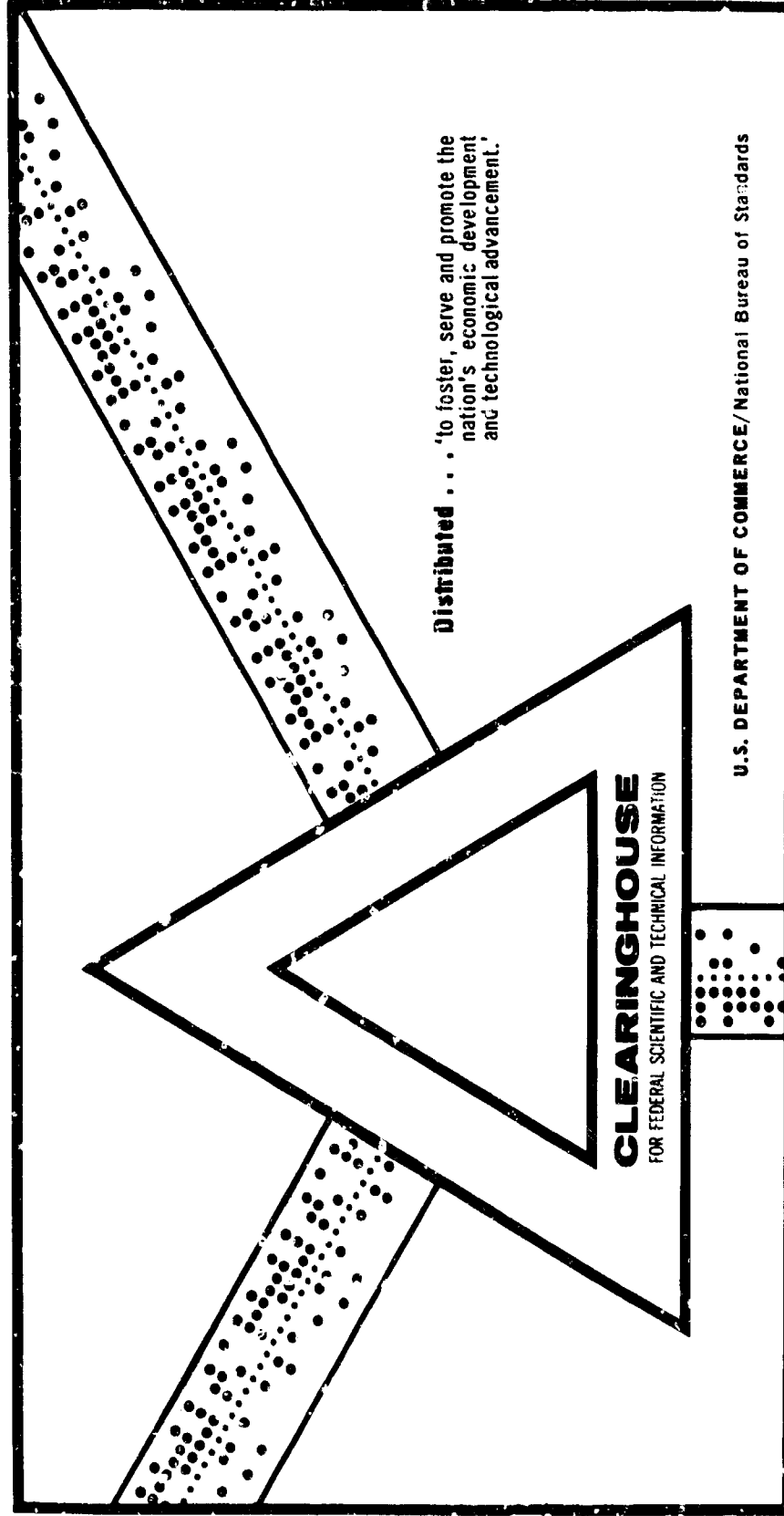


ABSTRACTS OF BESRL RESEARCH PUBLICATIONS - - FY 1969

Emma E. Brown, et al

Army Behavioral Science Research Laboratory  
Arlington, Virginia

September 1969



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Technical Research Note 217

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**ABSTRACTS OF  
BESRL RESEARCH PUBLICATIONS -- FY 1969**

Emma F. Brown

OFFICE OF THE DIRECTOR

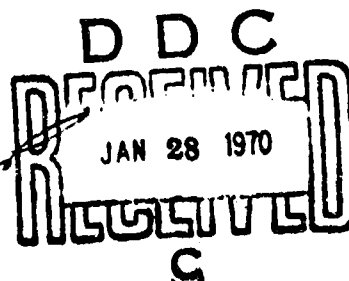


**U. S. Army  
Behavioral Science Research Laboratory**

**September 1969**

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**BEHAVIORAL SCIENCE RESEARCH LABORATORY**  
An activity of the Chief, Research and Development

**J. E. UHLANER**  
Director

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# **ABSTRACTS OF BESRL RESEARCH PUBLICATIONS -- FY 1969**

Emma E. Brown  
Office of the Director

Arthur J. Drucker  
Assistant Director for Operations

## **U. S. ARMY BEHAVIORAL SCIENCE RESEARCH LABORATORY**

Office, Chief of Research and Development  
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September 1969

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## FOREWORD

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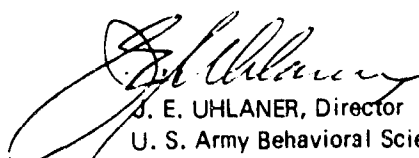
The present Technical Research Note continues the series of abstracts which began with Fiscal Year 1957. The series provides a synopsis of research efforts which reach either final or interim reporting stage during each fiscal year.

A substantial portion of the end-products of BESRL's research takes the form of psychological testing instruments to aid in the selection, classification, and utilization of Army personnel. About 30 Army personnel programs make operational use of over 100 research test products. Estimates of the number of personnel tested in the various programs during FY 1969 appear as the final section of this publication.

Simulation models developed by BESRL through operations research modeling assist Army personnel management in evaluating and deciding upon policies for the selection, allocation, training, and career progression of officers and enlisted men, as well as in planning future manpower policy. Through computerized programs, models are applied in the solution of Army personnel management problems. The products are increased knowledge of the effect of procurement, distribution, training, and reassignment policies on manpower quality, and comparison findings on alternative policies.

BESRL's human performance experimentation yields findings bearing on behavioral functions common to a number of Army systems. Typical products are improved operating procedures, work methods, and supervisory practices which enhance the performance of individuals within the system.

Manned systems research as conducted by BESRL has as its principal objective the enhancement of total system effectiveness through research on human performance. Scientific findings on human capabilities and performance under varying conditions within the system--findings which have implications for systems design, development, and use--constitute the end-products.



J. E. UHLANER, Director  
U. S. Army Behavioral Science  
Research Laboratory

ABSTRACTS OF BESRL RESEARCH PUBLICATIONS --  
FY 1969

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# INTRODUCTION

## BESRL RESEARCH PUBLICATIONS

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### TECHNICAL RESEARCH REPORTS

BESRL Technical Research Reports are publications describing completed research studies or programs which contribute directly to the solution of Army human factors problems in the broad areas of personnel management and the enhancement of human performance both individual and in the Army's manned systems. The Report is generally divided into two parts-- a brief general report to management and a technical supplement.

### TECHNICAL RESEARCH NOTES

BESRL Technical Research Notes are of interest primarily to technically trained research workers in the Department of Defense and in other government research agencies. Notes present technical information concerning research methodology or basic psychological and operations research knowledge growing out of the work program.

### RESEARCH STUDIES

BESRL Research Studies are special reports to military management, generally prepared in response to questions raised by operating agencies when early answers are needed. Research Studies may include presentations to military management, interim bases for changes in personnel operations, and bases for research decisions. Distribution is usually limited to operating agencies with a direct interest in the content.

### RESEARCH MEMORANDUMS

BESRL Research Memorandums are informal reports on technical research problems. Research Memorandums include the following types of content: details concerning construction of experimental instruments, fragmentary or incidental data, and methodological developments relating primarily to in-house technical operations. Limited distribution is made, primarily to personnel engaged in research for the U. S. Army Behavioral Science Research Laboratory.

## FY 1969 ABSTRACTS

Abstracts have been prepared for the majority of FY 1969 publications of the U. S. Army Behavioral Science Research Laboratory. Where a publication has been abstracted, the principal research findings have been described as much as possible in non-technical language. Technical language has generally been used as the most expeditious method of communicating details of research and analysis.

BESRL research publications are numbered consecutively and continuously from year to year, in separate series for the four types of publication. Publications released during FY 1969 include Reports 1156 and 1157, Notes 199 through 210, Research Studies 68-4, 68-5, and 68-6(C) and 69-1 through 69-10, and Research Memorandums 68-8 through 68-13. Research Note 217 identifies by publication serial number all research publications prepared and released by the U. S. Army Behavioral Science Research Laboratory in FY 1969. The listing includes 2 Technical Research Reports, 12 Technical Research Notes, 13 Research Studies, and 6 Research Memorandums.

Included are descriptions of 19 Work Units covering activities reported in the 33 abstracted publications, followed by the number of the abstracts of publications under each Work Unit. Included also are a list of the libraries in universities and metropolitan centers in which these publications are routinely deposited, and a listing of the U. S. Army personnel programs utilizing psychological test programs of the U. S. Army Behavioral Science Research Laboratory.

## DISTRIBUTION OF BESRL PUBLICATIONS

Initial distribution of each Technical Research Report and Technical Research Note is made directly by the U. S. Army Behavioral Science Research Laboratory. Research Reports are distributed primarily to operational and research facilities and their sponsors in the Department of Defense, to other interested governmental agencies, and to the Library of Congress which in turn distributes to depository libraries. Research Notes are distributed primarily to technically trained research workers, including those reached through Library of Congress channels.

