COTS): Human Engineering Results of "Crane-on-deck" Tests. SR 77-5. February 1977. H. C. McDowell, D. Meister, and G. Boykin.

To enable containerships to serve as Navy auxiliaries, it is planned to install heavy-duty cranes aboard these ships to transfer cargo. The purpose of this work was to evaluate the human engineering characteristics of a representative crane under various test conditions. The research team observed the crane in operation,

HUMAN PERFORMANCE (Continued)

conducted interviews with operator/maintainer personnel, and took video films illustrating crane characteristics. It was found that the representative crane could be effectively operated by a highly skilled operator on land, on a barge in smooth water, and in a tilted crane condition simulating a rolling deck. Many optional operating and safety features are not required by a skilled operator.

Software Design Specifications for an Interactive Fault Location-diagnosis System. SR 77-11. June 1977. L. A. Friedman.

Fault location and other diagnostic problems can be viewed as information storage and retrieval problems once a logical sequence of diagnostic tests is specified. In the present project, an interactive software system was designed and implemented. The system provided a computer novice with the capability to construct, and save for later usage, a conditional diagnostic sequence. The system then allowed access to this sequence by the person actually performing the diagnosis. The design principles are based on standard list processing techniques and are considered sound. Implementation should be on a minicomputer, and use as a training aid should be investigated.

Source Data Improvement Program (SDIP): Economic Analysis of Alternative Data Entry Systems. SR 78-2. January 1978. K. R. Michna, C. E. Laidlaw, and R. W. Obermayer.

BUPERS currently maintains personnel data in the manpower and personnel management information system (MAPMIS). Because of the growing dissatisfaction with the quality of information and deficiencies in the MAPMIS data base (largely due to the source data entry process), however, the source data improvement program (SDIP) was established in an attempt to resolve these deficiencies. Under this concept, a number of alternatives were proposed representing different levels of investment and benefits. This work developed an analysis of the current system and a conservative economic analysis of the candidate alternatives. Two alternatives, one providing computer terminals for shore use, and the other, automation on ships with reduced shore equipment, gave equally high return on investment.

Human Factors in Operational System Testing: A Manual of Procedures. SR 78-8. April 1978. D. Meister.

This report describes the procedures to be followed in conducting the human factors part of an operational system test.

Barrier Search Simulation for Targets with Arbitrary Crossing Distributions. SR 79-1. October 1978. M. W. O'Bar, J. R. Callan, and R. L. Hershman.

To provide operational planners with a means of evaluating alternative barrier search tactics, a barrier search simulation was written, using Monte Carlo techniques, for the Tektronix 4051 desktop computer. User inputs to the program were (1) the tactical parameters of the searcher and the target, and (2) the distributions of the target's crossing time and location. (Crossing time and location were considered to be independent random variables with arbitrary distributions.) Deterministic and stochastic elements relating to the search were mathematically modeled and incorporated in the program. Subject to certain simplifying assumptions, the program yields realistic estimates of the probability of detection for various search tactics and assumed crossing distributions.

HUMAN PERFORMANCE (Continued)

Analysis of AN/SQQ-30 Sonar Maintenance Space and Layout Requirements. SR 80-6. December 1979. H. L. Williams.

The AN/SQQ-30 Sonar is a production version of the engineering development model (EDM) AN/SQQ-14 Deep Mod that has been designed for centerwell towing from an ocean minesweeper (MSO). The SQQ-14 is presently installed on USS FIDELITY (MSO 433). Present plans call for the SQQ-30 to be installed on the MSO 523. This ship is in the early design stages, with the characteristics of the sonar maintenance area yet to be determined.

Because of the complexity and time-consuming nature of the handling and maintenance operations, it is essential that they are facilitated by the space and layout of the maintenance area. The goal of the present analysis has been to develop space and layout requirements capable of accomplishing this objective. Results are intended to serve as inputs to the MSO 523 design effort, and as a basis for evaluating the final configuration of the sonar maintenance area.

Tri-service Literacy and Readability: Workshop Proceedings. SR 80-12. March 1980. T. E. Curran.

This report provides the proceedings of the Tri-service Literacy and Readability Workshop, which was held to encourage closer coordination among persons working in the field of readability and literacy. The workshop was funded by the Naval Technical Information Presentation Program through its project at NAVPERSRANDCEN. It was organized and coordinated by the NAVPERSRANDCEN project officer and hosted by the Air Force Human Resources Laboratory at Lowry Air Force Base, Denver.

Engineer's Guide to the Use of Human Resources in Electronic System Design: An Evaluation. SR 81-3. November 1980. R. A. Dick and E. A. Koehler. (AD-A093 539)

This effort was conducted to evaluate the Engineer's Guide to the Use of Human Resources in Electronic System Design by determining the validity of its methodology, the adequacy of its data, and the degree to which it can be implemented (see NPRDC TN 79-8). The results of a survey administered to representative members of the Navy systems acquisition and development communities clearly show the guide's overall potential utility in making human resources a specific design consideration and in providing necessary technical data. Recommendations desirable for successful implementation are provided.

A Proposed Organizational Model for Implementing a Shipboard Facilities Maintenance Improvement Program. SR 81-17. April 1981. M. A. Schwartz.

A proposed organizational model for implementing a shipboard facilities maintenance (SFM) improvement program was developed. Functions and responsibilities of participants were defined.

HUMAN PERFORMANCE (Continued)

TECHNICAL NOTES

Design Considerations for Human/Computer Dialogues. TN 77-10. April 1977. L. R. Wilson.

The objective of this effort was to reduce the scope of design of interactive management systems (IMSS) by focusing upon the user-system interface, and to present criteria to facilitate the design, implementation, utilization, and evaluation of conversational software for this interface. Criteria were distilled from literature on man-computer dialogues and presented as normative statements that serve as guides to determine more specific and measurable design factors. These criteria are organized into six categories: (1) integration with current work habits, (2) training, (3) user input to the system, (4) user errors, (5) system output to the user, and (6) system processing.

Man as an Information Processor: A Bibliography (1972-1976). TN 77-18. September 1977. J. L. Lane.

This bibliography encompasses the literature dealing with information storage (memory) and action implementation (decision theory and problem solving). The literature, which is classified by subject area, was identified by reviewing leading psychological journals and United States government technical reports.

Quantification of Technical Manual Graphics Comprehensibility. TN 78-2. January 1978. T. E. Curran and M. Mecherikoff.

Very little, if any, empirical evidence exists pertaining to characteristics of technical illustrations that make them more or less easy to use. In this study, "information locating devices" (such as callouts) were manipulated, and the time required by Navy technicians to locate specific information was determined. The major findings were that (1) the organization of callouts on illustrations should always be in sequence, and (2) if callouts are in sequence, as many as 62, and probably a good many more, can be used on the same illustration.

Functional Requirements and Other Design Features of a Manned System Research Facility. TN 78-4. January 1978. G. V. Bailey, R. T. Hennessy, and C. D. Wylie.

This study describes the functional requirements and other design features of a manned system research facility (MSRF) that would optimally support the research objectives stated for the MSRF, considering both costs and capabilities. This study supports and makes recommendations for MSRF procurement, testing, and software system development.

A Personnel System Concept with Job Performance Aiding as a Principal Component: Preliminary Model. TN 78-6. February 1978. R. E. Blanchard and G. J. Laabs.

A personnel system concept is outlined that uses job performance aids (JPAs) as a means for deferring front-end-loaded technical training. Emphasis is given to early shipboard assignment with onboard indoctrination programs to support the individual during transition to shipboard life. Eligibility for technical training depends upon the individual's level of interest and motivation and his adaptation of shipboard physical and social environments. Training and advancement paths are clearly defined, with

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the opportunity for advanced technical training always available to career-minded individuals.

Job Performance Aid Selection Algorithm: Development and Application. TN 79-1. October 1978. H. R. Booher.

The difficulty experienced in selecting the best job performance aids (JPAs) for the tasks, environment, and personnel needs of any particular weapon system has limited the utilization of JPA technology. The purpose of this study, then, was to develop an algorithm for selecting JPA format and content that considers training, media, and work-center job designs. This selection algorithm includes nine decision steps. It has been used to identify candidate JPA systems for skill levels of the integrated personnel system and to examine progressive aiding/training requirements for the sonar technician and fire control technology ratings.

An Engineer's Guide to the Use of Human Resources in Electronics Systems Design. TN 79-8. June 1978. E. A. Koehler (Monitor). (AD-A104 839)

This report provides a working draft of a human resources information guide to be used by hardware program managers and system designers. This guide includes manpower and personnel information needed by hardware designers and program managers to assess the impact of candidate system design alternatives on the use and cost of the Navy's human resources, as well as analytical tools for making manpower tradeoff assessments during engineering trade studies. The final guide will be published after user evaluation of the working draft.

Analysis of LSD-41 Machinery Room Layout. TN 80-7. January 1980. H. L. Williams. (AD-A104 774)

As a preliminary step in developing machinery rooms for the LSD-41, tentative layouts of the machinery rooms were analyzed to identify their advantages and disadvantages. A key factor involved in selecting one concept over the other is the extent to which they conform to established human engineering principles and practices.

System Design Characteristics and User Skills: A Literature Review. TN 81-9. March 1981. D. Sullivan.

Recent studies conducted by the human resources research community were reviewed to determine how hardware design engineers perceive the relationships between system design characteristics and skills of system operator and maintenance personnel. Special attention was directed toward research conducted on (1) the design process and skill information needs of designers, (2) job performance, (3) the analysis and measurement of skills, and (4) the presentation of human resources information.

Designing for Human Skills in Navy Electronic Systems. TN 81-15. June 1981. Hughes Aircraft Company.

A preliminary design guide that could assist hardware developers in understanding the basis for human performance of system functions and tasks in traditional

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surface Navy electronic systems was developed. Further development of this guide has been abandoned in favor of a related effort.

Research Leading to the Development of a Guidebook on the Use of Human Resources in Electronic Systems Design. TN 81-17. June 1981. R. R. Mackie, R. A. Dick, C. D. Wylie, and R. R. Ridihalgh.

This study was directed toward the human resource requirements related to design concepts that might be applied to five classes of surface ship electronics systems: radar, sonar, communications, fire control, and data processing. Reviews of the literature and interviews with engineers led to the identification and definition of 21 design concepts. The impacts of these concepts on 14 criteria, including both human resource and more traditional system design criteria, were determined by means of a unique ranking/rating technique using 32 Navy engineers as expert judges.

Comprehensive taxonomies of operation and maintenance tasks that must be performed in connection with each type of electronic system were also developed. Estimates of how well each task could be performed by Navy technicians having different levels of experience were obtained using a total of 120 supervisory technicians as the judges.

A Performance Proficiency Assessment System (PPAS) for Surface Sonar Technicians: Specifications for Simulated Troubleshooting Tests. TN 81-19. July 1981. A. P. Chensoff, D. L. Scott, and R. P. Joyce.

A specification for use in developing diagnostic tests of electronic troubleshooting as performed in four antisubmarine weapons (ASW) systems was produced. The tests are to form part of a performance proficiency assessment system (PPAS) that provides manpower managers with data about personnel capabilities for use in making decisions about selection, training, and assignment.

The specification prescribed the development of seven subtests, which assess individual critical troubleshooting skills as well as the ability to "put it all together." The test development procedure, as specified, provides a standardized, optimized process for developing efficient, job-relevant, diagnostic tests that assess the capability of troubleshooting to isolate casualties within the four ASW systems.

