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Approved by
James J. Regan
Technical Director

Navy Personnel Research and Development Center
San Diego, California 92152

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report lists all unclassified technical reports which have been published during the period from October 1978 through September 1979. Reports are listed under the following four NPRDC product areas: Personnel Acquisition, Utilization, and Effectiveness, Human Performance in Navy Systems, Personnel Education and Training, and Personnel/Manpower Management.		

SUMMARY

Reports are listed under the following four NAVPERSRANDCEN product areas:

1. Personnel Acquisition, Utilization, and Effectiveness--Techniques, procedures, and systems for recruiting, selecting, assigning, advancing, and retaining Navy personnel for optimum initial and career assignment and utilization. Development of measures, tests, and instruments to determine occupational and skill requirements and career advancement paths and to assess aptitudes, attitudes, and motivation.

2. Human Performance in Navy Systems--Techniques and methods for measuring and enhancing human performance in Navy systems under various conditions and the application of those methods to assess personnel proficiency levels and to quantify human capabilities and limitations. Includes consideration of human factors in the design of equipment.

3. Personnel Education and Training--Development of instructional technologies and procedures and their application to human learning principles to develop required skills, knowledges, and abilities in naval personnel. Includes test and evaluation of training concepts, methods, and programs.

4. Personnel/Manpower Management--Models, tests, and techniques for improved manpower forecasting and planning systems and development of management decision aids and processes. Includes measures of organizational and management effectiveness.

Qualified users may request copies of reports from the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314 (Telephone: Commercial (202) 274-7633 or Autovon 284-7633). The DTIC Accession Number (AD) should be included for each requested document. Reports listed in this bibliography that have unlimited distribution can also be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22151 (Telephone: Commercial (703) 321-8543 (no autovon)).

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PERSONNEL ACQUISITION, UTILIZATION, AND EFFECTIVENESS

Selective Retention: A Longitudinal Analysis. 1. Factors Related to Recruit Training Attrition. TR 79-5. December 1978. S. Landau & A. Farkas. (AD-A062 516)

The purpose of the present study, 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 indicated 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, by opportunities to obtain various "self" needs. Attrites also 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, & L. Young. (AD-A066 190)

This study 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 study 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 experimental group personnel (who were eligible for voluntary separation) than for control group personnel, (2) attrition rates were higher for apprentice personnel than "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).

PERSONNEL ACQUISITION, UTILIZATION, AND EFFECTIVENESS (Continued)

Relation of Officer First Assignment and Education Major to Retention. TR 79-12.
March 1979. D. Robertson & 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 Officers 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.

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 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, & 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 study investigated the skills, activities, and training needs of 370 Navy civilian executives. Interviews, work activity diaries, observations, and questionnaires were used to gather data. 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 studies on retention were 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.

HUMAN PERFORMANCE IN NAVY SYSTEMS

User Performance with a Natural Language Query System for Command Control. TR 79-7. January 1979. R. Hershman, R. Kelly, & 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, 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.

Catastrophe Theory in the Behavioral Sciences. TR 79-8. February 1979. W. Hillix, R. Hershman, & 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 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.

Hemispheric Asymmetry as Related to Pilot and Radar Intercept Officer Performance. TR 79-13. March 1979. G. Lewis & 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).

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 & E. Pickering. (AD-A067 401)

A project is underway to investigate the feasibility of a Performance Proficiency Assessment System that would provide decision makers with information concerning the degree to which Fleet personnel are capable of performing the critical aspects of

HUMAN PERFORMANCE IN NAVY SYSTEMS (Continued)

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.

The following conclusions were reached: (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. Experiments will be conducted to determine the degree to which the type of information described in this report would be useful as part of a Performance Proficiency Assessment System.

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 planing 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.

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

The objectives of this study 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 totaling 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 Marie 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 study suggests are valid indicators of Navy and Marine Corps recruiter success be developed.

HUMAN PERFORMANCE IN NAVY SYSTEMS (Continued)

Hybrid Job Performance Aid Technology Definition. TR 79-25. July 1979. T. Post & M. 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 & 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 study, 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.

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

Two performance evaluation systems--supervisory ratings and peer ratings--which are currently used in a Federal agency for 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 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.

PERSONNEL EDUCATION AND TRAINING

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, & C. Buckley. (AD-A060 914)

Relationships found between BE/E and "A" school performance were used: (1) to determine the feasibility of applying lower mastery standards for different ratings without significantly affecting follow-on school success, and (2) to develop criteria for 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 was not very accurate in predicting performance and less so in predicting 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, & 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 is concluded that this procedure may hold considerable promise for increasing the efficiency of military training. It is relatively easy, and therefore inexpensive, to prepare questions covering instructional materials, and the self-pacing of progress saves student time and releases instructors for important instructional interaction with students. Therefore, it is recommended that tests of the procedures be carried out in military settings to determine the feasibility of using the procedure with military students.

Interior Communications Supervised Alarm and Warning Systems: Validation of Instructional Materials. TR 79-6. December 1978. D. Van Kekerix, W. Wulfeck, II, & 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.

PERSONNEL EDUCATION AND TRAINING (Continued)

Microfiche and Printed Materials in Individualized Instruction: A Comparison. TR 79-18. May 1979. L. Graham & 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; and 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, and those who used it 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 & 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 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. Wulfbeck, II, W. Montague, & W. King. (AD-A072 468)

The study 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;

PERSONNEL EDUCATION AND TRAINING (Continued)

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 & 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.

A Study of Authoring Alternatives for Training-Oriented Videodiscs. TR 79-33. September 1979. C. Bunderson, S. Jarvis, 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 study addresses eight areas that are related to the problems of authoring. These include the delivery system itself (i.e., the various capabilities of players and associated computer devices), media selection during instructional systems development, instructional strategies, author mock-up and simulation prior to premastering, premastering, mastering and replication, composition of videodisc authoring teams, and 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.

PERSONNEL/MANPOWER MANAGEMENT

Forecasting Naval Enlisted Retention Behavior Under Alternative Retirement Systems. TR 79-4. November 1978. M. Chipman & 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, & 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, & 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, & 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 manhours per flying hour and distribution of workload among maintenance levels (organizational, intermediate, and depot) and work centers.

PERSONNEL/MANPOWER MANAGEMENT (Continued)

Results indicate that system complexity, measured in terms of component reliability and density of functions (number of parts per subsystem), and rate of technological change, measured by subsystem commonality, are important in forecasting the manpower requirements of a new aircraft system. Automation in diagnostics did not have a significant effect on manpower requirements. The F-14 aircraft had a significantly different maintenance distribution by levels than the A-7 and F-4 models, the biggest shift being from organizational level (down 20% from other aircraft) to depot level (up 71% from other aircraft). This was accompanied by a much greater use of commercial support (96% of total depot support) than for other aircraft.

Development and Analysis of Loss Rate Forecasting Techniques for the Navy's Unrestricted Line (URL) Officers. TR 79-20. June 1979. E. Bres & 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 & J. Silverman. (AD-A075 024)

In planning promotions for the Navy's enlisted petty officer personnel, it is rarely possible 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 explicitly identify possible tradeoffs among conflicting goals.

BIBLIOGRAPHY FOR THE PERIOD NOVEMBER 1977-SEPTEMBER 1978

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 NPRDC product areas: Personnel Acquisition, Utilization, and Effectiveness; Human Performance in Navy Systems; Personnel Education and Training; and Personnel/Manpower Management.

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