Qualified requestors may obtain copies of Technical Research Reports and Technical Research Notes directly from the Defense Documentation Center. Copies may be purchased from the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce, Springfield, Virginia 22151. In the case of Technical Research Reports and Technical Research Notes, the AD number, when available, has been added for convenience in requesting copies from the Defense Documentation Center or from the Clearinghouse for Federal Scientific and Technical Information.

Copies may also be obtained on loan from depository libraries in many metropolitan and university centers. A list of these libraries appears on Pages 35 through 42.

Research Studies and Research Memorandums are not available for general distribution.

Operational tests are for official use only.

## ABSTRACTS

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### BESRL Research Publications -- FY 1969

#### TECHNICAL RESEARCH REPORTS

1. TRR 1156. James M. McKendry and Douglas J. Mace (HRB-Singer, Inc.) and James D. Baker (BESRL). Implications of BESRL research for displays in tactical information processing. January 1969. AD 688 581

The U. S. Army Computer Systems Command, Headquarters United States Army Europe (USAREUR), and Seventh Army are developing an automated Tactical Operations System (TOS). To provide back-up research in close rapport with TOS development, BESRL has established a Command Systems Field Branch within USAREUR. The Branch staff conducts on-the-spot human performance studies in support of the development of TOS and its concepts. The present publication summarizes BESRL research findings that are immediately applicable to problems of information display or that establish principles pertinent to information assimilation and decision making in a field TOS.

#### Examples of applicable findings:

In operational settings, primary emphasis is on situation map displays, and practically all crucial information is displayed in this fashion. BESRL research shows that some of the burden placed upon situation map displays could be taken care of by effective use of tabular (TOTE) type displays. For routine tasks, this substitution can be made with no loss in efficiency. The procedure, especially in an automated system such as TOS, would reduce substantially time spent in posting displays and collating information for briefings or summary reports.

Simple coding techniques devised by BESRL can facilitate detection and assimilation of changes in unit status over time. Such simple devices as using different sizes and degrees of brightness to denote updated information could make displays more useful to staff personnel and reduce visual search time.

2. TRR 1157. Pauline T. Olson, Richard C. Sorenson, Kenneth W. Haynam, Joanne M. Witt, and Elizabeth N. Abbe. Summary of SIMPO-I model development. March 1969.

In response to an operations research requirement, the Statistical Research and Analysis Division, BESRL has been engaged in study and evaluation of the Army's personnel subsystem through the development of a model simulation package for assessing quantitatively the cumulative impact of personnel policy changes on the allocation, distribution, utilization, and contingency readiness of Army personnel with special attention to effects of policies on deployability.

The present publication reports on progress as of January 1969 in dealing with the manpower system models noted above and for evaluating alternative personnel policies. Models completed are: DYNAMOD, consisting of four mass flow models representing characteristics of the Army's rotation system; ACCMOD, a dynamic mass-flow model of the noncareer enlisted subsystem; DYRCM II, a dynamic mass-flow model of the upper five enlisted grades; the Career-Noncareer model, incorporating desirable features of the three preceding models, and providing a greater number of options; and the SIMPO-I Quality Input model in which simulation is by flow of entities rather than by bulk.

Models in final stages of development are: SIMPO-I GMM (General Matrix Manipulator) with capability of simulating many segments of the personnel subsystem; DISTRO, a specific application of the GMM for estimating manpower capabilities under policy-constrained deployment; SIMPO-I GES (General Entity Simulator); and the Aviator Entity Flow Model.

Part I of the report is a discussion of the general concepts of the models and their use in policy evaluation. Part II gives descriptions of the several models and their application to assignment/rotation problems.

#### TECHNICAL RESEARCH NOTES

3. TRN 199. Pauline T. Olson. Use of Army school samples in estimating ACB test validity. August 1968. AD 677 388

The final measure of the quality of a classification test is its effect on the magnitude of the objective function. In the case of the Army Classification Battery (ACB), the objective function is the predicted performance of enlisted men in the jobs to which they are assigned. Grades in Army school courses are frequently used as the criterion since it is not always possible to obtain a satisfactory measure of job performance. In any case, Army school success and job performance can be measured only for subsamples of individuals already assigned. Test validity can therefore be computed only for subsamples of Army input that have met the requirements for the job group to which they are assigned.

Extension of validity results obtained from a selected subgroup to a theoretical whole has long been accepted statistical practice. The present study was a reexamination of the method commonly used to estimate the validity of a test when data are restricted to a segment of the population with which the tests are used. Predictor data used in classification were available on 2480 men at the beginning of their first enlistment, as well as data on experimental tests. The men were subsequently assigned to 21 different MOS school courses. Small subgroups in closely related MOS were combined into 12 subgroups and a pooled sample. The correction process was applied to the tests of direct selection (nine tests of the ACB) and results compared with actual results observed for the total group.

Means, standard deviations, and intercorrelations for the subgroups were used to compute difference ratios and regression weights for partial correlation coefficients between subgroups and total group. Means and standard deviations of the difference ratios were compared. No appreciable effect of the curtailed sample on the estimated effectiveness of the cognitive tests of the ACB in the total group was demonstrated. Differences between statistics for curtailed samples and for the total population were somewhat larger in the case of noncognitive measures. Results raised some slight question as to the appropriateness of estimating the validity of noncognitive tests by statistical correction for restriction in the range of scores in curtailed samples. Factors entering into the classification process as applied by interviewers at reception stations--but not quantified or recorded--may not correspond closely to characteristics measured by the noncognitive tests in the battery administered. Replication of the present study on current data is projected.

4. TRN 200. James D. Baker (BESRL) and James M. McKendry and Douglas J. Mace (HRB-Singer, Inc.). Certitude Judgments in an operational environment. November 1968. AD 681 232

In September 1967, BESRL established a field branch in Europe as an extension of its Command Systems program. Mission of the Branch is to conduct human performance research in connection with the development of Tactical Operations Systems (TOS). One of the first studies conducted was an analysis of certitude judgments accompanying intelligence spot reports received during a large-scale field exercise.

G2 spot reports entering the intelligence cycle include as a requirement subjective evaluations of the information expressed in a standard rating format. All messages (N = 2039) filed by two divisions of one corps during the 7-day field exercise were examined for presence of ratings of reliability of the information source and accuracy of the information. Half the spot reports lacked the required ratings. Assigned ratings had strong tendency to be high rather than distributed along the scale. Where both ratings were present, they were highly correlated, indicating some redundancy in the information elicited.

The formatting requirements of the automated TOS can be expected to standardize rating procedures and insure the inclusion of the ratings in the spot reports, since reports not having the evaluations will be rejected as input.

The complexity of the two rating scales may account for the fact that the ratings appear not to achieve their full potential. To enhance the utility of the ratings when they are adapted for use in an automated TOS, method and format may well be simplified.

5. TRN 201. George W. Doten (System Development Corporation) and Robert Sadacca (BESRL).  
Team interpretation procedures: Selection of teammates and role assignment. January 1969.  
AD 688 140

Image interpreter teams in which one man checks the work of another have been found to produce more complete and accurate information than does the average interpreter working alone. However, if the initial interpreter is highly proficient, or if the checker is very poor, no improvement is to be expected. The relationship between the proficiency of individual team members and team performance was investigated to determine whether certain aspects of individual performance are predictive of team performance. If predictive relationships are discovered, teammates could be selected and their roles assigned so as to optimize team performance.

Interpreters were first tested individually in both free search and directed search to provide base-line proficiency measures, and later in two-man teams. In the team procedure, each man served in two roles, initial interpreter and checker. Interpreters later switched roles, so that the initial reporter became the checker and vice versa. Completeness and accuracy of detection and identification were measured and correlated with team performance. In the team procedure selected, the checker, without discussion, evaluated the work of the initial interpreter and made the final decision as to which detections and identifications should be accepted as valid. The checker also searched for omitted targets.

Individual completeness scores for detection and identification were usefully predictive of overall team performance. The finding held for both free and directed search. Accuracy scores were not found to be usefully predictive of team performance. The better the initial interpreters, the less the improvement resultant from adding a checking interpreter. Conversely, the better the checking interpreter, the greater the improvement. The more proficient the individuals comprising the team, the better the team performance.

Desired improvement in team performance can best be attained by applying the following guidelines: 1) To select a team which will give maximum performance, sum completeness scores on standardized image interpretation tests for each interpreter and select subset of interpreters yielding the highest score. 2) To select teams which will give relatively equal performance, form subsets of interpreters such that the summed completeness scores of the interpreters total approximately the same value. 3) To determine who will serve as team checker, designate the interpreter within the selected subset whose summed completeness score is highest.

6. TRN 202. William H. Helme. Factor analysis of a situational leadership measure--the Speeded Practical Judgment Test. September 1968. AD 679 044

The Speeded Practical Judgment Test is one of the experimental psychological instruments designed to measure characteristics important in officer leadership (See Work Unit statement: Prediction of officer performance and retention).

Development of scoring formulas for many of the experimental predictors of the Differential Officer Battery requires detailed and complex analysis of officer responses. These analyses are an essential step toward developing psychological measures that are usefully discriminative for assignment to combat, technical, and administrative duties. The method used in the case of the Speeded Practical Judgment Test involved a rather unusual technique for dealing with noncognitive data.

The test consists of eleven situations presented as brief motion pictures. In each, a conflict in command performance is developed to the point at which the officer must make a decision. Four solutions are then offered. The officer indicates on a four-point scale the extent of his agreement with each solution before the next is presented. Thus, the 44 solutions are in effect test items. The situations vary from handling recruits and conflicts calling for administrative decisions to matters concerning command and combat. Officer responses to the 44 alternative solutions were analyzed on the basis of interrelationships (factor-analyzed) to determine the extent to which aspects of practical judgment could be statistically isolated for scoring purpose. Eight factors were selected and identified: Taut Ship, Indecision, Reluctant Leadership, Buckpassing, Combat Discipline, Mediation, Considerate Leniency, and Command Responsibility.