Design Engineers' Concepts of Skills for System Operation and Maintenance. TN 81-20. July 1981. R. J. Hornick, J. E. Robinson, J. G. Rogers, and D. Sullivan.

This effort was part of a program aimed at developing tools for hardware developers to use in assessing the personnel implications and costs of alternative design options. It was conducted to determine (1) the kinds of skill concepts engineers apply to their designs and (2) whether the sophistication of these skill concepts can be increased by presenting the engineer with a structured framework based on behavioral research.

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TECHNICAL REPORTS

Enlisted Rotation Management: Users' Guide to the Computerized Equilibrium Flow Model. TR 74-1. September 1973. N. I. Borgen, J. A. Segal, and R. P. Thorpe. (AD-769 679)

The planned periodic rotation of enlisted personnel between sea and shore assignments is a firmly established practice in the Navy. Managing rotation in an equitable and effective manner, however, continues to pose serious problems that are extremely difficult to resolve. Previously developed computer programs have successfully demonstrated the feasibility of generating quantitative data useful in rotation-related decisions.

The computer model described in this report provides a highly flexible management tool that can be controlled by the user through selected data on three parameter cards and an input personnel data deck at any desired level of occupational grouping. Basic output consists of equilibrium tours that would support prescribed tours for each of three selected conditions. A secondary output presents summary tables of population aggregate characteristics to aid in broad policy testing and formal action. A variety of other problems may also be dealt with by manipulation of the input parameters.

A Simple Policy Planning Model for Determining Sea and Shore Tour Lengths. TR 74-2. September 1973. R. W. Butterworth. (AD-767 962)

The periodic rotation of enlisted personnel between sea duty and shore duty assignments is a firmly established Navy policy. The efficiency with which the rotation process is managed, however, can have an effect on both the personnel readiness of operating units and morale of the individual Navy person. This study is part of a larger research program to develop computerized models of the rotation process to provide rotation managers in the Bureau of Naval Personnel with a quantitative basis for decisions and the capability to test and evaluate rotation policy.

In this report, a simple model for determining nominal tour lengths that would keep the sea and shore populations in balance is presented. It differs from previous models developed within the research program in that a different set of assumptions is used and different data are required for using the model. In the conclusions, the applications and limitations of this model are discussed as well as some ideas on what future research might be done on the sea/shore rotation problem.

A Method for Evaluating Alternative Recruiting Selection Strategies: The CAPER Model. TR 74-3. September 1973. W. A. Sands. (AD-770 390)

Managers of personnel systems justifiably demand an estimate of the payoff, in dollars, which can be expected to result from the implementation of a proposed selection program. The cost of attaining personnel requirements (CAPER) model determines an optimal recruiting-selection strategy. Specifically, the CAPER model provides the personnel manager with the information necessary to minimize the estimated total cost of recruiting, selecting, inducting, and training a sufficient number of persons to meet a specified quota of satisfactory personnel. This report

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describes the CAPER model and illustrates the application of the model to a personnel recruiting-selection problem. The advantages and limitations of the model are discussed.

Apprenticeship Personnel Shipboard Work Evaluation: Statistical Analysis. TR 74-18. March 1974. H. C. McDowell and P. A. Magnusson. (AD-782 333)

Methods and techniques for determining qualitative Navy manpower requirements must be adequate to keep pace with expanding needs for occupational data. This research effort was conducted to (1) develop job analysis tools and techniques to improve data gathering and (2) employ these tools and techniques to determine actual work being performed by seaman (SN) and fireman (FN) apprenticeships. SN and FN apprenticeship work requirements survey booklets were developed and used as questionnaires in the fleet to obtain occupational information.

Navy Manpower Planning and Programming: Basis for Systems Examination. TR 75-19. October 1974. D. A. Wedding and E. S. Hutchins, Jr. (AD-A015 325)

This report contains a compilation of available source information about the Navy manpower planning and programming processes at the onset of a Manpower Requirement and Resources Control System (MARRCS) advanced development project. It describes the functional and organizational elements in manpower planning and programming, their interlocking relationships, and the structure of the system under which requirements for the human resource variables in the system are determined.

An Approach and Instrumentation for Management System Analysis. TR 75-20. October 1974. D. B. Barefoot and F. R. DiGialleonardo. (AD-A014 550)

This report describes an approach for system analyzing complex management functions. A data collection instrument designed to map the communications network of the Navy manpower planning system is used to solicit from system participants the data necessary to trace both formal and informal information flows and make cost-benefit judgments about specific communications. The format developed to organize the collected data is not only suitable for descriptive network analysis, but it also provides a framework for comparing producer and consumer views of the raw data and intermediate information products generated and utilized within the management system. Such comparisons are indispensable to diagnosis of possible system malfunctions and the prescription of changes.

An Approach for Measuring Benefit and Cost in Management and Information Systems. TR 75-21. October 1974. F. R. DiGialleonardo and D. B. Barefoot. (AD-A014 209)

A technique is developed for assessing benefit and, to a more limited degree, cost of management and information systems to permit meaningful cost-benefit analysis. The technique is a response to requirements in analyzing a large and complex manpower planning and programming system, as well as to an apparent gap in existing cost benefit methodology. A model with three prime determinants of benefits is postulated: potential contribution, received value, and utilized value. Other candidate factors are also considered; notably, feedback. A methodology for costing inputs and outputs is also developed as an important complement to the benefit measures. Analysis results are presented for preliminary data gathered via a questionnaire. Alternative models for considering the measures are discussed. A

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plan for detailed analysis of the model using extensive data now being collected, in addition to proposed laboratory experimentation, is presented.

Utility Theory in Military Personnel Management. TR 76TQ-38. July 1976. J. R. Schmid and R. K. Hovey. (AD-A035 590)

An important element of personnel policy testing and decision making with computer simulation models is criteria used for evaluating changes. Measures of cost and inventory have been used by BUPERS to manage distribution of personnel filling billet structures. Other measures are needed to achieve an optimum distribution of strength. An effort was undertaken to develop another personnel planning tool--a utility model that would assess the overall value that the Navy should expect to receive from personnel afforded by a level of manpower expenditure.

Two DELPHI experiments and a Broadcast experiment were conducted to solicit opinion of Navy experts from headquarters as well as the fleet regarding the productivity of the average enlisted man in terms of utility to the Navy as he progresses in years of service in specific pay grade. Pay grade utility "tents" from DELPHI experiments were developed. Results showed that, in all pay grades, maximum utility is reached well before end of career.

Analysis of Fleet and Shore Demands on the Naval Supply Center, San Diego. TR 76TQ-39. July 1976. T. A. Blanco. (AD-A035 589)

In developing a system for allocating manpower resources in the Navy, major emphasis has been placed on design of an input-output (I/O) model to forecast workload of shore activities based upon size and distribution of the fleet. To test feasibility of I/O analysis for operational use, a full-scale model of the Eleventh Naval District (11ND) is being developed. The major effort underway is collection and organization of data and empirical analysis of a fleet-shore workload demand network focusing on major shore activities in 11ND. Analysis of demand on NSC San Diego was made in terms of individual customers, proportion of fleet demands to shore demands, feasibility of grouping ships by type, effect of deployment and overhaul on NSC's workload, and stability of demand for ship and shore customers.

Analysis of Demands on the Long Beach Naval Shipyard. TR 77-7. December 1976. M. W. Rowe. (AD-A033 842)

A major effort underway is the collection and organization of data and the empirical analysis of the fleet-shore workload demand network, focusing on major shore activities in the 11th Naval District (See abstract for NPRDC TR 76TQ-39). This report is concerned with the analysis of workload demand on one of these shore activities--the Long Beach Naval Shipyard (NSY). The structure of demands on this activity was analyzed by using NSY workload data that provided a monthly status report (in terms of man-days expended) on all work being performed on each ship. The data base was used to determine the configuration of total workload and the differences in demand among repair categories and among ship types, as well as changes in demand over time.

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Optimization in Military Personnel Management. TR 77-14. January 1977. J. R. Schmid, R. K. Hovey, and J. P. Mayberry. (AD-A037 429)

The computer-based optimization methodology discussed was developed for use by BUPERS in defining long-range management goals for each major Navy personnel skill category. Goals are defined in terms of objective optimum force distributed by skill grouping by length of service and by pay grade.

Analysis of Demands on the Naval Air Rework Facility, North Island. TR 77-21. March 1977. T. A. Blanco and M. W. Rowe. (AD-A037 799)

A major effort is underway to collect and organize data and to conduct an empirical analysis of the fleet-shore workload demand network, focusing on major shore activities in the 11th Naval District (see abstract for NPRDC TR 76TQ-39). This report concerns the analysis of workload demands on one activity--the Naval Rework Facility (NARF), North Island, San Diego. The structure of demands on NARF North Island was analyzed by using production load norms, induction and completion schedules, "carry overs," and actual man-hour expenditures, obtained quarterly for FY75 and FY76 from fleet support conference packages prepared by the Naval Air Systems Command Representative Pacific. The data were used to determine the distribution of total workload and differences in demand among aircraft models, engine models, and repair categories.

Analysis of Demands on Naval Regional Medical Center, San Diego. TR 77-23. April 1977. M. Chipman. (AD-A038 419)

This report describes the analysis of workload demands on the Naval Regional Medical Center, San Diego (see abstract for NPRDC TR 76TQ-39). Structure of demand was analyzed by using inpatient and outpatient data, master loading plans, and enlisted data verification reports. Data were used to determine distribution of total workload and differences in demand between retired and active duty personnel.

Input-output Analysis in Navy Manpower Planning. TR 77-26. April 1977. S. Sorensen and R. Willis. (AD-A038 764)

In large-scale organizations having a variety of outputs or products, many units within organizations perform primarily a support function. Changes in outputs or activity levels of individual units cause second and higher-order effects throughout the system resulting in a substantial impact on aggregate resource requirements. This report focuses on some of the ways in which organizational and workload structures influence the formulation and data analysis of manpower requirements models. Some of the issues involved in using intraorganization input-output models as a way of evaluating these influences are considered.

A Policy Evaluation Model and Prototype Computer-assisted Policy Evaluation System for Naval Personnel Management. TR 77-27. April 1977. F. Glover, D. Karney, and D. Klingman. (AD-A038 804)

This report describes a prototype computer-assisted policy evaluation (CAPE) system for solving naval personnel assignment problems. The CAPE system utilizes a new mathematical formulation for multiobjective function assignment problems,

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which is capable of evaluating a number of important personnel management problems. The computer program documentation for the CAPE system is included.

Analysis of Demands on the Naval Air Station, Miramar, California. TR 77-44. September 1977. W. M. Bokesch and D. S. Wertz. (AD-045 560)

A major effort is underway to collect and organize data for the empirical analysis of the fleet-shore workload demand network, focusing on major shore activities in the 11th Naval District (see abstract for NPRDC TR 76TQ-39). This report is concerned with the analysis of workload demands on one of these activities--the Naval Air Station (NAS), Miramar, California. The structure of demands on the three largest departments at NAS Miramar (Air Operations, Aircraft Intermediate Maintenance, and Supply) was analyzed. The differences in demand among aircraft types are determined for each of the three departments.