The scales obtained represent only the first organization of "items" into sets for validation. If these scales do not prove valid or fail to correlate appreciably with scales of logically similar content from other predictors, the next step will be to validate single items against the various criteria of officer performance.

7. TRN 203. William H. Helme. Factorially derived information measures for differential prediction of officer performance. December 1968. AD 686 288

The primary objective in analysis of the information test of the DOB was to obtain relatively homogeneous item clusters for assembling into scales to be validated for all criteria. In addition, the comprehensive data afforded an opportunity for an empirical test of the usefulness of factor analysis of item intercorrelations as a technique for developing homogeneous scoring scales.

The analysis took the unusual form of a double analysis--each analysis based on half the questions--and a synthesis of the results. Two equivalent sets of questions were formed from the 600 information questions in

the battery. The officer sample for both analyses consisted of 900 officers who took the test at entry on active duty, 100 being randomly selected from each of nine branches of service. In each analysis, officers responses were grouped on the basis of interrelationships (factor-analyzed) to define relatively independent areas of information. Matching areas defined in the two parallel studies were identified for scoring purposes. Questions not belonging in the matched areas were assembled on the basis of content into 13 additional sets.

The ten areas of information matched in the two separate analyses are: Practical Skills, Technology operations, Math-physical science, History-politics, Literature-arts, Entertainment-culture, Finance, Organized sports, Intellectual games, and Biochemistry.

8. TRN 204. Emma E. Brown. Abstracts of BESRL research publications--FY 1968. September 1968. AD 679 154

Research publications prepared and released by BESRL in FY 1968 are identified both by publication serial number and RDT and E Work Unit. Included are two Technical Research Reports, nine Technical Research Notes, six Research Studies, and eight Research Memorandums. Work Units included in BESRL's R and D work Program for FY 1968 are briefly described and references to relevant abstracts are noted by number. Provided also are a list of depository libraries furnished copies of BESRL publications and a compendium of information on BESRL test products which are operational in the Army's personnel selection and classification programs.

9. TRN 205. C. L. Klingberg and C. L. Elworth (The Boeing Company) and S. Epstein (System Development Corporation). Change detection in aerial photo coverage as influenced by methods of comparison. January 1969.

Interpretation of aerial photographs taken of the same terrain at different times can provide critical intelligence information regarding change in the enemy's strength and deployment--information not readily available from other sources. Change detection from analysis of comparative cover is affected by many situational factors, among them the type and amount of information available on the earlier coverage, the interpreter's familiarity with the target area, and the time allowed for comparing the photos. In the present study, variations in these factors were studied as they affected interpreter performance.

Sixty-four student interpreters performed a target (military vehicles) change detection task. Comparison materials provided were either pairs of unannotated photos, pairs of photos one of which was annotated, or schematic photo overlays plus written reports of earlier coverage, paired with a more recent photo. In a fourth procedure, separate interpretations of the comparative photos were made and the data subjected to a simulated computer comparison procedure. Each comparative scene was viewed for either 5 or 15 minutes. Half the subjects had gained familiarity with the target areas through a prior interpretation and half had not. Change detection performance was evaluated in terms of completeness and accuracy.

Under the 5-minute time limit, the computer comparison of independent interpretations of current and prior cover resulted in more complete change detection than did the other methods employed and about the same degree of accuracy. The advantage of computer comparison was less marked under the 15 minute time limit.

Providing the interpreters with overlay plus written report on the prior cover was least effective of the methods investigated. Also, the method was time-consuming. Interpreter familiarity with the terrain through having prepared the prior cover reports resulted in more complete and accurate change detection under the 5-minute time limit. Advantage was negligible under the 15-minute time limit.

10. TRN 206. C. L. Klingberg and C. L. Elworth (The Boeing Company) and A. H. Birnbaum (NESRL).  
Effect of disparity in photo scale and orientation on change detection. January 1969. AD 688 967

The objective was to estimate the extent to which completeness and accuracy of interpreters' reports of change are dependent on the essential equivalence of the imagery being compared, and to assess the desirability of incorporating scale rectification and rotational capability in systems for displaying comparative cover.

The experiment assessed the effects for three levels of scale discrepancy (1:1, 2:1, and 4:1), three levels of orientation misalignment (0°, 90°, and 180°), and two different time limits (3 minutes and 6 minutes) on the completeness and accuracy of change detection. The experiment was conducted under two requirements, one in which the interpreter detected change in objects characterized only as target or non-target, the other requiring identification of the target as belonging in one of nine categories. Subjects were 36 student image interpreters at the U. S. Army Intelligence School.

Significant decrements in both completeness and accuracy of target change detection were associated with scale disparity and with orientation misalignment when target identification was not required. When target identification was required, scale discrepancy resulted in significant decrement in accuracy as well as completeness, whereas orientation misalignment resulted in lower completeness but not lower accuracy. Completeness but not accuracy of change detection with or without target identification was higher with the longer time limit.

Findings strongly support inclusion of scale rectification and orientational capabilities in systems used to display comparative cover imagery at operational facilities.

11. TRN 207. Anthony E. Castelnovo. Effects of spectrum sampling on speech intelligibility. March 1969. AD 690 261

The operator in a military communication system faces a serious problem in the noise which may obscure the message. The noise may be broad-band, or it may appear in specific bands, depending on the source. If the noise is in relatively narrow bands, these bands might be excised from the speech spectrum to eliminate the noise. In the present study, the effect on speech intelligibility of filtering out portions of the speech spectrum was explored.

Phonetically balanced (PB) stimulus word lists spoken by three different individuals were presented to 36 subjects through a filter system which permitted variation in the configuration of pass bands over a 1300-cycle bandwidth. Experimental conditions totaled 54, there being 18 filter configurations under each of three noise conditions. Analysis of variance techniques were applied.

Intelligibility appears not to be a simple function of amount of bandwidth excised and the position of the excised segment in the speech spectrum, but to depend also on how the spectrum is sampled. Intelligibility was significantly higher for configurations in which the bandwidths were excised over the spectrum than for equal bandwidth concentrated in one area. Findings held for all three noise levels. Conclusion was that under conditions of low noise, substantial amounts of the speech spectrum may be excised without incurring a proportionate reduction in intelligibility. Specific bands of interference might thus be eliminated. Another implication of the finding is that greater use could be made of a given communication channel by sending more than one message over the channel at the same time, each message using different segments of the channel.

12. TRN 208. Elizabeth N. Abbe. Experimental comparison of Monte-Carlo sampling techniques to evaluate the multivariate normal integral. December 1968.

Personnel management research relating to manpower has led to the development within BESRL of optimization and simulation models which provide means of solution to personnel management problems related to the distribution, training, career progression, and utilization of personnel. Realistic estimates require, however, that multiple behavioral response patterns, as well as the complex interrelationships among these patterns, be incorporated into the models of the personnel system or subsystem. Continued development of more advanced quantitative methodology is required. The present objective was to evaluate two different numerical methods for estimating probability when a multivariate normal model (for example, one involving scores on a battery of tests) can be assumed.

In a series of simulation experiments in which random vector observations were generated, probability estimates were computed by each of the methods. Probability regions on which the experiments were based were chosen so as to have a variety of properties. The precision of the two methods was

compared from the magnitudes of the variances of the probability estimates over independent samples. Results appear to be affected both by the size of the probability region being estimated and by the goodness of the approximation of the sampling distribution to the unknown distribution. The more complex method was consistently superior for very small probability regions; but when the sampling approximation was poor, the precision of the probability estimates favored the simpler approach.

The computational procedures developed in conjunction with this series of experiments are considered practical methods of estimating probability based on multiple scores for individuals in a sample population. Estimation problems for which one method can be expected to be superior to the other were clarified. Changes in the computational procedures from which methodological improvements may be expected were also made apparent.

13. TRN 209. Robert T. Root and Paul D. Gallagher (HRB-Singer, Inc.) and Robert Sadacca (BESRL). Maintaining interpreter proficiency in a computerized facility. Experiment I: Programming and feedback method. November 1968.

Studying the usefulness and desirability of computer-aided instruction (CAI) in an operational facility, four alternative programming methods were evaluated by their effect on performance in identifying two types of target--tank and truck. The CAI techniques involved two formats--branching, in which the material presented varies with the interpreter's progress, and linear, in which material is presented in fixed order to all individuals--and two types of feedback--response-sensitive and response-insensitive. Response-sensitive feedback lets the interpreter know the correct identification and why an incorrect identification is wrong, whereas response-insensitive feedback merely supplies the correct answer.

The branching and linear methods resulted in the same level of post-instruction performance, but the branching program took significantly less time than the linear. The experimental results did not show conclusively that response-sensitive feedback results in better identification performance than response-insensitive. However, indications were that the instructional procedures making greater use of computer capability--response-sensitive feedback and branching programs--may be more efficient in that they permit presentation of more remedial information and greater gain in proficiency per unit of time. All methods investigated made use of imagery and equipment to be found within an advanced computer-based image interpretation facility.

14. TRN 210. Emilie E. Larson and Donald M. Kristiansen. Prediction of disciplinary offense early in Army service. April 1969.

As a part of BESRL's study of the impact of introducing various levels of ability in the Army enlisted system, selected written instruments were evaluated for their effectiveness in identifying men likely to incur military discipline early during service.

Three measures derived from the Personal Opinion Study, a personality questionnaire developed at the University of Illinois, and an Overall Acceptability measure representing the best written predictor of Army disciplinary record that has resulted from previous BESRL research, were obtained for a large sample of men tested at Reception Stations. For 1999 of these men, disciplinary records of their first 16 weeks in the Army were obtained and men were categorized as offenders (6%) and non-offenders (94%). Phi or point biserial coefficients of the experimental predictors were computed. A special analysis was made in a subsample of lower ability men admitted under the lower mental standards established in 1965 and 1966.

None of the measures tried out was sufficiently effective for operational use in the early identification of potential offenders. The most effective predictor, the Overall Acceptability measure, would screen out an undue number of nonoffenders in order to identify a small number of potential early offenders.

## RESEARCH STUDIES

15. RS 68-4. James D. Baker. Human factors experimentation within a tactical operations system (TOS) environment. October 1968.

Describes the initial research activities of the Command Systems Field Branch established in Europe as an extension of research conducted under BESRL's Command Systems program. The field branch operates in support of the development and design verification of the Army's automated tactical operations system (TOS). An important area of research on human performance in the TOS is the use made of judgments about the reliability of the source of intelligence information and the accuracy of the information. Focus is on evaluation--and improvement--of operational practices in making such judgments and on facilitating their use in the decision process. (See also TRN 200).

16. RS 68-5. Harry Kaplan. Evaluation of the Army Fixed-Wing Aptitude Battery in selection for ROTC flight training. November 1968

A follow-up study of the Army Fixed-Wing Battery adopted for ROTC use in 1961 was conducted to evaluate the current effectiveness of the test and appropriateness of the present qualifying score in selecting trainees for the ROTC Flight Instruction Program.

Rate of rejection for flight training on the basis of aptitude test scores was found to be low (13%) and rate of successful completion of the course high (85%). Under present conditions, even a highly valid selection test would result in only marginal reduction in attrition during training. Research findings were furnished the ROTC Branch, DCSPER, as a basis for decision on operational policy with respect to retention or modification of the cutting score on AFLAB-1.

17. RS 68-6. (CONFIDENTIAL) Jack J. Sternberg, John P. Farrell, and James H. Banks. Human performance with selected night vision devices: Methodology and analysis of preliminary data (Unclassified Title). December 1968.

18. RS 69-1. Francis F. Medland. Research program for selection and performance evaluation in overseas security operations assignments. March 1969.

A brief description of a behavioral science research program formulated by BESRL in response to interest expressed by DCSOPS, DCSPER, and the Special Warfare Center. Planned with a view to enhancing the selection, assignment, and evaluation of officers for a new Army career field, Overseas Security Operations, the research was designed for identification of job requirements, curriculum development for the training course, development of measures for selecting junior officers for the OSO career field, and performance assessment.

19. RS 69-2. Pauline T. Olson. DYROM II, SIMPO-I model representing Army upper enlisted grades. March 1969.

Reports on the development and user application phases of a computerized model of the career portion of the Army personnel system corresponding roughly to the upper five enlisted grades. The model can provide estimates of the numbers of men required month by month to meet force requirements under operational or alternative utilization policies. The model has been applied over 24-month periods, yielding information on additional personnel requirements to satisfy force commitments while maintaining acceptable rotation policies relative to stabilized tours and restricted assignments of certain force members.

The Research Study describes the systems simulated and the model logic, and provides instructions for model application, a listing of computer programs for the model, and sample input and output.

20. RS 69-3. Edmund F. Fuchs. Characteristics of stockade prisoners--summary of major findings. March 1969.

A study of Army stockade input for a year was completed in connection with research conducted by BESRL's OPTIMUM MENTAL DISTRIBUTION Work Unit. An important objective of the larger program is to determine what balance of personnel of various ability levels is consistent with effective unit performance.

Prisoners were compared with an independent sample of enlisted input to explore the relationship of personal and background factors to stockade confinement. FOR OFFICIAL USE ONLY.

21. RS 69-4: J. Richard Lepkowski (System Development Corporation). Study of image interpreter use of aids and equipment. April 1969.

Each Army image interpreter is supplied with a kit of aids and equipment for use in his task. The P. I. kit as now issued includes magnifiers, stereo viewers, measuring scales of several kinds, a slide rule, and other items. When the kits were reviewed for adequacy for current operations, it was found that while all items now included in the P. I. kit are used by the interpreter, some are rarely used. The P. I. kit does not provide complete interpretation capability but must be supplemented by section supplies and reference materials.

Contents were identified for an abbreviated kit which would equip the interpreter with the tools and devices he needs most often--tube magnifiers, stereoscope, slide rule, and P. I. scale. All other items needed can be drawn from supplies maintained by the image interpretation facility.

Plotting templates for plotting panoramic photography from selected camera systems were conceptualized. An improved magnifier reticle was also conceptualized.

22. RS 69-5. Edmund F. Fuchs. Summary of BESRL research on screening and classification of enlisted men. April 1969.

BESRL's research on the selection and initial classification of enlisted manpower concentrates on three broad problem areas in Army personnel management: screening, differential classification, and utilization of marginal manpower through optimum distribution of individual abilities.

Research on initial screening deals with methods for establishing the mental standards to be used in deciding whether an individual should be accepted for enlistment or induction. Differential classification, which establishes the type or types of Army job for which an individual is suited, poses a different problem in psychological measurement. Whereas screening is essentially a comparison of individuals with respect to general aptitude, the classification procedure adds a set of measures which yield the pattern of aptitudes and abilities within the individual which differentiates him from others. The research objective is to achieve the best basis for matching the aptitudes of incoming enlisted personnel with the Army jobs for which they are to be trained.

A special problem which touches both screening and classification is the effective incorporation of mentally marginal personnel within the Army job structure. Effective personnel management requires that screening standards not be too high (especially during mobilization). Yet many assignments are demanding, and require personnel of superior ability. Responsibilities placed upon some units call into question the proportion of men of marginal ability the units can absorb and still function adequately. BESRL research attacks the problem of how many marginal personnel can be used effectively in which assignments.

23. RS 69-6. Seymour Ringel, James D. Baker, Michael H. Strub, and Loren L. Kensinger. Human factors research in command information processing systems--summary of recent studies. May 1969.

The Command Systems program is divided into two work units. Research efforts which focus on such information processing aspects as the rapid and accurate input and assimilation of information are conducted by the Tactical Information Processing (TIP) Work Unit. Efforts which emphasize aspects of the total system such as allocation of functions to man and equipment and system information requirements fall within the Tactical Operations System (TOS) Work Unit. The present report traces research progress from the beginning of FY 1967 to the present. During this period, 23 projects were completed or are now in progress. An extensive list of publication from the studies is included.

BESRL's manned systems research in this area is directed toward the enhancement of human performance and facilitation of man-machine interaction in relation to total system effectiveness. It involves experimentation with various configurations of system components, considering interactions and tradeoffs.

The end products--immediate or ultimate--are scientific findings on human capabilities and performance under varying conditions within the system. The findings have implications for systems design, development, and operational use. The present report--the result of a review of recent research activities--presents such end products in abbreviated form, providing sufficient information on a given study to show the basis for the findings reported.

Evidence has begun to accumulate from BESRL studies that men can be over-conservative in arriving at a decision. This conservatism shows itself in a low level of certitude on the part of the individual that his decision is correct. The tendency may cause an officer to wait to accumulate more and more information when each new item of information adds little to the basis for decision. The implication is that timeliness of action is sacrificed for little or no enhancement of decision quality. Current studies are designed to develop decision aids which would reduce or eliminate the detrimental effects of the tendency.

24. RS 69-7. A. Hyman, J. J. Sternberg, and J. H. Banks. BESRL's field-laboratory studies in human performance experimentation. May 1969.

When the Army is introducing innovations in a system or changing over from one system or subsystem to another, effective means of evaluating the changes are an imperative need. What concerns behavioral science is the impact on the performance of the human element in the system. In assessing this impact, the development of quantifiable and reliable measures of human performance as it affects systems output is crucial. In the Combat Systems Research Division of the U. S. Army Behavioral Science Research Laboratory (BESRL), such measures are developed through an iterative field-laboratory research program. In such a program, operational problems and

hypotheses are first identified in the field. Problems are then simulated and investigated in the laboratory where scientific controls can be maintained. The principles established in the laboratory are further checked by experimentation in a field environment. The two research programs described are representative of the Division's application of the iterative field-laboratory approach in two different areas having Army-wide applicability.

As part of the night operations research, a field research program has been established at CDCEC, Fort Ord, operating in conjunction with BESRL's laboratory facilities. Highly specialized experimental methodology has been developed by BESRL research scientists as a product of preliminary field study of night operations at Fort Benning. Through applications of these techniques, operational data have been obtained which are useful as a basis for establishing procedures and for improving search and scanning performance in night operations. BESRL research scientists have developed a mobile automated on-line data recording system which provides rapid feedback of findings to military users as well as a data base on search behavior for more exhaustive analysis.

The research approach in MONITOR PERFORMANCE is based on intensive analysis of human functions in existing systems and identification of critical behavioral factors common to a class of present and near-future systems. This approach is exemplified by studies in the area of communications monitors. In one group of studies, repeated transcriptions of a message by a single operator was found to result in substantial improvement in accuracy. However, the use of multiple transcribers was not justified on a cost-effectiveness basis, except perhaps on messages of marginal or less-than-marginal intelligibility or when conditions were critical. A second group of studies dealt with the ability of transcribers to rate the accuracy of their own transcriptions. It was found that the operator's confidence in the accuracy of his transcript was a good indication of transcript quality. This finding can be of importance to the decision maker in determining the relative weight to be placed upon the transcript message in relation to information from other sources.

25. RS 69-8. Pauline T. Olson, Richard C. Sorenson, Kenneth W. Haynam, Joanne M. Witt, and Elizabeth N. Abbe. Summary of SIMPO-I model development. May 1969.

Summary report excerpted from BESRL Technical Research Report 1157, which bears the same title. Indicates progress made in the production and planning of computerized models for use in dealing with problems related to the distribution and utilization of Army personnel and to career progression, reassignment, and rotation, and for evaluating alternative personnel policies.