Analysis of Demands on the San Diego-based Intermediate Maintenance Activities. TR 78-1. November 1977. T. A. Blanco and M. W. Rowe. (AD-A046 610)

A major effort underway is the collection and organization of data on major shore activities in the 11th Naval District (see abstract for NPRDC TR 76TQ-39). This report is concerned with the analysis of workload demand on the San Diego-based Intermediate Maintenance Activities (IMAs). The structure of demands on the San Diego IMAs was analyzed by using IMA workload data that provided an annual report (in terms of man-hours expended) on all work being performed on each ship and shore activity. The data were used to determine the division of workload between fleet and shore customers, the proportion of workload accruing to each ship type, the feasibility of grouping ships by type, and the difference in workload for different ship types and home ports.

Analysis of Demands on the Navy Public Works Center, San Diego. TR 78-2. November 1977. A. W. Whisman. (AD-A046 593)

A major effort is underway to collect and organize data for the empirical analysis of the fleet-shore workload demand network, focusing on major shore activities in the 11th Naval District (see abstract for TR 76TQ-39). This report is concerned with the analysis of workload demands on the Navy Public Works Center (PWC), San Diego. The structure of demands on the three major departments at PWC (Maintenance, Transportation, and Utilities) was analyzed, yielding demand rates for individual customers of PWC, the proportion of fleet demands to shore demands, and utility use rates by ship type for ships in the port of San Diego.

Forecasting the Naval Enlisted Personnel Force Structure to Estimate Basic Pay. TR 78-4. November 1977. M. Chipman. (AD-A046 878)

A primary concern of Navy management is the ability to meet the Navy's manpower requirements in terms of both the quantity and quality of personnel. Recruitment, promotion, retirement, and other managerial policies are all directly related to and restricted by the Military Personnel, Navy (MPN) budget. Because over 50 percent of the MPN budget is allocated for enlisted basic pay, special attention must be given to the accurate forecasting of enlisted populations. The Naval Pay Predictor, Enlisted (NAPPE) Model, designed to accomplish this objective, relies solely upon historical population data and user-supplied enlisted end-strengths.

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Time series analysis is used to determine a general set of forecasting models that adequately explain the historical data. Other statistical procedures, including those employed in costing the enlisted force and in estimating recruit input populations, are also detailed. Validation results indicating errors of less than .1 percent for total enlisted basic pay are presented.

Analysis of Demands on the Naval Station, San Diego. TR 78-7. December 1977. T. A. Blanco and M. W. Rowe. (AD-A048 349)

A major effort underway is the collection and organization of data and the empirical analysis of the fleet-shore workload demand network, focusing on major shore activities in the 11th Naval District (see abstract for NPRDC TR 76TQ-39). This report is concerned with the analysis of workload demand on the Naval Station (NAVSTA), San Diego. The structure of demands on the two major departments at NAVSTA, San Diego (Waterfront Operations and Military Personnel) was analyzed, and the differences in demand among ship types were determined. The Waterfront Operations Department primarily provides port services to ships in the harbor; and the Military Personnel Department, personnel services to fleet personnel.

Forecasting the Numbers and Types of Enlisted Personnel in the United States Marine Corps: An Interactive Cohort Model. TR 78-14. March 1978. K. T. Marshall. (AD-A052 592)

This report describes the development of a model to forecast the total enlisted Marine Corps strength at the end of each quarter for 1 or 2 years into the future. The method involves the use of a simple cohort model, which has been implemented interactively and allows users to forecast the effects of changes in the recruit 2-3-4-year mix, education level, racial mix, or any combination. It also allows for gaming of the continuation rates, and provides long-range or steady-state results of particular recruitment policies.

Projections of the U.S. Population of 18-year-old Males in the Post-1993 Period. TR 78-16. April 1978. J. Borack and M. Govindan. (AD-A053 628)

With the advent of the all-volunteer force, it is necessary to estimate the long-term supply of individuals available for military service to determine our ability to meet future manpower requirements. Planners must be able to forecast both the size and composition of manpower supply because of the lead time necessary to take corrective action in areas such as recruitment strategies, training policies, hardware and job design, and necessary legislation whenever there are critical imbalances between projected supply and requirements.

The primary manpower pool for the military is comprised of young men 17-21 years old. This report discusses a forecasting methodology based upon asymptotic exponential regression that may be used to project this population in the post-1993 period. Specifically, a methodology is presented to project the 18-year-old male population. Extension to other age groups is straightforward. Projections obtained by this methodology are compared to Bureau of the Census population projections and actual post-period estimates. The methodology is shown to be an interesting alternative to other projection techniques.

MANPOWER MANAGEMENT (Continued)

Techniques for Evaluating Military Retirement Policies. TR 78-29. July 1978. M. Chipman, J. Silverman, and R. Willis. (AD-A059 291)

In evaluating alternative military retirement policies, models have been developed to compare regular military compensation, severance, vesting, and retirement cost given an underlying set of assumptions. The report outlines the interactive Retirement Analysis Model (RAM), which performs this task in both transitional and steady-state environments, examining both short-run and long-run effects. In addition, emphasis is given to a dynamic programming approach that will produce a set of continuation rates (which express personnel behavior), given a set of economic incentives as depicted by a retirement system. The combination of RAM with the dynamic programming approach is expected to lead to a more accurate assessment of the effects of retirement policies on both personnel behavior and total costs.

A Regional Input-output Model for Forecasting Shore-based Navy Workload. TR 78-32. August 1978. T. A. Blanco, J. M. Kissler, and A. W. Whisman. (AD-A059 316)

To forecast the changes in workload on Navy shore-based support activities caused by changes in the size and configuration of the fleet, an input-output (I/O) model has been developed to represent the fleet-support demand network of the 11th Naval District. The I/O sectors represent naval shore-based facility outputs, with final demands represented by the ships and squadrons of the fleet. The activity levels obtained from the model can be used to derive manpower requirements and to justify changes in budget requirements. This report contains a complete description of the model, including formulation, data collection and analysis, coefficient estimation, test runs, and applications.

Interactive Sea/Shore Billet Rotation Model. TR 78-33. September 1978. M. Rowe and M. Smith. (AD-A059 732)

An interactive billet rotation (BILROT) model was developed for use by billet planners in allocating enlisted billets by rate/rating between sea and shore to achieve balanced rotation flows. The model also determines (1) the number of shore billets available for women enlisted or civilians without impacting male rotation, and (2) appropriate tour lengths given current or future allowance structures. The interactive capability allows the user to access any of a series of reports for a multiyear planning horizon.

Intentions of Women (18-25 Years Old) to Join the Military: Results of a National Survey. TR 78-34. September 1978. J. I. Borack. (AD-A060 104)

In anticipation of the projected decline in the national population of young men, defense planners have given increased thought to expanding the role of women in the military. Therefore, a survey was conducted to gauge the interest of women and men in joining the military under present conditions and under three alternative options involving greater utilization of women. These options relate to the expansion of the role of women in terms of both the physical location (ships, aircraft, combat zones) and nontraditional job classifications (mechanics, electronics) where they are likely to serve. Findings are presented regarding the percentages of women and men interested in joining the military currently and under each alternative. The composition of the pool of interested women is also analyzed in terms of its demographic and attitudinal components.

MANPOWER MANAGEMENT (Continued)

Forecasting Naval Enlisted Retention Behavior Under Alternative Retirement Systems. TR 79-4. November 1978. M. Chipman and H. Mumm. (AD-A062 106)

Recently, substantial changes in the U.S. military retirement system have been proposed by various groups. While the primary goal is the reduction of total personnel costs (particularly retirement costs), a more significant consideration is the resulting change in retention behavior of active duty personnel. For the Navy enlisted force, which already faces retention problems in some high technology ratings, the implementation of a new retirement system without considering its effect on force behavior could easily lead to personnel shortages and force quality problems. A technique is presented for forecasting Total Navy enlisted retention rates and service continuation rates under the economic incentives of alternative retirement systems. The same technique can be applied to enlisted rating groups characterized by relatively homogeneous occupations and retention behavior. Examples of forecasted retention rates and continuation rates under two different retirement systems are given.

Shore Activity Manpower Planning Models: Development and Application. TR 79-10. March 1979. E. Bres, R. Niehaus, and D. Sholtz. (AD-A066 306)

This report is concerned with the development of models for determining recruiting requirements based upon manpower goals and for promotion planning. These models were tested at a large industrial facility and at a large laboratory.

Design and Development of Equal Employment Opportunity Human Resources Planning Models. TR 79-14. March 1979. A. Charnes, W. Cooper, K. Lewis, and R. Niehaus. (AD-A066 896)

The report describes the construction of a set of Navy civilian manpower management models that accommodate EEO requirements. Two types of models are presented: (1) a goal policy planning model with embedded Markoff personnel transition matrices to deal with multiple objectives involved with satisfying EEO goals over time at an aggregate or Navy-wide level, and (2) a local goal-arc personnel planning model. Realistic test data are used to provide examples of both models' outputs and uses. Detailed mathematical descriptions of both models, including a derivation of the network or transshipment model formulation for the local model, are provided. In addition, a system of EEO goal setting accountability is addressed.

Technology Trends and Maintenance Workload Requirements for the A-7, F-4 and F-14 Aircraft. TR 79-19. May 1979. T. Blanco, G. Chernowitz, J. Ciccotti, and A. Lee. (AD-A070 036)

Three major technology variables--system complexity, rate of technological change, and automation in diagnostics--were addressed to determine their significance in formulating a methodology for forecasting maintenance manpower requirements for new aircraft. These variables were analyzed separately for the A-7, F-4, and F-14 aircraft systems, as well as maintenance workload requirements. Conclusions are drawn from the effect of these variables on maintenance man-hours per flying hour and distribution of workload among maintenance levels (organizational, intermediate, and depot) and work centers.

MANPOWER MANAGEMENT (Continued)

Development and Analysis of Loss Rate Forecasting Techniques for the Navy's Unrestricted Line (URL) Officers. TR 79-20. June 1979. E. Bres and M. Rowe. (AD-A070 160)

Several time-series-based forecasting techniques were used to project Navy unrestricted line officer loss rates, by grade and length of service category. An autoregressive minimum absolute error regression model was selected as the best technique, producing a substantial increase in forecasting accuracy over previously used techniques.

Enlisted Advancement Optimization: A Multigoal Problem. TR 79-32. September 1979. R. Jordan and J. Silverman. (AD-A075 024)

In planning promotions for the Navy's enlisted petty officer personnel, it is difficult to satisfy all goals simultaneously. These goals include (1) enlisted manpower requirements by grade and occupation, (2) personnel ceilings, (3) "minimization" of shortages and surpluses, (4) equal promotion opportunities among skill categories, and (5) satisfactory requirements for experience. A goal programming formulation was used to explore the structure of the problem and to identify explicitly possible tradeoffs among conflicting goals.

Forecasting Naval Enlisted Occupational Retention Behavior Under Alternative Retirement Systems. TR 80-3. November 1979. M. D. Chipman and H. Mumm. (AD-A078 028)

This report presents a continuation of the study discussed in NPRDC TR 79-4. A technique for forecasting total Navy enlisted rates and service continuation rates, under the economic incentives of alternative retirement systems previously developed, is applied to 15 enlisted rating groups characterized by relatively homogeneous occupations and retention behavior. Examples of forecasted retention rates and continuation rates under two different retirement systems are given. In addition, applications of the forecasting function to selective reenlistment bonus policies are presented.