Working models so far produced include DYNAMOD, ACCMOD, DYROM II, SIMPO-I Quality Input Model, and Career-Noncareer Model. These models and others still in development are more fully described with special reference to their capabilities in Technical Research Report 1157.

26. RS 69-9. A. H. Birnbaum, Robert Sadacca, R. S. Andrews, and M. A. Narva. Summary of BESRL surveillance research. May 1969.

Content is abstracted from a forthcoming BESRL Technical Research Report which summarizes in integrated fashion the rationale, broad objectives, and specific studies of the Surveillance Systems research programs conducted by the Support Systems Research Division of BESRL. Sketched very briefly in the present publication are the areas in which BESRL's manned systems experimentation has resulted in findings of interest to the Office, Chief of Research and Development, the Assistant Chief of Staff for Intelligence, and the U. S. Continental Army Command. Findings are applicable in optimizing performance of the human component in existing systems and in providing systems developers with information useful in design specifications for future systems. Included are the background discussion from the Report proper and a sampling of significant findings.

The research effort is currently organized into four Work Units, listed below with their stated objectives:

INTERPRETER TECHNIQUES. To develop methods and procedures which maximize the accuracy, completeness, and speed with which intelligence information is derived from imagery--photographs, infrared, and radar.

IMAGE INTERPRETATION DISPLAYS. To determine how interpreter performance is affected by variations in the characteristics of the image--magnification and image quality of photos, for example, and output of infrared and radar sensors; to specify techniques for accurate and speedy reporting of information; and to select or develop efficient procedures for change detection in comparing early and late cover.

IMAGE SYSTEMS. To integrate, evaluate, and improve advanced surveillance information processing systems through laboratory simulation, and to develop effective techniques for team operations, data bank utilization, and control of imagery and information flow through the system.

INTELLIGENCE SYSTEMS. To increase the speed, accuracy, and completeness of field army intelligence processing in advanced computerized systems through research on man/machine functions, procedures, and information management.

27. RS 69-10. W. H. Helme. Research to predict cadet and officer performance. June 1969.

Summarizes the human factors research on officer selection and evaluation performed under two major work units, Prediction of Officer Performance and Retention, and Cadet Leaders. In the OFFICER PREDICTION Work Unit, instruments and procedures are developed for the selection or early identification of potential officers and of individual assets relevant to effective performance of combat, technical, and administrative duties. Current activity of the CADET LEADERS Work Unit includes OCS selection, performance evaluation in ROTC Summer Camps, and performance appraisal of

USMA graduates. Selection techniques and evaluative methods developed for the OFFICER PREDICTION research will have application in major officer procurement programs--OCS, USMA, ROTC--and in the career development of selected officers.

## RESEARCH MEMORANDUMS

28. RM 68-8. William H. Helme. Factor analysis of leadership inventory for differential prediction of officer assignment. July 1968.

The Differential Inventory A (DI-A) is one of the experimental psychological instruments designed to measure characteristics important in officer leadership (See Work Unit statement: Prediction of officer performance and retention). The DI-A is a self-description questionnaire on personal background, activity preferences, and personal attributes.

A factor analysis based on item intercorrelations identified 14 scorable factors. The three largest were interpreted as Decisive Leadership, Administration, and Combat Command. Six others represented activity-interest areas of Manual Crafts, Outdoor, Aesthetic, Construction, Organized Sports, and Nature Endurance. Background and temperament factors comprised the remaining five: Social Advantages, Emotional Control, Easy-going Disposition, Social Interaction, and Achievement Orientation.

29. RM 68-9. Milton H. Maier. Relationship between AQB and ACB scores. July 1968.

Study conducted to probe the hypothesis that Category IV personnel would attain higher scores on the longer ACB tests than on the AQB administered at AFEES. Although some individuals improved their scores by taking the ACB, the sample as a whole (300 men at Fort Bragg Reception Station and 300 at Fort Jackson) had lower scores on the ACB.

30. RM 68-10. Kay H. Smith. Internal analysis of the Group Awareness Test for the Differential Officer Battery. September 1968.

The 225 scorable responses (3 responses to each of 75 items) of the Group Awareness Test were analyzed in a stratified sample of 900 officers who took the experimental Differential Officer Battery. Each examinee estimated what proportion of NCOs, recruits, and ROTC graduates would indorse each statement. Eight scales were developed based on loadings on five factors extracted separately for each of the estimation groups. These factors covered such aspects of perception of others as socially desirable characteristics, cynicism, sophistication, and human relations in work and play.

31. RM 68-11. Kenneth Haynam, Joanne M. Witt, and Robert McMullen. Army personnel system analyses. December 1968.

Covers three preliminary studies conducted as part of a SIMPO-I subtask established to accomplish systems analysis and flow charting of the Army personnel subsystem. Includes 1) a list of efforts of other Army elements which have relevance to SIMPO-I; 2) a survey of the Armor Branch personnel system, concerned primarily with the office assignment process; and 3) a more detailed analysis of the Army aviation personnel system.

32. RM 68-12. C. L. Elworth, B. K. Gonzales, and C. L. Klingberg (The Boeing Company). Comparison of side-by-side and apparent motion displays for target change detection. December 1968.

Study conducted incidental to two major experiments on change detection (TRN 205 and TRN 206). Construction of the apparatus designed to introduce controlled variations in scale differences of two sets of imagery and orientational misalignment is described.

33. RM 68-13. Elizabeth N. Abbe. Statistical properties of allocation averages. December 1968.

Examines in detail any differences in allocation averages which might occur as a function of number of observations. In a series of simulation experiments, optimal assignment was performed with respect to least squares estimates of performance for finite samples. Two measures of allocation averages, one based on the least-squares performance estimates and the other on actual performance values, did not differ in statistical significance. Such results indicate lack of bias in both measures of optimal assignment and are consistent with Brogden's theoretical proof of equality of the two measures for infinite samples.

## WORK UNITS

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### U. S. Army Behavioral Science Research Laboratory

Work Units included in the BESRL Research and Development Work Program for FY 1969 are briefly described. Units are grouped according to research area. Numbers appearing at the conclusion of each description designate publications abstracted or listed on pages 3 through 19.

#### PERSONNEL MANAGEMENT RESEARCH--SELECTION AND BEHAVIORAL EVALUATION

Selection research for military personnel management embraces research on selection and classification of enlisted men and on the evaluation of both officer and enlisted behavior under conditions making unusual demands on individuals, teams, and manned systems. Findings have implications for manpower planning. Empirically based information is provided on the optimum mental distribution of enlisted men within units, for example, and the means of early identification of individual assets essential to high level performance in different areas of military activity. In addition to general trainability and potential or acquired capabilities for defined occupational areas, such assets include combat potential, ability to function well as a team member, officer leadership qualities, and career motivation.

Studies to improve enlisted classification have recently centered on interaction between job environment and the predictive effectiveness of classification tests, both operational and innovative. In behavioral evaluation, an important aspect of the research is the development of improved techniques for assessing officer performance.

Added research effort goes into the development of technical information for use in consultative assistance to staff agencies responsible for procurement and standards policies and to Department of Defense officials for use in manpower studies and programs.

**WORK UNIT: Interface between Civilian and Military Enlisted Manpower Systems. FY 1969.**

Army induction and enlistment policy bases acceptance in large part on measures of aptitudes related to likelihood of successful performance in Army jobs. A growing body of psychometric methodology is developed and applied in the updating--or developing replacements for--measures of general military trainability and supplementary measures of specific aptitudes. Research products must reflect military policy and organization as well as standards for military service established by the Congress.

Instruments now in operational use include the Enlistment Screening Test administered by recruiters to determine whether men seeking to enlist are likely to meet mental standards for service and should be sent on to Armed Forces Examining and Entrance Stations for further testing; the Armed Forces Qualification Test--overall measure of trainability for both enlistees and inductees; the Army Qualification Battery, a set of short tests to evaluate specific abilities; and special devices to aid in identifying deliberate failures. Tests for women applicants for enlisted service include preenlistment screening and qualification tests. An instrument more recently introduced is the Armed Services Vocational Aptitude Battery (ASVAB) developed in response to need for a test which could be used by all the services to test high school seniors as potential enlistees. The battery is also used to determine acceptability of enlistees for training commitment.

ASVAB development was the first result from a joint accelerated research program to determine which aptitude tests of the services were sufficiently interchangeable to permit of an all-service battery. Joint service studies of the appropriateness of the current ASVAB continue, and BESRL is leading in-house and contract research to develop alternate ASVAB forms.

The work unit has for several years engaged in methodological research on unconventional testing techniques as possible means of extracting from tests additional information predictive of soldier potential. Included are very short limited-range tests for go-no go screening, disguised aptitude tests as a new approach to detecting deliberate failures, and branching tests programmed for computer administration. 21.

**WORK UNIT: Differential Classification of Enlisted Manpower. FY 1969.**

The objective of initial classification is to assign enlisted personnel across the full range of Army jobs so as to make best use of the potential and developed skills of available manpower. The research objective is to develop and maintain measures of maximal differential value--measures highly valid for one set of Military Occupational Specialties (MOS) and of relatively low validity for other MOS.

The Army Classification Battery (ACB) was developed by BESRL to improve the classification of enlisted manpower by matching the different demands of training and jobs to the different aptitudes, experiences, and background of the soldiers. Recent effort has been toward improvement of the differentiating power of the battery predictors so as to better distinguish potential for success in different MOS groups. One effort is on reconstituting the aptitude areas from the present ACB. Another important emphasis is on devising additional test content reflecting motivation. A long-term research effort has resulted in the Army Differential MOS Battery, which has been administered to about 25,000 enlisted men in over 100 training courses. The experimental measures that prove effective will become replacements for, or supplements to, tests of the operational ACB. The effectiveness of the measures, both experimental and operational, is being determined for the conditions under which they are to be used, both in training and on the job.

The emphasis of the work unit has been expanded to include a major study of conditions in the Army which affect the validity of the classification predictors. An important segment of current effort centers on investigation of interactions between job environment and the effectiveness of classification tests. The Army is redesigning training courses to reduce emphasis on abstract material and increase the task-oriented material, so that trainees emerge with more specific skills. This change may affect the way men are assigned and utilized on the job, and in turn may alter the validity pattern of the ACB tests. 22, 29.

**WORK UNIT: Optimum Distribution of Individual Abilities for Unit Effectiveness. FY 1969.**

The performance of marginally qualifying personnel in individual jobs has received considerable attention, and a substantial body of findings on the aptitudes and ability levels significant for performance in selected groups of jobs has accumulated--with emphasis on the adequacy with which individuals in given mental categories meet training demands. However, the general impact of different mental standards for enlisted input on Army effectiveness has not been satisfactorily evaluated. The question for management is not whether an individual of marginal ability can barely get along in a job. Rather, it is what balance of ability levels is needed for a unit as a whole to be effective in its mission.

The OPTIMUM MENTAL DISTRIBUTION Work Unit has the ultimate objective of determining optimum numbers of enlisted men at different levels of ability which Army organizations can absorb and still maintain effectiveness. As a major step to this goal, measures of the effectiveness of individuals and of small military units are being developed so that units of varying composition can be compared. Benchmark MOS are studied in units in which the selected MOS predominate. The performance measures are designed to take into account not only mission accomplishment but also training and supervision demands, disciplinary actions, and other cost factors as they relate to the utility of marginal personnel.

Methods will include both field experiments and use of mathematical models where feasible for computer simulation of projected conditions. The effort looks to the development of models which will make it possible to estimate the effect of prospective changes in standards under varying conditions of peace and mobilization. 15, 20, 22.

**WORK UNIT: Prediction of Officer Performance and Retention. FY 1969.**

The OFFICER PREDICTION Work Unit was established to provide the Army with improved techniques for identifying officers who have aptitudes and other characteristics to meet the differing demands of different officer assignments. An added gain can accrue from an expected increase in the numbers of qualified junior officers motivated through career satisfaction to pursue a military career. The objective is maximum utilization of available officer talent in the Army of the future through early measurement of aptitudes and characteristics related to competent performance in different job areas and improved prerequisites for the selection or early identification of potential officers. The basic research design involves development of experimental predictors and the differential validation of the predictors against situational performance criteria. The U. S. Army Officer Evaluation Center (OEC) at Fort McClellan completed the unique mission of staging the continuous three-day exercise which provided criterion evaluations of 900 officers previously tested with the experimental battery.

With the advent of U. S. participation in Vietnam, the effort of the Officer Prediction Work Unit was redirected to permit collection of available human performance data in up-to-date combat or combat-ready settings. The basic design remained the same: development and administration of experimental psychological predictors, development of criterion measures of human performance, collection of measures of human performance, analysis of predictors against criteria, and follow-up to identify qualified officers who remain on active duty beyond their obligated service. The performance of the 900-officer sample who had taken the predictors and who were evaluated at the OEC is still relied upon as the major data source for differential validity analysis. In the meantime, officers originally given the experimental screening measures and still on active duty have been followed up in order to validate the predictors against performance demonstrated beyond the OEC. Evaluations of such actual performance have been obtained in Vietnam, Europe, and elsewhere.

Priority is given to analysis of the data collected to determine effectiveness of the battery in predicting performance in the exercise staged at the OEC and in Vietnam combat. The short-range analysis also involves relating test item responses to remaining in the Army. From a more exhaustive data analysis, BESRL research scientists plan to structure techniques and procedures to identify potential career officers and encourage their commitment to a military career. The complete analysis will constitute a test of the hypothesis that abilities to meet the differing psychological requirements of combat, administrative, and technical officer jobs are differentially predictable. 6, 7, 27, 28, 30.

**WORK UNIT: Performance in Combat and Overseas Service. FY 1969.**

This work unit continues a series of related research activities concerned with the psychological requirements of individuals, teams, and systems performing under environmental and psychological hazards. In addition to developing classification measures for use in assigning enlisted men to training for combat and combat support duty, research is conducted to aid in the selection of men for assignment in specialized combat conditions and in a cultural milieu markedly different from their own. Data on which to evaluate experimental measures designed for these several purposes have been obtained on men serving in actual combat in Vietnam, in combat-ready units in Korea, in combat-ready units in Germany (a culture similar to their own), and in garrison duty in Alaska (an arduous physical environment).

The work unit also has responsibility for developing generalized methods for instituting military selection and classification systems in selected countries. The latter effort is typified by aid furnished by BESRL in developing (at the request of ARPA) a personnel system for the Imperial Iranian Army with guidelines on methods and techniques generalizable to other countries desiring to institute comparable systems. The task involves determining the manpower resources of the country, so that skill and ability requirements for military training and service can be set realistically, and, if feasible, assisting in planning for an indigenous personnel research capability to take over ongoing development and implementation of the military personnel system. 18.

**WORK UNIT: Officer Performance Evaluation Systems. FY 1969.**

DCSPER has established a priority requirement for improved officer performance evaluation and institution of a continuing record of officer performance. In response, BESRL in FY 1969 began a research program to develop new and improved officer performance evaluations for use at career decision points and to integrate the evaluation procedures into an operational officer performance evaluation system.

In the early 1950's, BESRL conducted a series of major studies on rating methodology and developed a sequence of Officer Efficiency Report Forms which were capable of providing discriminating ratings. The forms did not, however, have generally favorable acceptance by officers. Subsequent rating methods have afforded more descriptive evaluations. Meantime, improved tools and techniques involving computer-assisted simulation and analysis of ratings by peers and supervisors in both group and individual situations have been the subject of experimentation.

Based on the new and more fruitful constructs that have emerged, BESRL research is moving toward construction of a model defining the requirements of an officer performance evaluation system, based on analysis of officer assignment, school selection, and promotion policies. Two additional work sub-units have been established: 1) Exploration of assessment techniques in relation to criterion concepts of officer effectiveness, and 2) Evaluation of simulation exercises as vehicles for officer performance measurements. In the latter effort, findings from the simulated exercise conducted

at the Officer Evaluation Center to provide criterion data for the OFFICER PREDICTION study are expected to find application. Computer feedback and war-gaming situations are among the devices considered for experimentation on evaluation at command and staff levels. 27.

**WORK UNIT: Psychological Measures for Use in Primary Officer Selection and Evaluation Programs. FY 1969.**

Major primary training programs through which the Army obtains officers for commissioning are the U. S. Military Academy, the senior division of the Reserve Officer Training Corps, and the Army's officer candidate schools. Work now in progress includes research in each of the officer procurement programs to meet the changed needs of the Army. Selection procedures for the ROTC program as the Army's major source for commissioned officers are studied with a view to developing techniques effective in identifying candidates with high leadership potential. In the OCS program, the selection procedure is studied with the objective of developing and validating a "whole man" evaluation that will accommodate changes in quotas and quality of applicants. The possible application of measures and concepts developed in OFFICER PREDICTION research is being explored. Research assistance is being provided the United States Military Academy in research on cadet leadership and attrition and evaluation of USMA graduates.

Performance of graduates of the three officer training programs in Vietnam combat and in other assignments has been evaluated and data are being analyzed. 16, 27.

**PERSONNEL MANAGEMENT RESEARCH--MANPOWER MANAGEMENT**

Direct solutions are sought to problems involving development and implementation of mathematical manpower models to assist in manpower processing, planning and policy formulation, and quantitative models and computer aided simulation studies relating to human behavior and/or personnel utilization. Methodology is developed and evaluated which builds on operations research capability, model sampling techniques, and computer technology to evaluate systems performance where the human element is critical and to provide means of optimizing manpower utilization.

**WORK UNIT: Computerized Models for the Simulation of Policies and Operations of the Personnel Subsystem--SIMPO-I. FY 1969.**

Models developed in the SIMPO-I effort have found application at the manpower policy analysis level as tools for both the one-time assessment of proposed policy change and the periodic analysis of the projected state of the Army personnel system. The products include a SIMPO-I simulation program library including the General Entity Simulator (GES), a relatively general bulk flow model, and several specialized simulation models. Specifically identified as part of this effort is the completion of a simulation model to describe the total personnel flow world-wide which addresses the impact of personnel policies relating to deployability of personnel.

The SIMPO-II effort constitutes a continuation and extension of the work accomplished in SIMPO-I. Objectives of SIMPO-II are 1) to develop new approaches and techniques for use in computerized models of manpower/personnel systems which may be used by management in evaluation of alternative policies, 2) to determine the effectiveness and efficiency of these approaches, 3) to apply the new approaches and techniques to models developed in SIMPO-I to extend their usefulness as operations research tools, and 4) to develop new SIMPO-II models capable of solving additional kinds of manpower/personnel management problems.

The SIMPO effort includes consultation and problem formulation for model users, adaptation and exercise of models in response to user requirements, and development of new models when judged appropriate. 2, 19, 25, 31.

**WORK UNIT: Optimization Models for Manpower Operations Research. FY 1969.**

BESRL's basic contributions to quantitative methodology relating to the inventory, allocation, and quality control of personnel, extending back a decade or more, are continued in this Work Unit. BESRL has developed optimization techniques for use in conjunction with computerized models and advocated their application in Army manpower management. Special attention has been given to application of quantitative models and computer-aided methods for optimally assigning personnel and to developing more efficient methodology and instruments for accomplishing optimal allocation.