Forecasting the Naval Officer Personnel Force Structure to Estimate Basic Pay. TR 80-4. November 1979. M. D. Chipman. (AD-A078 029)

A primary concern of Navy management is the ability to meet the Navy's manpower requirements in terms of both the quantity and quality of personnel. Recruitment, promotion, retirement, and other managerial policies are all directly related to and restricted by the Military Personnel, Navy (MPN) budget. Because about 17 percent of the MPN budget is allocated for officer basic pay (approximately \$1 billion), special attention must be given to the accurate forecasting of officer populations. The Naval Pay Predictor, Officer (NAPPO) Model, designed to accomplish this objective, relies solely upon historical population data and user-supplied end-strengths. Time series analysis is used to determine a general set of forecasting models that adequately explain the historical data. Other statistical procedures, including those employed determining the cost of paying the officer force and in estimating newly commissioned officer input populations, are also described.

MANPOWER MANAGEMENT (Continued)

Optimal Officer Accession Planning for the U.S. Navy. TR 80-5. November 1979. E. S. Bres, A. Charnes, A. D. Burns, and W. W. Cooper. (AD-A078 030)

This report describes the development of a multiperiod goal programming model for deciding how many officers the Navy should commission from several commissioning sources for several career specialty areas. The model, called the Accession Into Designators (AIDS) model, has been adopted by OP-130, Officer Program Implementation Branch, DCNO (MPT) for planning and policy analysis. An example illustrates uses of the model.

A Qualitative Approach to Balancing Manpower Requirements and Personnel Inventories. TR 80-9. December 1979. R. W. Butterworth. (AD-A079 472)

A model for the Navy's enlisted personnel system was formulated to determine (rather than predict) an advancement and recruit input/training "policy" for each of the enlisted ratings. The formulation is intended to make a feasible determination based on the personnel system's structure, estimates of promotion eligible personnel, and the supply of recruits. A penalty function is used to measure the discrepancy between "requirements" and strength, by rating and pay grade, over time. Bounds on the strength will not permit a feasible solution to create an excessive shortage or overage, unless it is inherited from the beginning inventory. This inventory is categorized by skill, period, pay grade, and time-in-grade. The apprentice population (those in pay grades E-1--E-3) is categorized by period and time in service but not by skill. "Strikers" are accounted for implicitly.

Recruit Input Optimization (RIO) Model: Formulation and Development. TR 80-12. February 1980. Y-S. Yen. (AD-A080 653)

A cross-sectional manpower flow model was formulated for the Navy Enlisted Personnel System. The model describes the flow of recruits through the three non-petty officer pay grades (E-1--E-3) and the third class petty officer pay grade (E-4) into the higher petty officer pay grades (E-5--E-9). The purpose is to assure sufficient input to the petty officer force structure so as to minimize future personnel shortages and surpluses. The report describes the problem of projecting the number of recruits subject to requirement constraints on petty officer force structure and careerists and the restriction on training capacity.

Forecasting the Supply of Women Available to the Navy. TR 80-31. August 1980. J. I. Borack. (AD-A088 214)

Defense planners have given increased thought to expanding the role of women in the military. To gain insight into and obtain estimates of the relative size of the potential female and male Navy military supply pool, health examination survey data, mental aptitude data, and demographic data were analyzed. The population of females and males 17 to 24 years old were successively decremented by estimates of the population of these individuals not available for military service due to physical/medical, mental, or family status reasons. Additionally, individuals not interested in military service were deleted from the estimated supply pool.

MANPOWER MANAGEMENT (Continued)

Accession Gaming Model (AGAM). TR 80-32. August 1980. A. W. Whisman, Y-S. Yen, and M. D. Chipman. (AD-A089 160)

This report is the second in a series describing manpower flow models for use in determining accession plans that provide sufficient input to the force, while preventing large surpluses and shortages in various force categories. The model described here expands a previous quarterly optimization model, the Recruit Input Optimization (RIO) Model, to allow specification of force goals in terms of structured strength and trained strength in addition to total strength. The optimization procedure minimizes a weighted sum of the surpluses and shortages from force goals, subject to constraint equations that control the flow of personnel through the force.

Optimal Accession Requirements (OAR) Model. TR 80-33. September 1980. A. W. Whisman. (AD-A089 095)

This report is the third in a series describing manpower flow models that may be used to determine accession plans that prevent large surpluses and shortages in various force categories. Previous reports described the development of quarterly optimization models to determine the allocation of recruits over a 5-year planning horizon. In this effort, a similar optimization technique was used to develop an annual accession model that, while retaining much of the comprehensiveness of the quarterly models, is small enough to allow it to be linked with other personnel forecasting models to form a more comprehensive personnel planning system.

Review and Analysis of the Legislative History/Intent, Cost, and Value of Special Pay While on Duty at Certain Places. TR 81-1. November 1980. J. Dorsey, R. King, and M. Rowe. (AD-A092 726)

Certain Places Pay (CPP) is provided to enlisted personnel serving at specified locations outside the contiguous United States as a morale factor and in recognition of the greater-than-normal rigors of service at such locations. Because CPP rates have not changed since 1949, the pay has declined from about 10 percent of base pay to less than 2 percent. As a basis for developing a set of alternative CPP rates and payment plans, this effort examines the legislative history/intent/CPP, the criteria for awarding the pay, and the cost and value of CPP.

Life Cycle Navy Officer Billet Costs--FY81. TR 81-12. June 1981. E. A. Koehler. (AD-A100 659)

The officer billet cost model has been developed to compute the cost of manning Navy billets with officers having requisite designators and grades, in terms of investment and operating cost to the U.S. government, for each year in the life cycle of a given billet. The resulting cost data are displayed in 22 designator groups by pay grade and reflect the total cost of manning an established or proposed billet.

The STRAP Enlisted Predictor (STEP). TR 81-16. July 1981. J. I. Borack and K. W. Gay. (AD-A102 910)

A new computerized management system, the structured accession planning (STRAP) system, is being developed to provide Navy planners with techniques to perform integrated manpower management. This system will enable planners to evaluate the relationships between alternative manpower requirements, personnel

MANPOWER MANAGEMENT (Continued)

policies, and the available pool of qualified military manpower. STRAP is comprised of computerized modules that focus on the major determinants of manpower and personnel policy. These modules include manpower requirements determination, personnel policy evaluation, accession requirements determination, manpower supply forecasting, and personnel flow/loss estimation. This report describes the STRAP enlisted predictor (STEP) module, which provides STRAP with estimates of personnel flows and losses.

MANPOWER MANAGEMENT (Continued)

SPECIAL REPORTS

Manpower Requirements and Resources Control System (MARRCS). Phase I: Review and Prospectus. SR 75-3. July 1974. E. S. Hutchins, Jr. and F. R. DiGialleonardo.

The Manpower Requirements and Resources Control (MARRCS) project supplies general R&D support for an integrated Navy Manpower Planning System. Specifically, it focuses on the demand for manpower resources, a neglected area of manpower management, since most previous efforts have dealt with the supply of personnel. Phase I of this project is an attempt to describe and analyze the Navy's current manpower planning processes and to facilitate future analysis and development of these processes. Data acquisition under this phase has been essentially completed, and a software package (labeled Technique for Interactive System Analysis (TISA)) has been developed (see NPRDC TR 75-22).

Exposition of Significant Manpower Planning Decisions in a Major Navy Command Organization. SR 75-5. July 1974. E. S. Hutchins, Jr.

The advanced development project, "Manpower Requirements and Resources Control System" (MARRCS), required a descriptive systems analysis of the manpower planning in the Navy. The goal of the data collection was to provide a clear definition of the manpower planning system. It was found that the operations sequence diagram (OSD) technique made a significant contribution by enabling analysis to link all major command functions together. It was recommended that the operational managers consider use of OSD as demonstrated in this effort.

Investigation of the Navy Workweek at Sea. SR 76-2. September 1975. H. L. Williams, J. S. Malone, and W. M. Bokesch.

The primary objective of this report was to determine if a single standard workweek would be appropriate for enlisted personnel at sea in a combat environment. If so, the elements making up such a workweek standard were to be established based on actual observations in relevant operating environments. It was found that a single workweek should be established for air and surface enlisted personnel. The workweek standard recommended should be 76 hours in length. Within that total, 7.5 hours should be allocated to drills and training; 5.5 hours, to service diversion activities; and 63 hours, to primary duties, watches, and other work activities.

Workweek of Naval Aviation Squadrons in CONUS. SR 76-4. December 1975. W. M. Bokesch and H. L. Williams.

This investigation was undertaken as part of a study to update the standard workweek for Navy military personnel in the continental United States (CONUS). The specific objective was to determine if separate workweeks should be established for personnel assigned to naval aviation shore and sea duty squadrons that are distinct from each other as well as from those established for other naval communities in CONUS. It was found that, although hours actually worked by squadron personnel exceed the standard 40-hour week, this finding does not in itself justify a change in the workweek. The differences between workweeks of shore duty squadrons and sea duty squadrons in CONUS are too small to justify establishing workweeks of different

MANPOWER MANAGEMENT (Continued)

lengths; therefore, it was recommended that the standard workweek for squadrons in CONUS remain at 40 hours.

Workweek of Shipboard Enlisted Personnel During In-port Periods. SR 76-5. December 1975. W. M. Bokesch and H. L. Williams.

The objective of this effort was to determine the length of the workweek of personnel assigned to ships during in-port periods and to identify and quantify the unavailable hours consumed during the average workweek. On the basis of data analyzed, it was concluded that the workweek should be updated to reflect the actual time personnel spend aboard ship. It was recommended that the workweek be established at 66 hours for enlisted personnel on board ship during in-port periods. Within this total, 27.5 hours should be allocated to primary duties; 17 hours, to the duty section (on board nonworking); 10 hours, to service diversion; and 11.5 hours, to training and leave.

Workweek of Navy Military Personnel in CONUS. SR 76-6. December 1975. H. L. Williams, J. S. Malone, and W. M. Bokesch.

The investigation being reported was undertaken to update the standard workweek for Navy military personnel in the continental United States (CONUS) activities other than aviation squadrons. Information developed reflects the weekly work period segmented into amounts of time spent on training, service diversion activities, annual and sick leave, and time that is available for productive work (primary job). It was recommended that (1) the standard workweek of Navy personnel in CONUS should remain at 40 hours, and (2) a study be conducted to determine the basis of and need for overtime that the data indicated was being worked by Navy military personnel.

Workweek of Squadrons Overseas Ashore. SR 76-7. February 1976. H. L. Williams, J. S. Malone, and W. M. Bokesch.

The objective of this effort was the updating of standard workweeks in effect for Navy enlisted personnel in squadrons based or deployed overseas. Based on data obtained for selected samples of officers and enlisted personnel permanently based or deployed overseas, it was determined that (1) personnel in squadrons based overseas worked an average of 49.8 hours per week, and (2) those in squadrons deployed overseas from the continental United States (CONUS) worked an average of 69.5 hours per week. Thus, it was recommended that the standard workweek of squadrons based overseas remain at 40 hours per week, but that a standard workweek of 68 hours per week be placed in effect for enlisted personnel in squadrons deployed from CONUS.

CNO (OP-01) Internal Communications Relating to the Program Objective Memorandum and CNO Program Analysis Memoranda Development Processes: An Analysis. SR 76TQ-13. July 1976. L. R. Wilson.

Several projects from Phase I of the Manpower Requirements and Resources Control System (MARRCS) project have been generated that are significant contributions to the concept of Navy manpower planning. The objective of this endeavor was to provide a detailed description of the Navy's manpower planning activities as they

MANPOWER MANAGEMENT (Continued)

occur between, and are perceived by, manpower managers involved in one portion of the entire manpower planning process.

Generating Navy Recruiting Goal Matrices: Present and Long-term Solutions. SR 77-7. March 1977. B. A. Rafacz.