Studies have been conducted to assess the feasibility of alternative approaches to optimal assignment of enlisted men, and for determining the gains that could accrue from a computerized optimal assignment procedure. Feasible quantitative models and computing algorithms for optimal assignment of enlisted men have been produced. Model sampling studies have dealt with a number of questions relating to the effect on the predicted average performance of individuals of varying characteristics of classification test battery and personnel information systems, when optimal assignment procedures are being utilized in the system under study.

The effort continues with the following stated objectives: 1) to solve personnel management problems relating to the distribution, training, career progression, reassignment, and utilization of personnel in both

current and future systems, 2) to analyze personnel systems and identify additional areas where objective optimization techniques can be applied, and 3) to develop further quantitative techniques for management and provide consultative assistance regarding their application. 3, 12, 33.

## HUMAN PERFORMANCE EXPERIMENTATION

Experimentation in this area involves study of behavioral functions common to many systems in order to discover general principles which, when applied operationally, will enhance the performance of individuals and teams within the systems. Typical outputs are work methods, basis of issue and mix, work-rest cycles, supervisory techniques, information input and response output procedures. Those means of improving performance that are determined to be successful in the laboratory setting are evaluated by field research in an operational setting.

### WORK UNIT: Dependable Performance in Monitor Jobs. FY 1969.

The complex weapons and surveillance systems of the modern Army have created many new types of monitoring jobs. In some of these jobs, operators are required to detect and identify a variety of visual and auditory signals which are weak, fleeting, and unpredictable in occurrence. Operators must make fairly simple responses at appropriate times, and must continue to respond accurately and quickly during long work hours under fatiguing or boring conditions. Under such conditions, successful performance depends as much upon the operator's ability to remain alert and vigilant as it does upon his technical skills.

In other jobs, the operator is required to discriminate critical signals from very similar but unimportant signals in an active signal environment. Jobs of the latter type involve not only the problems of vigilance but also operator judgment based on the integration of information from multiple sources.

The MONITOR PERFORMANCE Work Unit emphasizes applied vigilance research through simulation of the relevant aspects of many of these Army monitor jobs in a laboratory setting where experimental controls can be maintained. The objective is to develop and test principles, techniques, and operating procedures to improve performance of individuals working in a variety of monitor jobs. Laboratory apparatus capable of simultaneous or independent presentation of many different signals on meters, speakers, dials, scopes, lights, and alpha-numeric displays is used to investigate the effects on monitor response of factors associated with signals, task, environment, and the individual.

The effort has been subdivided into four work subunits: 1) Laboratory studies of monitoring behavior, 2) Human factors studies of signal acquisition and processing, 3) Enhancement of communications operator performance, and 4) Human performance factors in communications analysis and processing. 11, 24.

**WORK UNIT: Human Performance Experimentation in Night Operations. FY 1969.**

Increasing need to improve night military operations had led to the development of sensors which improve night seeing ability and night target acquisition. Important human factors problems in the use of these technological devices remain to be resolved. Salient questions are: Who should use which devices and under what conditions? How should the devices be used? What should be the basis of issue and mix? However promising these devices are, the human element in their use, as well as their tactical employment, enters into their effectiveness. The NIGHT OPERATIONS Work Unit is a major research effort to enhance night seeing performance with and without instrumentation. Included is research to determine the human factors effects of sustained activity on human performance during night operations, the effects of prolonged use of equipment, work cycles, team procedures, and test beds and their relationship to varying illumination, targets, and terrain.

To accomplish this research, a BESRL field experimentation unit has been established at Ft. Ord, California and data collection has been completed on the first two phases of a multi-phase research effort in support of SEA NITEOPS and STANO. These two phases have dealt with relative performance and work methods with selected passive night vision devices. Initial analyses have provided insights into the effects of prolonged activity, inferences for basis of issue and mix, and implications for search techniques and future design of equipment. Information was also generated on the effects on performance of variables such as target contrast, type, movement, and distance and ambient light conditions. 17, 24.

**WORK UNIT: Dependable Performance in Controller Jobs. FY 1969.**

Complex man-machine interfaces are appearing on the military scene with increasing frequency. Many of these require the human controller to stay alert for long periods of time to the input of critical information from superior and/or subordinate levels and to act quickly and precisely when such information appears. Displays are usually visual but can include audio and kinesthetic elements. They can be real-world, synthetic, or combinations of the two, and most often require assessments, decision, and response in real time. The CONTROLLER PERFORMANCE Work Unit was established to develop and test more effective controller procedures and more effective methods of identifying and assigning personnel in controller jobs.

Initial research focuses on control performance critical to combat operations involving air defense missiles. Systems factors associated with degraded controller performance are being identified using part-task simulation, electronic recordings, and even live exercises. The major factors identified will be tested in controlled laboratory experimentation and subsequently in the field. Research in this area is a further application of the iterative laboratory/field method which characterizes BESRL's human performance experimentation.

**WORK UNIT:** Response Systems in Human Performance. FY 1969.

Covert human responses, generally involuntary and detectable only by instruments, have rarely been used in military situations. Exploring the possibility of such deliberate use is the focus of the present effort. Major objective is to determine how and to what extent covert response systems can be employed usefully and reliably to enhance human performance. If under certain conditions covert responding to signals is found to be more sensitive and rapid than overt reactions, then covert responding to critical information could be deliberately established through classical conditioning. When needed, responses could be recorded. For example, an image interpreter could be conditioned to give covert responses to pictures of missile sites. Later, when he is scanning reconnaissance photos for missile sites, his covert responses could be recorded to obtain information not produced by overt response.

Critical to the experimental aspect of each exploration is the development of new techniques for recording and processing electro-behavioral signals generated by the covert response systems, including devices of original design and the unique modification of relevant equipment. Substantial progress has been made in these areas, including completion of preliminary telemetry techniques with a view of field application.

#### **MANNED SYSTEMS RESEARCH**

Manned systems research has as its principal objective the enhancement of human performance in relation to total system effectiveness. It involves experimentation with various configurations of systems components, considering interactions and trade-offs. The goal is to improve human performance within the system and also to provide means of evaluating systems effectiveness as a function of systems factors.

**WORK UNIT: Tactical Information Processing (TIP). FY 1969.**

BESRL's Command Systems research program embraces two major efforts, one dealing with tactical information processing (TIP), the other with tactical operations systems (TOS).

The Army is developing Automatic Data Systems within the Army in the Field (ADSAF) for receipt, processing, storage, retrieval, and display of different types and vast amounts of military data. Research on the human components of these new systems has accomplished the following: 1) Basic human problems were identified and organized around five critical information processing operations--screening incoming data, transforming raw data for input into storage-retrieval devices, input of information, assimilation of displayed information, and decision making. 2) An experimental facility has been developed within BESRL's Information Systems Laboratory in which aspects of ADSAF functions are simulated. 3) Studies completed or in progress on information assimilation and decision making investigate the effects on performance of such information factors as amount of information presented, coding, specificity, alpha-numeric versus graphic format, rate and degree of updating, and use of hard copy, individual versus group procedures, probability data, decision alternatives, and consequences generated by man and computer. Results of these studies delineate human performance capabilities and limitations. They have implications for improved work methods for operational personnel and for increasing the efficiency of the information assimilation-decision process.

Another series of studies concerns problems inherent in preparing information (screen, transform, input) for subsequent use. Apart from the effects on these operations of the factors listed above, other questions must be answered: How can personnel be best utilized in screening and transforming masses of information? Should they work as teams or as individuals? What aptitudes and skills are needed? Different work methods, techniques, and configurations of groups are tried out in various tasks to determine how accuracy, completeness, and speed of information processing are affected. 1, 23.

**WORK UNIT: Tactical Operations Systems (TOS). FY 1969.**

The more recently initiated work unit deals with the Army's Tactical Operations System (TOS). This complex man-equipment organization requires clear understanding of the various parts, functions, and interrelationships to assure total system effectiveness. The BESRL Command Systems Field Branch was established and located with the 7th Army TOS Development Group in USAREUR to perform research in an operational setting and to furnish human factors assistance to TOS evaluation efforts. An experimental facility has been developed within BESRL's Information Systems Laboratory in which aspects of ADSAF functions are simulated. Research scientists are conducting research on information requirements, criterion measures for evaluating performance at various levels, data input and display functions, and decision making in the field. The TOS itself is part of

a larger complex within which mutual dependencies exist. Problems of centralization-decentralization and extent of overlap in the data bases maintained in the various systems come under research scrutiny in relation to the requirements for capability of independent action.

BESRL research yields assistance to users and developers of command systems in the form of findings regarding 1) allocation of functions to men and equipment, 2) identification of appropriate personnel for critical positions, 3) objective performance measures for the evaluation of man-machine interaction, 4) emergency manual back-up systems, and 5) differing system configurations. 4, 15, 23.

**WORK UNIT:** The Determination of Interpreter Techniques in a Surveillance Facility. FY 1969.

The capability to acquire aerial imagery has increased manyfold, with a resultant increase in the amount of raw reconnaissance data that must be reduced. At the same time, increasing mobility of the armed forces puts a premium on the speedy reduction of these data. Within this context, it is the interpreter who must transform the raw data into intelligence information. The need to handle large volumes of static and dynamic (real-time) imagery of various types (photographic, infrared, and radar) in new tactical interpretation facilities demands critical examination of the tasks and duties of the interpreter.

Research on interpreter functions within existing systems was initiated by BESRL in FY 1965. Early studies established the necessity for enhancing both the accuracy and completeness of interpretation to meet the crucial and exacting demands of modern tactical operations. An expanded research effort was formulated to apply to the broad area of surveillance systems. The research is conducted as an in-house effort, augmented by research contracts with organizations selected as having superior capabilities and facilities for research in aerial surveillance. Within BESRL, an Information Systems Laboratory has been established in which computerized equipment is used to simulate variations in display mode, image quality, image enhancement devices, and other aspects of information processing specified for experimentation.