Navy recruiting area manpower planners spend 4 man-hours for each target recruiting month in manually generating goals for the Navy recruiting districts in their area. There are about three changes in recruiting goals that require recompilation and addition delay. Using the Naval Postgraduate School computer system and the AREA program, Area 8 personnel were able to generate goal matrices for any recruiting month in about 18 minutes. An analysis of goals generated by both methods disclosed no significant differences. Because of these findings, this procedure has been implemented by Area 8 manpower planners. It was recommended that the Navy Recruiting Command implement interim solution procedures at all area offices.

Manpower Forecasting: Problems in Determining the Long-range Supply of Military Manpower. SR 77-8. April 1977. M. Govindan.

Because of the impact that Bureau of Census projections (decline of male population in the 1990s) would have on manpower policies and planning, questions have arisen as to their accuracy and implications. This effort (1) assessed the validity of underlying assumptions related to fertility in Census Bureau projections by evaluating existing evidence as to the determinants of fertility changes, and (2) identified other research problem areas. It was concluded that there is no systematic and general theory to explain how much of the recent variation in fertility rates is due to specific social variables.

Techniques for Estimating Pay Entry Base Data Enlisted Personnel Force Structures from Data Categorized by Total Active Federal Military Service. SR 77-9. May 1977. J. I. Borack.

The Department of Defense required all branches of the service to develop and assess the accuracy of mathematical techniques that estimate pay entry base data (PEBD) force structure data from total active federal military service (TAFMS) force structure data. Methods utilizing cell-by-cell conversion and lagged linear models were analyzed in terms of their ability to generate individual PEBD cell and overall force cost values. It was recommended that a statistical technique, based upon apportioned linear regression of prior-year cell conversion factors, be chosen as the method to estimate the cost of TAFMS data matrices.

A Descriptive Analysis of Budget Activity Two of the Military Personnel, Navy Appropriation. SR 77-10. July 1977. M. D. Chipman and L. R. Wilson.

In forecasting the budget requirements for the Military Personnel, Navy (MPN) appropriation, a problem of concern is avoiding cost overruns. Methodologies and techniques designed to facilitate the forecasting process should deal with, in part, difficulties experienced in the past. This report analyzes the forecasting efforts from 1962-1975 of Budget Activity Two of the MPN Appropriation--the pay and allowances of enlisted personnel. Particular emphasis is given to forecasting performance for basic pay and allowance for quarters subactivities.

MANPOWER MANAGEMENT (Continued)

Estimation of Pay Entry Base Data (PEBD) Enlisted Personnel Rating Force Structures from Total Active Federal Military Service (TAFMS) Data. SR 77-12. September 1977. J. I. Borack.

To estimate the cost of future projected enlisted personnel inventories of ratings, mathematical techniques were developed to estimate pay entry base data (PEBD) force structure matrices from data categorized by total active federal military service (TAFMS). Methods using cell-by-cell exponential smoothing and apportionment were analyzed in terms of their ability to generate appropriate individual PEBD cell and rating cost estimates. Results indicated that these procedures yield highly accurate rating cost estimates.

Investigation of Navy Workweeks: Summary Report. SR 77-15. September 1977. H. L. Williams, W. M. Bokesch, and J. S. Malone.

This report summarized five previously reported investigations undertaken to update the standard workweeks of enlisted personnel in Navy forces afloat and ashore. It concluded that the number of standard workweeks in the force should be reduced and recommends the values that should be assigned each workweek.

Life Cycle Navy Enlisted Billet Costs Tables: FY77. SR 77-16. September 1977. J. I. Martin, E. A. Koehler, L. S. Mairs, and P. F. Hogan.

This report provides program managers and systems engineers with the life-cycle costs of operator and maintenance personnel. The information is intended to facilitate the decision-making process of comparing various hardware design concepts. Costs of system approaches that may be more manpower intensive can be weighed against those that may be less manpower intensive.

Intermediate Maintenance Activity Workload Prediction. SR 78-13. June 1978. H. L. Williams and J. S. Malone.

This endeavor was undertaken to investigate methods and models capable of predicting the workload of intermediate maintenance activities (IMAs) in advance of the dates ships enter the activities for maintenance. The results revealed a great deal of variability in weekly workload. Although a method of estimating workload was developed, it was not considered operational because of inadequate amounts of available data.

Life Cycle Navy Enlisted Billet Costs--FY78. SR 78-14. July 1978. J. I. Martin, E. A. Koehler, and L. S. Mairs.

This report provides life-cycle costs information for Navy enlisted personnel by ratings and pay grades in 1-, 5-, 10-, 15-, and 20-year increments. The cost information presented is based on the FY78 military pay rates. Factors included in the cost computations and instructions for use of the cost data are also provided.

Investigation of Navy Laboratory Support Manpower Requirements: A Pilot Study. SR 79-9. December 1978. R. F. Morrison, H. L. Williams, and J. S. Malone.

The Navy has been directed to develop staffing standards for shore-based facilities as rapidly as possible. To meet this objective, Navy manpower and material

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analysis centers are applying several programs within the Shore Requirements, Standards, and Manpower Planning System (SHORSTAMPS) to support functions across the Navy shore establishment. SHORSTAMPS assumes that (1) nearly all shore activities require the same support functions as long as the size of the facilities is comparable, and (2) these functions can be performed by the same number and types of employees. To determine whether these assumptions are valid for Navy laboratories, a series of in-house and contract efforts was conducted. Results suggest that the applicability of the SHORSTAMPS approach to Navy laboratories cannot be accepted without further investigation. Restricting consideration to functions or subfunctions that are common to all shore-based facilities ignores variables that may be essential to the development and testing of an adequate assessment methodology.

Manpower Availability--Navy Enlisted Projections--FY78-FY84. SR 79-11. January 1979. E. A. Koehler.

Second-term enlistees, which comprise the bulk of the Navy's experienced personnel pool, are in critically short supply for many ratings. As a result, many Navy systems are being manned and maintained by personnel with inadequate skills and experience. This effort identified those Navy ratings and pay grades in critically short supply, based on manpower forecasting data developed and maintained by CNO (OP-135D) and requirements data based on CNO estimates. Results can be used by hardware developers in developing systems that can be operated and maintained by fewer and lesser skilled military personnel.

Life Cycle Navy Enlisted Billet Costs--FY79. SR 79-13. March 1979. E. A. Koehler.

This report provides life cycle cost information for Navy enlisted personnel by ratings and pay grades in 1-, 5-, 10-, 15-, and 20-year increments. The cost information presented is based on FY79 military pay rates. Factors included in the cost computations for use of the cost data are also provided.

Life Cycle Navy Officer Billet Costs: An Interim Report. SR 79-20. May 1979. E. A. Koehler.

This report provides life-cycle Navy officer billet costs for 22 officer communities (derived by aggregating officer designator codes) by 1-, 5-, 10-, 15-, and 20-year increments. Costs were computed from FY79 costing information available in the officer billet cost model. This information can be used for developing life-cycle costs for existing and potential hardware Navy systems, for developing cost estimates of various manning concepts, and for conducting manpower-hardware cost trade-off analyses.

Automating the Production of Navy Recruiting District Budget Reports. SR 79-21. May 1979. D. S. Nelson and D. Halstead.

Since the budget reports produced by the Navy Recruiting District (NRD), San Diego have the same format and involve considerable computation, NRD management felt that it would be desirable to automate their production as much as possible. Thus, the purpose of this effort was to develop the software, data base, and procedures required to create, maintain, and use a computer report generation program. The program that was developed consists of three main sections: data base initialization, data base editing, and report generation. It is operable on a

MANPOWER MANAGEMENT (Continued)

communicator terminal and is capable of editing the stored reports and producing both summary and nonsummary reports.

Preliminary Study of Manning Requirements for the AEGIS Combat System Support Facility. SR 80-1. October 1979. H. L. Williams.

The Naval Surface Weapons Center, the principal Navy activity responsible for AEGIS Combat System engineering support, is planning to construct an AEGIS Command System Support Facility (ACSSF). The numbers and types of personnel and the skill levels required at ACSSF will depend on (1) the workload imposed on AEGIS ships, (2) the types and layout of equipment installed in the facility, and (3) operating policies and procedures. The purpose of this effort was to establish values for the factors affecting ACSSF personnel requirements and, based on this information, to identify the personnel and skill levels required to operate and maintain the facility.

Preliminary findings indicated that the selection and layout of equipment and facilities in the ACSSF can affect the amount of time required and frequency of errors made in conducting tests and evaluating tactical computer programs. A thorough human engineering analysis of the equipment layout and operating procedures is needed to identify problem areas and develop recommended solutions.

Manpower Availability. Navy Enlisted Projections--FY79-FY85. SR 80-5. December 1979. E. A. Koehler and M. A. Miller.

To identify those Navy ratings and pay grades where there are serious shortages, manpower availability data were developed using manpower forecasting data developed and maintained by the Chief of Naval Operations (CNO) (OP-110) and requirements data based on CNO (OP-11) estimates. Projections through fiscal year 1985 indicate that manpower shortages, especially in pay grades E-5 and E-6 (second and first class petty officers), will continue to plague the Navy. The hardware development community can assist in reducing the impact of these shortages by actively seeking to develop systems that can be operated and maintained by fewer and less skilled military personnel.

Life Cycle Navy Enlisted Billet Costs--FY80. SR 80-7. January 1980. E. A. Koehler.

This report provides decision makers in manpower planning and in hardware development offices with manpower annual and life cycle billet cost data for FY80. These data are intended for use in conducting acquisition and life cycle cost estimation studies for new hardware system concepts and alternative manpower support plans.

Technology-based Aircraft Resources (T-BAR) Model. SR 80-11. March 1980. T. A. Blanco, M. Smith, G. Chernowitz, and J. Ciccotti.

The technology-based aircraft resources (T-BAR) model developed in this effort is designed to relate changes in required maintenance man-hours (MMHs) at all maintenance levels--organizational, intermediate, and depot--to changes in desired aircraft capability. To achieve this objective, the model uses a data base built up from data gathered by existing Navy reporting systems that divide the type/model/series (T/M/S) of operational aircraft into major subsystems. Each subsystem identifies equipment that must be operative for the aircraft to perform a

MANPOWER MANAGEMENT (Continued)

particular mission. Thus, the data base consists of (1) MMHs and number of failures reported against all equipments that are not operationally ready due to maintenance/supply or are in a reduced material condition due to maintenance/supply, and (2) flight hours for all fleet aircraft of a particular T/M/S.

Navy Reserve Billet Costs--FY 1980. An Interim Report. SR 80-14. March 1980. E. A. Koehler.

This report provides hardware developers and manpower managers with specific manpower cost data for Navy officer and enlisted personnel within the ready reserve for 1-, 5-, 10-, 15-, and 20-year periods. These cost data were produced using the reserve billet cost model, which computes the costs of reserve force billets manned with people having requisite qualifications, in terms of the investment and operational cost to the U.S. government, for each year in the life cycle of a given billet. The resulting cost data are displayed for enlisted personnel using categories created by combining all ratings into occupational groups, and for officer personnel using functional occupational groups keyed to designators.

Life Cycle Navy Officer Billet Costs--FY80. An Interim Report. SR 80-18. May 1980. E. A. Koehler.

This report provides decision makers in manpower planning and in hardware development offices with specific officer billet cost information for FY80. This cost information can be used for developing life cycle costs for existing and potential new hardware systems of the Navy, for developing cost estimates for various manning concepts, and for conducting manpower-hardware cost trade-off analyses.

Navy Civilian (Civil Service) Billet Costs--FY 1980: An Interim Report. SR 80-19. May 1980. E. A. Koehler.

This report provides hardware developers and manpower managers with specific manpower cost data for Navy civilian work force (Civil Service) billets. These data were developed using the civilian (Civil Service) billet cost model and its supporting data base to compute the costs of manning billets with people having requisite qualifications, in terms of the investment and operation cost to the U.S. government, for each year in the life cycle of a given billet. The resulting cost data are displayed for 91 functional occupational groups and pay grades, including both general schedule and wage board positions. These data, which reflect the total cost of manning an established or proposed Navy billet, project costs for 1-, 5-, 10-, 15-, and 20-year periods.

Projecting the Impact of a Navy-wide Decrewing Policy on the Navy's Manpower Force Structure: A Detailed Approach. SR 80-20. June 1980. T. A. Blanco.

The Navy has set up a pilot ship decrewing program to evaluate the extent to which the level of personnel skills and morale can be increased by modifying existing overhaul policies. The research and development reported here was conducted to assess the projected effects of a Navy-wide decrewing program on the Navy's manpower force structure. Key issues addressed were alleviation of fleet skill shortages, impacts on the training system, and requirements for new sea/shore rotation patterns and policies.

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Evaluation Plan for Assessing Costs of Decrewing Ships During Overhaul: Pilot Ship III--USS CONYNGHAM, DDG 17. SR 80-22. June 1980. T. A. Blanco.

The Navy has set up a pilot ship decrewing program to evaluate the extent to which the level of personnel skills and morale can be increased by modifying existing overhaul policies. One approach, which was suggested by the General Accounting Office and which is being tested on one pilot ship--USS CONYNGHAM (DDG 17)--is to use civilians in shipyards to accomplish work that is normally done by ships' crews during overhaul. The crewmen released from overhaul work are reassigned to ships at sea, thereby alleviating critical shortages. This report provides an evaluation plan for assessing the costs and benefits to the Navy of this approach. This evaluation plan suggests detailed methods for assessing the effects of decrewing CONYNGHAM, as well as the projected effects of Navy-wide decrewing.

Impact of Alternative Navy-wide Decrewing Scenarios on Fleet/SIMA Skill Shortages: Preliminary Results. SR 80-27. July 1980. T. A. Blanco and R. H. Mumm.

The objective of this effort was to project the impact of six specific Navy-wide decrewing scenarios on fleet and shore intermediate maintenance activity (SIMA) skill shortages based on the assumptions used in decrewing USS CONYNGHAM (see NPRDC SR 80-22), historical fleet-distributed personnel and billet authorizations, and FY 1980-1982 overhaul schedules and active ship inventories.

Average skill shortages by rating and pay grade group (E-1--E-3, E-4--E-6, E-7--E-9) per ship within a ship class were calculated by comparing FY 1979 distributed personnel with authorized billets. Projected operational skill shortages were computed by (1) using active ship inventory and overhaul schedules to compute total ship-months of nonoverhaul time for FY 1980-1982 for each ship class, and (2) multiplying the total ship-months for each ship class by the average skill shortages per ship within the class. The amount of type and personnel skills made available by decrewing were estimated based on such factors as the form of Navy-wide decrewing (scenario), regular overhaul (ROH) liaison team and recrewing requirements, and transient and transfer policies.

Life Cycle Navy Enlisted Billet Costs--FY 1981. SR 81-22. July 1981. E. A. Koehler and R. F. Turney. (AD-A103 043)

The enlisted billet cost model has been developed to compute the cost of manning Navy billets with personnel having requisite ratings and pay grades, in terms of investment and operating cost to the U.S. government, for each year in the life cycle of a given billet. The resulting cost data are displayed for each active Navy rating by pay grade and reflect the total cost of manning an established or proposed operational billet.

Navy Civilian (Civil Service) Billet Costs--FY 1981. SR 81-24. July 1981. E. A. Koehler. (AD-A104 564)

The Navy civilian (Civil Service) billet cost model has been developed to compute the costs of manning Navy billets with employees of given occupational groups and pay grades. Data were collected for both general schedule (GS) and wage board (WB) billets. Investment and operation costs that the government must incur in creating and supporting each billet were established and are presented in 1-, 5-, 10-, 15-, and 20-year increments.

MANPOWER MANAGEMENT (Continued)

TECHNICAL NOTES

Analysis of Alternative Military Retirement Policies: An Approach with Some Results. TN 78-8. April 1978. M. D. Chipman and J. Silverman.

The report describes the first step in developing methods for evaluating alternatives retirement systems. The methods are used to evaluate various retirement policies for Navy enlisted personnel, such as 20-, 23-, 26-, and 29-year systems, and to test different planning scenarios, involving preretirement and second-term attrition levels.

Interactive Sea/Shore Billet Rotation Model (BILROT): Users' Guide. TN 78-17. September 1978. M. W. Rowe and M. Smith.

This users' guide to the interactive sea/shore billet rotation model (BILBOT) (described in TR 78-33) provides (1) a detailed description of how to use the computer program, (2) a description of each field in the input files and output records, (3) a system flowchart, and (4) a source listing of the model's computer code.

Computerized Input-output Model (CIOM): User's Manual. TN 79-7. May 1979. J. M. Kissler.

The computerized input-output model (CIOM), which is currently operational for the fleet and support activities of the 11th Naval District, is capable of providing workload forecasts for nine major shore activities based on a varying fleet structure or operating tempo. A conversion can then be made from workload levels to manpower requirements by the various shore activities. This report, which provides an operating guide to CIOM, documents a series of interactive computer routines that permit an assessment of the impact of changes in fleet structure on shore activities' workload levels.

Estimation of Enlisted Personnel Advancement Resources. TN 79-12. August 1979. J. I. Borack.

Navy managers need improved methods for estimating enlisted personnel advancement resources. These resources are comprised of examined individuals in each rating that are available for advancement to the next highest pay grade. A method was developed that is more accurate than previous methods used and that is compatible with data and methodology used in the force structure simulation (FAST) model. Using this method, inventory data from the enlisted master record and test taker data from the candidate master data base are analyzed using a weighted averaging technique.

Comparative Analysis of Enlisted Retirement Behavioral Models. TN 80-1. November 1979. M. D. Chipman.

This report outlines similarities and differences among five enlisted retention behavior forecasting models developed by the Air Force, NAVPERSRANDCEN, the Congressional Budget Office (CBO) (two models), and the Center for Naval Analyses (CNA). The five models all differ in theoretical assumption and/or types of data. All use one or more economic variables (e.g., cost of leaving) to forecast retention. Some implied pay elasticities indicate possible problems in forecasting lower length

MANPOWER MANAGEMENT (Continued)

of service (LOS) continuation rates. Because all five models rely on cross-sectional data rather than longitudinal data, continuation rate forecasts for some alternative retirement systems may be optimistic.

Inflationary Effects on Navy Procurement Workload. TN 80-4. December 1979. A. R. Walker.

The workload at Navy procurement offices (NPOs) throughout the Naval Supply Systems Command (NAVSUP) has increased considerably over the past several years because of an increase in the number of procurement actions that have moved from the area of small purchases to that of contracts. Thus, to develop a quantitative forecasting tool to determine workload at NPOs, a procurement workload model was developed from empirical analysis. This model has been successful in providing useful and accurate information for workload and manpower planning at NAVSUP. It clearly demonstrates that workload at procurement offices can be forecast and that a rational increase in the small purchase ceiling can be justified to hold the workload constant.

Warrant Officer/Limited Duty Officer Attrition Data Base (WOLDO): System Description and User's Guide. TN 80-13. March 1980. W. C. Butler and M. W. Rowe.

Force planning in the warrant officer/limited duty officer (WOLDO) community has been without a systematic, computerized aid for monitoring inventory and attrition. Therefore, to assist planners, an easy-to-use data base, WOLDO, was developed. WOLDO contains an historical data set (FY74--present) and accompanying software to generate inventory and attrition displays for user-defined WO and LDO communities.

Modelling Logistics Support Requirements for the Pacific Fleet. TN 80-16. May 1980. T. A. Blanco, J. M. Kissler, and R. P. Woon.

This report describes the development of an input-output (I/O) model of the fleet-logistic support demand network for 30 major supply and maintenance sectors within the Pacific Fleet (PACFLT). This model has potential applications at both the claimant and CNO programming levels. It can be used by logistics managers to test the effects of major changes in policies concerning fleet homeporting and employment schedules on the PACFLT logistic support workload. In the application described herein, it was used to measure effects of increased deployment in the Arabian Sea/Indian Ocean area.

Variable Housing Allowance (VHA) Proposals and Issues: Review and Analysis. TN 80-19. June 1980. M. Chipman and M. Rowe.

This report provides a political and technical history of variable housing allowance (VHA) schemes, as well as a methodology for evaluating VHA proposals.

Navy Manpower Access Program: User's Manual. TN 80-24. August 1980. R. H. Mumm.

The Navy manpower access program (NMAP) is an interactive computer program that is used for retrieving manpower fiscal year end-strength quantities from an extract of the Navy cost information system (NCIS)/five year defense program

MANPOWER MANAGEMENT (Continued)

(FYDP) subsystem data base. NMAP is capable of (1) listing each record that contains the user-specified sets of accounting codes and (2) creating disc files that contain total manpower quantities by year. These files may be input directly to the Time Series Processor (TSP) and Statistical Package for the Social Sciences (SPSS) statistical software packages. This report provides a user's guide to NMAP.

The Enlisted Survival Tracking File (STF). TN 81-11. April 1981. K. W. Gay and J. I. Borack.

This report describes an enlisted longitudinal data base jointly developed by the Navy Military Personnel Command (NMPC 164) and the Navy Personnel Research and Development Center. For each individual who served in the enlisted force since September 1977, the data base contains a sequence of records derived from the Navy's enlisted master file at quarterly intervals. This structure permits analysis of the longitudinal behavior of individuals or groups of individuals (e.g., cohorts).

An Econometric Model of Navy Enlistment Behavior. TN 81-16. June 1981. B. S. Siegel and J. I. Borack. (AD-A101 1365)

This report describes an econometric model of the enlistment process, provides parameter estimates of the model, and forecasts "supply" (or, more accurately, enlistment contracts) under alternative scenarios.

R&D METHODS AND TECHNIQUES

TECHNICAL REPORTS

Development of a Social Distance Scale. TR 74-23. April 1974. A. Katz and P. P. Foley. (AD-780 439)

A total of 276 enlisted personnel were presented with 34 statements and asked to judge the degree of personal interaction implied in each. The distribution of judgments resulting from this procedure served as a basis for establishing social distance scale values through use of the method of successive intervals. Nine statements were selected for the final scale because they (1) covered a wide range of closeness in personal interaction, (2) did not overlap as to item content, and (3) were approximately equal as to social distance between items. This scale, designed to measure willingness to engage in social contact with host country nationals, will be incorporated into survey instruments covering issues of living in an overseas environment.

The Theory and Application of Linear Decision Programming. TR 75-4. November 1974. G. B. Hatfield. (AD-A002 455)

An investigation of mathematical forms that generalize the ordinary linear programming problem has led to the identification of a problem termed the "decision programming" canonical form. The study of this canonical form indicates the possibility of unifying certain theories and methods of decision-making (i.e., linear programming, vector maximization, goal programming, two person zero-sum games, the Chebyshev approximation problem, and "satisfying"). It is shown that (1) solving a certain linear decision programming problem is equivalent to solving a linear vector minimization problem for an efficient point, and (2) a two-person, zero-sum game is equivalent to a linear decision programming problem where the payoff matrix is the set of goals. Satisfying follows directly from the canonical form by considering inequality goals. A general algorithm, called the minimum distance method, is developed for a class of decision programming problems.

Development and Evaluation of a Primal/Dual Method for the Solution of Nonlinear Programming Problems With Linear Constraints. TR 75-8. October 1974. G. B. Hatfield. (AD-A001 280)

A general algorithm for solving the class of nonlinear programming problems that have linear constraints has been developed. The constraints can be either equations or inequalities and the variables can be free or nonnegative. The objective function is assumed to be continuously differentiable. The algorithm is an "effective" second-order method in that slow convergence is eliminated without requiring second partial derivations. It combines the desirable features of projection methods, conjugate gradient methods, and methods that solve LP problems to obtain feasible directions. Computational results on a wide variety of test problems are given. The comparison of two nonlinear programming algorithms--the primal-dual and the ricochet gradient--was employed as the vehicle for evaluating practices and standards employed in testing algorithms. While the primal-dual algorithm was found to be "superior" on a number of standard test problems, it is observed that the multiplicity of conflicting criteria generally employed in testing algorithms generates arbitrariness in the evaluation process.

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R&D METHODS AND TECHNIQUES (Continued)

Instructions for Use of the Primal/Dual Algorithm for the Solution of Nonlinear Programming Problems with Linear Constraints. TR 75-8 (a). October 1974. G. B. Hatfield. (AD-A002 456)

Instructions for solving the nonlinear programming problem with linear constraints using the primal-dual method are given. A brief exposition of the problem is followed by instructions concerning program input and output, deck set-up, and some comments on problem strategy.

Use of the Operation Sequence Diagram as a Planning, Monitoring, and Control Tool in Resource Planning. TR 75-10. October 1974. E. S. Hutchins, Jr. and P. T. Conway. (AD-A000 811)

An experiment is conducted to determine if the operation sequence diagram (OSD) technique, which is primarily a human factors tool, could be adapted as a planning, monitoring, and control device in the area of resource planning. In the discipline for which it was designed, the OSD is most useful for simulation of system reaction to change. It was first developed to display the information-decision-action relationships of highly complex man-machine systems. While experimentation in adapting the OSD to a planning system scenario utilized actual data, with appreciable results, it has not been validated in a truly operational environment. Technology advancements in the field of automation (interactive computer graphics) are utilized and it appears that significant improvements to systems understanding can be realized through further exploitation of the automated interactive OSD approach.

A Theoretical Approach to Multiobjective Decision Problems. TR 75-15. November 1974. G. B. Hatfield and J. Silverman. (AD-A003 453)

The basis for a "synthetic" decision theory has been developed and operationalized through decision programming. The theory is addressed to higher-order decision problems characterized by multiple objectives, conflicting goals, and an uncertain decision environment. A novel canonical form embracing three "primitive" concepts--goals, preferences, and constraints--provides a framework that accommodates a wide diversity of decision behavior. In this form, although constraints are treated in the conventional manner, preference ordering may be incomplete (or even intransitive) and goals may be conflicting.

Technique for Interactive Systems Analysis (TISA). TR 75-22. October 1974. F. R. DiGiallenonardo, D. B. Barefoot, and T. A. Blanco. (AD-A013 223)

The field of systems analysis has traditionally been devoted to obtaining the necessary basis for design or redesign of hardware systems. While this analytic capability is no less desirable for "soft" systems, applications in that area have been hampered by data deficiencies, difficulties in system definition, and the specification of desired performance, measurement problems, and the like. In response to the problems, a technique for interactive systems analysis (TISA) has been developed. TISA is a computerized technique for conducting system analysis in a conversational mode from interactive terminals. TISA uses networking algorithms to access and structure system descriptive data from computer files. It can apply various analyses to these data and has the capability to display resulting system networks through the medium of computer graphics. TISA has been further developed as an analytic tool for the design, development, and management of organizational processes.

R&D METHODS AND TECHNIQUES (Continued)

An Assessment of Nonresponse Bias in Mail Surveys of Naval Personnel. TR 76-30. February 1976. L. A. Broedling and C. H. Fuller. (AD-A021 387)

This effort was aimed at identifying the extent and nature of nonresponse bias in direct surveys of naval personnel, and at determining whether questionnaire format affects response rate. The target population was enlisted, male naval personnel, since this population had consistently low response rates in direct mail surveys. Four different questionnaires were mailed to two experimental samples over a period of 14 months. The number of questionnaires out of four that each subject sent back was taken to be a measure of his tendency to respond to mail surveys. Results indicated that nonresponse bias does exist in direct mail surveys and that the factors related to this bias are quite complex. Because of this complexity, it is difficult to determine to what extent nonresponse bias will exist in a given naval personnel survey. Therefore, it was recommended that a follow-up procedure be used in conjunction with any direct mail, naval personnel survey.

Follow-Up Strategies in a Mail Survey: Effect on Return Rate and Response Bias. TR 77-5. December 1976. J. Sachar, S. Stumpf, and W. Kieckhafer. (AD-A033 489)

The present effort was designed to (1) assess the effects of various follow-up techniques on the return rate and response bias of demographic and attitudinal measurements, and (2) explore the possibility that reaction to extensive follow-ups biases the responses from initially uncooperative selectees. Approximately 1500 Navy and Marine Corps personnel from San Diego were mailed the DoD Family Housing Preference Survey and were assigned to 10 follow-up groups. The results indicate that some type of follow-up procedure results in greater return rates than no follow-up. Response bias was found in some variables.

Factor Regression Analysis: A New Method for Weighting Predictors. TR 77-12. December 1976. E. W. Curtis. (AD-A035 441)

A method was developed that sacrifices some "prediction" in the sample at hand in order to achieve a more reliable and stable predictor composite. The method developed, called factor regression analysis (FRA), is based on the first principle component of the predictor intercorrelation matrix with validities in the diagonal cells. FRA yielded very stable predictor composites and weights--the weights themselves varied less from sample to sample than did multiple regression (MR) weights from the same samples. These differences were marked for low sample sizes (e.g., $N = 25$), regardless of the number of variables in regression. With regard to prediction, FRA composites were substantially more valid in the population than the MR composites based on the same samples. The number of predictors in the subset did not turn out to be very important. FRA weights based on samples of 25 were about as valid as MR weights based on samples of 100. With samples of 200, the two methods yielded roughly equivalent prediction.

Catastrophe Theory in the Behavioral Sciences. TR 79-8. February 1979. W. Hillix, R. Hershman, and F. Wicker. (AD-A065 014)

Catastrophe theory is a recent and rich development in mathematics. Its possible application to the behavioral sciences, however, is uncertain and the source of considerable controversy. The theory was reviewed with emphasis on its usefulness in the behavioral sciences. Previous attempts to apply catastrophe theory

R&D METHODS AND TECHNIQUES (Continued)

were examined and criticized. A bibliography of publications in catastrophe theory was compiled, and three new investigations were designed to test the theory's applicability. A laboratory study of reversible apparent movement was the more successful of these; some aspects of the data showed properties that were in accord with expectations derived from a cusp catastrophe. Computer simulations of the behavior of hypothetical neural nets revealed selected catastrophic properties and suggested possible connections between mutually inhibitory systems and the phenomena of perceptual reversals.

R&D METHODS AND TECHNIQUES (Continued)

SPECIAL REPORT

The Quest for an Inexpensive, General-purpose, Stand-alone Computer. SR 79-18. April 1979. J. D. Hollan.

The issues involved in the design and selection of portable, inexpensive microcomputer systems powerful enough for interactive instructional applications were discussed. Also, software and hardware specifications for a microcomputer system for Navy use are provided. The software is designed to be transportable to more powerful microcomputers as they become available.

R&D METHODS AND TECHNIQUES (Continued)

TECHNICAL NOTES

Instructions for Executing LRS-Comp Likelihood Ratio Statistic Comparison: A Population Subgroup Multiple Comparison Computer Program for Categorical Data. TN 75-2. April 1975. B. A. Rafacz.

This computer program considers a common problem relative to categorical-type questionnaire items. The likelihood ratio test statistic is employed to test for homogeneity of a set of population subgroups over selected categories of a questionnaire item. The reader is referred to the previous studies for a more detailed account of the power and limitations of the technique.

DELPHI: Characteristics and Application. TN 76-2. October 1975. S. I. Sander.

Because of the disadvantages associated with conventional group processes employed in decision making, the DELPHI technique, where individual judgments are elicited and refined, was suggested as an alternate process. Results showed that the DELPHI technique was valid and effective for decision-making and forecasting purposes. Therefore, it was suggested that the use of DELPHI be increased, particularly in situations where it is essential to avoid the limiting factors inherent in traditional group processes.

Technique for Interactive Systems Analysis (TISA) Users' Manual. TN 76TQ-10. August 1976. D. B. Barefoot and T. A. Blanco.

The TISA manual describes the computer programs capable of entering, structuring, and accessing descriptive data from computer files. TISA operates in a conversational mode from interactive terminals. It was developed as an analytical tool for design, development, and management of organizational processes. This manual is meant as a systems reference as well as an operating guide to TISA.

Analytical Derivations of the Partial Correlation Coefficient. TN 76TQ-11. September 1976. J. Sachar.

Partial correlation coefficients are derived analytically under a number of factor patterns and compared to the expected partial correlation coefficients. It was found that the common criticism of partial correlation usage (i.e., that the variable being partialled out must not contain a specific factor or an error) is not uniformly true for all factor patterns. A series of scenarios that serve to facilitate the interpretations of computer partial correlation coefficients is provided.

GURU: A Computer Program for Analyzing Categorized Data. TN 77-4. December 1976. J. A. Riedel and J. D. Dodson.

A comprehensive computer program was designed to satisfy the data analysis requirements of the ongoing ECHO project and to be useful to other investigators employing open-ended question techniques such as ECHO. The resulting program, called GURU, provides extensive descriptive statistics of categorized data and allows great flexibility in comparing various groups of respondents as well as different classifications of the same data.

R&D METHODS AND TECHNIQUES (Continued)

PLOT3D: An SP-12 Three-dimensional Plotting Package. TN 77-11. April 1977. M. W. O'Bar.

Because of the lack of a three-dimensional plotting package for the graphics units, the scope of experiments and data display capabilities in the Center's PDP-12 computer laboratory have been reduced. Thus, under this effort, a general-purpose plotting package written in the SP-12 programming language was designed to be capable of providing realistic representations of three-dimensional surfaces on computer display terminals. This package, PLOT3D, can be used in any situation requiring presentation of three-dimensional surfaces by two-dimensional drawings.

SCATTER: An SP-12 Package for Display and Analysis of (X, Y) Data. TN 77-14. July 1977. R. L. Hershman.

A utility program, called SCATTER, was written in the SP-12 programming language for use in plotting (X, Y) data on the Tektronix 4006-1 graphics display terminal. The SCATTER package can be readily implemented in the Center's PDP-12 facility, and should be used whenever analysis and/or display of (X, Y) data are appropriate.

Sample Size Determination for Personnel Research Investigations. TN 77-16. August 1977. W. J. Moonan.

This effort was conducted to help personnel researchers in determining the size of the sample they should use in personnel research investigations. Various aspects of sample size determination problems and techniques that can be used for solving those problems are discussed in detail. Included are techniques for contingency tables, analysis of variance, and sample survey problems.

HIDLIN: An SP-12 Drawing Package with Hidden Line Elimination Capability. TN 78-3. January 1978. M. O'Bar.

No hidden line drawing package has been available to provide realistic depictions of three-dimensional surfaces on the Center's Tektronix 4006-1 computer display terminals. This project sought to design a hidden line plotting package written in the SP-12 programming language. It was to have the capability of producing realistic drawings of those three-dimensional surfaces that satisfy the definition of a "function." In addition, viewing aspect, viewing distance, and origin location were all programmed for control by the user.

Reliability and Validity of Critical Task Identification Using a Card-sort Technique. TN 78-16. August 1978. G. J. Laabs and G. D. Kissler.

This study was conducted to evaluate the reliability and validity of expert judgments of relative task criticality obtained in an application of the Q-sort methodology. Over 350 sonar technician tasks were organized into 50 higher-order task headings called "performance domains." These domains were then sorted by 37 subject matter experts (SMEs) according to their importance to "having a good sonar gang." These SMEs also rated the domains in terms of two dimensions often used to assess task criticality: (1) consequences of improper performance and (2) consequences of delayed performance. Analyses of results showed that this application of the Q-sort methodology yielded reliable and valid expert judgments. Thus, it

R&D METHODS AND TECHNIQUES (Continued)

was recommended that this methodology be considered as an alternative to more traditional rating scales.

Agreement Coefficients as Indices of Dependability for Domain-referenced Tests. TN 79-2. October 1978. M. T. Kane and R. L. Brennan.

This report provides an extensive review of coefficients that have been proposed as indices of dependability or reliability for criterion-referenced, domain-referenced, or mastery tests.

Generalizability Analyses: Principles and Procedures. TN 79-4. December 1978. R. L. Brennan.

This report provides a detailed treatment of a psychometric theory that can be used to address issues of measurement errors for both domain- and norm-referenced testing procedures. In subsequent reports, this theory will be used to develop and discuss specific psychometric approaches and results appropriate for domain-referenced testing.

Extension of Generalizability Theory to Domain-referenced Testing. TN 80-3. December 1979. R. L. Brennan.

This report proposes a psychometric theory for criterion-referenced testing that is based primarily upon the fundamental principles of generalizability theory. In earlier reports on this subject, results were developed for simple data collection designs only. This report extends the work to other designs that are more realistic and useful, provides a set of examples using both real and synthetic data, and considers similarities and differences between norm-referenced and criterion-referenced testing.

Handbook for GAPID: A FORTRAN IV Computer Program for Generalizability Analyses with Single-facet Designs. TN 80-15. May 1980. R. L. Brennan.

This handbook is organized into two principal parts. Part I provides a self-contained description of how to use the GAPID computer program and interpret results for "simple" runs of the program. Part II treats additional features of GAPID and provides technical considerations.

Test Equating Using Stratified Sampling: A Simulator Study. TN 81-3. October 1980. J. H. Wolfe.

The objective of this research was to determine whether or not the stratification method yields unbiased estimates of population scores when applied to selected samples. All simulations showed that stratified weighting underestimates the population percentiles below the median and, in the symmetrically truncated group, overestimates population percentiles above the median.

R&D METHODS AND TECHNIQUES (Continued)

Some Statistical Procedures for Domain-referenced Testing: A Handbook for Practitioners. TN 81-6. February 1981. R. L. Brennan.

This report provides a handbook of statistical techniques for producing and evaluating domain-referenced tests (DRTs) for use by Navy practitioners who develop and assess DRTs and/or criterion-referenced tests. This handbook considers item analysis procedures, techniques for establishing cutting scores, errors of measurement and classification, test length, and advancement scores, as well as group-based coefficients of agreement.

Improving the Validity of a Criterion-referenced, Diagnostic Test Using a Discriminant Function Procedure. TN 81-7. March 1981. R. Bearden.

The purpose of this effort was to determine whether an application of discriminant function analysis could significantly improve the overall predictive validity of the scores on a diagnostic criterion-referenced test. In this statistical procedure, the examinee's score is based on the sum of the individual item discriminant weights as opposed to one for a correct response and zero for an incorrect one.

BIBLIOGRAPHIES, REVIEWS, AND SUMMARIES

TECHNICAL REPORTS

Symposium Proceedings: Occupational Research and the Navy--Prospectus 1980. TR 74-14. March 1974. E. I. Jones. (AD-779 000)

This report includes 22 papers assessing the state-of-the-art in occupational research presented in a symposium on 10-12 July 1973. Fields covered include: (1) occupational analysis, structure and methods, (2) career development, (3) organizational effectiveness, (4) motivation to work, and (5) measurement and prediction.

Consolidated Bibliography--Navy Personnel and Training Research--FY1949-FY1973, Volumes I-IV. TR 74-15, May 1974. W. J. Stinson (Ed.)

- Volume I--Unclassified Reports, FY 1949-FY 1963. (AD-780 206)
- Volume II--Classified Reports, FY 1949-FY 1963. (AD-919 647)
- Volume III--Unclassified Reports, FY 1964-FY 1973. (AD-780 207)
- Volume IV--Classified Reports, FY 1964-FY 1973. (AD-919 648)

This publication is a consolidated bibliography that lists all technical reports issued during the period FY 1949 through FY 1973 by Navy personnel research organizations in San Diego and Washington, DC. Abstracts are included where readily available from past records. Within each volume, reports are listed in appropriate subject categories for reference convenience as follows: manpower management, personnel administration, training and education, human factors support, resource costs, and bibliography reports.

Bibliography--Unclassified Reports, May 1973 Through June 1976. TR 77-10. December 1976. (AD-A035 626)

This report lists all unclassified technical reports that have been published during the period from May 1973, when the Navy Personnel Research and Development Center was created, to the end of June 1976. Reports are listed under six major functional areas: personnel acquisition and initial assignment, career and occupational design, human performance in Navy systems, personnel education and training, personnel management, and factors in personnel effectiveness.

Bibliography--Unclassified Technical Reports, July 1976 Through September 1977. TR 78-5. November 1977. (AD-A047 671)

This report lists all unclassified technical reports that were published during the period from July 1976 through September 1977. Reports are listed under the following four NAVPERSRANDCEN product areas: (1) personnel acquisition, utilization and effectiveness, (2) human performance in Navy systems, (3) personnel education and training, and (4) personnel/manpower management.

Bibliography--Unclassified Technical Reports, November 1977 Through September 1978. TR 79-24. June 1979. (AD-A071 097)

This report lists all unclassified technical reports that have been published during the period from November 1977 through September 1978. Reports are listed under the following four NAVPERSRANDCEN product areas: (1) personnel acquisition,

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utilization, and effectiveness, (2) human performance in Navy systems, (3) personnel education and training, and (4) personnel/manpower management.

Bibliography--Unclassified Technical Reports. October 1978 Through September 1979.
TR 80-2. November 1979. (AD-A077 647)

This report lists all unclassified technical reports that have been published during the period from October 1978 through September 1979. Reports are listed under the following four NAVPERSRANDCEN product areas: (1) personnel acquisition, utilization, and effectiveness, (2) human performance in Navy systems, (3) personnel education and training, and (4) personnel/manpower management.

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SPECIAL REPORTS

Progress in Navy Manpower Management Effectiveness Technology: Assessment and Application (1968-1975). SR 76TQ-14. July 1976. J. Collins, and J. Erlichman.

The purpose of this effort was to determine the results of DoD's first advanced development program in manpower management. The program was initiated by the Chief of Naval Operations by the issuance of ADO 43-07X dated 21 August 1967. This report, which covers the period from April 1968 to June 1975, identifies and describes completed and ongoing subprojects and their impact on operational readiness and/or technical capabilities.

Progress in Navy Education and Training Technology: Assessment and Applications (1966-1975). SR 76TQ-15. July 1976. J. J. Collins and J. Erlichman.

The purpose of this effort was to catalogue the progress and results of DoD's first advanced development program in education and training. The program was initiated as a result of a policy decision of the Secretary of Defense on 16 August 1965 to establish the program in FY 1967. This report, which covers the period from July 1966 to June 1975, identifies and describes completed and ongoing subprojects and their impact on operational effectiveness and/or technical capabilities.

Proceedings of the 1977 National Symposium of the Military Services on Utilization of People-related Research, Development, and Test and Evaluation (RDT&E). SR 78-3. January 1978. F. F. Sands (Ed.). (AD-A051 195)

The 1977 symposium provided a forum for active discussion of the problems of research utilization (RU) in the military services, with an emphasis on formulating recommendations for improved utilization strategies. The program agenda encompassed a review of current research utilization activities in the Air Force, Army, and Navy; viewpoints of some key DoD decision-makers about RU; perspectives of potential users of military research from the operational community; and a review of RU activities in other federal agencies and private industry. The symposium provided the first major opportunity for a diverse group representing a broad spectrum of interests to discuss this important topic with reference to military research and development.

The 1979 Interservice Conference for the Coordination of People-related R&D: A Summary. SR 79-17. April 1979. F. F. Sands (Ed.).

The 1979 Interservice Conference for the Coordination of People-related R&D allowed top management of laboratories engaged in people-related R&D to meet and discuss critical issues and problems in this area. This report provides a summary of the conference proceedings and describes working group conclusions and recommendations.

Bibliography--Unclassified Special Reports and Technical Notes. FY 1974 Through FY 1979. SR 80-10. February 1980.

This report lists all unclassified special reports and technical notes that have been published at this Center from Fiscal Year 1974 through Fiscal Year 1979. Publications are listed in chronological order under five major functional areas: (1)

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personnel technology, (2) manpower management technology, (3) education and training, (4) human factors and simulation technology, and (5) research theory, methodology, and management.

Independent Research and Independent Exploratory Development at the Navy Personnel Research and Development Center. SR 80-23. June 1980. R. C. Sorenson.

This report summarizes the work undertaken by NAVPERSRANDCEN within the independent research (IR) and independent exploratory development (IED) programs during FY76-FY79. It identifies currently active units of efforts, as well as publications and presentations of IR/IED work during FY79.

Bibliography: Unclassified Technical Reports, Special Reports, and Technical Notes: October 1979 Through September 1980. SR 81-8. January 1981.

This report lists all unclassified technical reports, special reports, and technical notes that have been published by this Center from October 1979 through September 1980. Publications in each category are listed in chronological order under six areas: manpower management, education and training, organizational management, personnel selection and assignment, human performance, and bibliographies/annual reports.

Independent Research and Independent Exploratory Development at the Navy Personnel Research and Development Center--FY80. SR 81-20. June 1981. B. Rimland.

The independent research (IR) program at the Navy Personnel Research and Development Center has been active since the Center was formed in 1973. The independent exploratory development (IED) program was initiated in FY76. This annual IR/IED report provides synopses of current IR/IED projects, the IR/IED funding profile, and a list of publications and presentations on IR/IED projects.

BIBLIOGRAPHIES, REVIEWS, AND SUMMARIES (Continued)

TECHNICAL NOTE

Boring, Dashiell, and Cronbach Revisited. TN 78-1. November 1977. E. I. Jones.

For almost a century, a schism has existed between experimental and correlational psychology. This schism has been characterized by basic assumptions concerning the unchanging nature of man (correlationists) and the changeability of the nature of man (experimentalists). This report, the presidential address delivered to the Division of Military Psychology of the APA in August 1977, recounts the history and status of the schism and conditions necessary for rapprochement.

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