The INTERPRETER TECHNIQUES Work Unit focuses on developing work methods and procedures which, through the most efficient use of human abilities, maximize the accuracy, completeness, the speed with which intelligence information is derived from imagery.

BESRL findings indicate that many factors influence performance: the imagery, its content, quality, and scale; the requirements placed on the interpreter in terms of accuracy, completeness, and speed; the man, his ability, background, and experience; and the display and equipment with which he works. Studies of these factors, severally and in combination, provide direction for method of achieving gain in interpreter performance.

Special studies have concentrated on screening quantities of imagery to select the most promising frames for more intensive interpretation, methods of detecting change in imagery obtained at different times (including use of computer analysis), methods of dealing with infrared and SLAR imagery for better interpretation through systematic identification and consolidation of cues and signals. 25, 32.

**WORK UNIT: Influence of Displays on Image Interpreter Performance. FY 1969.**

In systems concerned with obtaining, processing, and displaying imagery for the extraction of intelligence information, the interface problem of relating human performance to display characteristics must be considered. In BESRL's Information Systems Laboratory, a variety of display characteristics and conditions can be tested to determine appropriate conditions for imagery acquisition and the most efficient presentation for tactical imagery and related reference materials.

Studies are conducted to determine how performance is affected by variation in the characteristics of the photos displayed--magnification and orientation, for example--and by the nature and content of references and reporting devices used by the interpreter. A major concern of the work unit is the relationship of image quality to information extraction. Recent work has been concerned with the evaluation of selected characteristics of photographic references and with the effects of imagery transmission on performance. In addition, alternative target entry and correction procedures using such input/output devices as teletypewriters, cathode ray tubes with associated typewriter, and fixed response keyboards interfaced in the laboratory with a digital computer have been studied.

Work on the interpretability of infrared and radar imagery has progressed to the stage where a number of interpretation difficulties have been identified, together with cues and signatures that may lead to improved performance. Based on these cues and signatures, reference materials of increased usefulness to the interpreter can be assembled. 10, 21, 26.

**WORK UNIT: Information Processing in Advanced Image Interpretation Systems. FY 1969.**

Intrinsic to the development of an effective advanced surveillance information processing system are: the rapid retrieval of required reference information; the specification of required team methods and communication links among personnel; and the delineation of procedures for controlling system operations and interpreter decision processes. It is then necessary to test the total system configuration of men, equipment, and procedures and compare it with reasonable alternatives under operational conditions. On the basis of such evaluation, modifications and improvements are introduced. The studies in the IMAGE SYSTEMS Work Unit are directed toward the fulfillment of these objectives and thereby to contributing to the orderly development of a highly effective, smoothly functioning system.

Research to date has studied how the efforts of a number of interpreters can best be combined in team operations to meet system demands for increased accuracy, completeness, and timeliness. Computer-aided procedures for use in selecting reference keys have also been developed and experimentally evaluated. Work has been initiated on the establishment of a decision matrix approach to controlling interpretation systems output. A convenient means of establishing the trade-off costs of interpretation errors of various types has been established.

A standard measurement package for assessing the comparative performance of alternative concepts and configurations has been completed. The package includes all materials and instructions (including scenario with attendant imagery, data collection and reporting forms, and scoring rules and criteria) necessary for evaluating and comparing a variety of tactical image interpretation facilities. A simulated advanced facility has been developed and tested in BESRL's Information Systems Laboratory for the purpose of exercising the standard measurement package and developing a sound model for further systems research. 5, 9, 13, 25.

**WORK UNIT:** Intelligence Information Processing Systems. FY 1969.

The need for continually updating intelligence appraisals while absorbing and evaluating incoming information from a great variety of sources imposes a severe burden on the intelligence analyst. He must judge source reliability and information accuracy, determine relevancy and decay rates, and consider information gaps while integrating large amounts of different kinds of information.

Emphasis in BESRL's INTELLIGENCE SYSTEMS Work Unit is on the development and application of automated data handling techniques to assist the decision process. Allocation of functions and interrelations between man and computer are studied intensively to identify the critical intelligence operations which must be performed by the man and those which can be automated wholly or in part so that an effective man-machine balance can be achieved and productive man/machine dialogs or interaction techniques developed. 25.

## TECHNICAL ADVISORY SERVICE

BESRL research scientists provide technical advisory services to various elements of military management on a wide range of behavioral science problems. Services include consultative assistance on application of research findings to operational problems, evaluation of personnel and manpower policies and proposals and implications of concepts emerging from research, assistance with problems of research planning, design of experiments, and interpretation of findings, evaluation of concepts and contractor proposals in the area of human performance and manned systems research, and participation in study and planning groups Army- and service-wide, such as ad hoc working groups for the Manpower Management Planning Board on interservice problems, the Army Mathematics Steering Committee, the Armed Forces-NRC Vision Committee, and the Joint Chiefs of Staff ISCIG Multi-Sensory Correlating Committee. 16.

## In-house Laboratory Independent Research (ILIR)

While BESRL research is in the main conducted so as to be responsive to military requirements, a limited portion of the Laboratory effort is devoted to the conduct of original research appropriate to the interests and capabilities of the personnel concerned. Scientific talent is directed toward the exploration of new developments in experimental psychology, psychometrics, statistical-mathematical models and other operations research methodology. Laboratory capability may thus be extended in terms of knowledge, techniques, and facilities which may ultimately be applicable in research on a wide range of Army activities. 3, 12.

## DEPOSITORY LIBRARIES

### BESRL Research Publications

BESRL Technical Research Reports and Research Notes are on file in each of the following libraries, listed by state.

#### Alabama

University of Alabama Library  
Reference Department  
University, Alabama 35486

Auburn University  
Ralph Brown Draughon Library  
Serials Department  
Auburn, Alabama 36830

#### Alaska

University of Alaska Library  
Government Documents Division  
College, Alaska 99735

#### Arizona

Arizona State University  
Matthews Library  
Documents Librarian  
Tempe, Arizona 85281

University of Arizona Library  
Acquisitions Department  
Tucson, Arizona 85721

#### Arkansas

Arkansas State College Library  
Acquisitions Librarian  
State College, Arkansas 72467

#### California

University of California  
General Library  
Documents Department  
Berkeley, California 94720

University of California Library  
Government Publications Room  
405 Hilgard Avenue  
Los Angeles, California 90024

California State Library  
Documents Section  
Sacramento, California 95809

San Diego State College Library  
San Diego, California 92115

The Hannold Library  
Documents Department  
Claremont, California 91711

University of California Library  
Documents Section  
Riverside, California 92502

University of California Library  
Government Publications Department  
Santa Barbara, California 93106

California State College at Los Angeles  
John F. Kennedy Memorial Library  
Documents Section  
5151 State College Drive  
Los Angeles, California 90032

California (Continued)

Library  
Occidental College  
1600 Campus Road  
Los Angeles, California 90041

Documents Section  
The University Library  
University of California  
Santa Cruz, California 95060

Chico State College Library  
Chico, California 95927

Fresno State College Library  
Government Publications Department  
Fresno, California 93726

University of California Library  
Documents Department  
Davis, California 95616

Library, University of  
Southern California  
700 West 35th Place  
Los Angeles, California 90007

University of California Library  
Government Publications Section  
Irvine, California 92650

San Fernando Valley State College  
Library-Acquisitions Department  
18111 Nordhoff Street  
Northridge, California 91324

Connecticut

Wesleyan University, The Library  
Middletown, Connecticut 06457

University of Bridgeport Library  
Bridgeport, Connecticut 06602

Delaware

University of Delaware  
Morris Library  
Documents Department  
Newark, Delaware 19711

District of Columbia

Library of Congress  
Washington, D. C. 20540

Florida

Florida State University Library  
Documents Division  
Tallahassee, Florida 32306

University of Florida Libraries  
Documents Division  
Gainesville, Florida 32603

Georgia

University of Georgia  
The University Libraries  
Documents Section  
Athens, Georgia 30602

Hawaii

University of Hawaii Library  
Government Documents Collection  
2425 Campus Road  
Honolulu, Hawaii 96822

Illinois

University of Illinois Library  
Documents Division  
Urbana, Illinois 61803

Center for Research Libraries  
5721 Cottage Grove Avenue  
Chicago, Illinois 60637

Northwestern University Library  
Documents Department  
Evanston, Illinois 60201

University of Chicago Library  
Documents Librarian  
Chicago, Illinois 60637

Illinois State University  
Milner Library  
Acquisitions Department  
Normal, Illinois 61761

Southern Illinois University  
The General Library  
Serials Department  
Carbondale, Illinois 62903

Northern Illinois University  
Library  
Documents Department  
DeKalb, Illinois 60115

Western Illinois University Library  
Documents Librarian  
Macomb, Illinois 61455

University of Illinois  
at Chicago Circle  
Documents Section  
P. O. Box 8198  
Chicago, Illinois 60680

Indiana

Purdue University Library  
Reference Unit  
Lafayette, Indiana 47907

Indiana (Continued)

Indiana State Documents Librarian  
140 N. Senate Avenue  
Indianapolis, Indiana 46204

Indiana University Library  
Documents Librarian  
Bloomington, Indiana 47405

Indiana State University  
Cunningham Memorial Library  
Documents Librarian  
Terre Haute, Indiana 47803

Ball State University Library  
Muncie, Indiana 47306

University of Notre Dame  
Acquisitions Dept. (277449A)  
Memorial Library  
Notre Dame, Indiana 46556

Iowa

State College of Iowa  
Library - Serials - A  
Cedar Falls, Iowa 50613

Iowa State University of Science  
and Technology  
The Library  
Ames, Iowa 50010

Cowles Library  
Drake University  
Des Moines, Iowa 50311

Kansas

University of Kansas Library  
Documents Librarian  
Lawrence, Kansas 66045

Kansas State University Library  
Acquisitions  
Manhattan, Kansas 66502

**Kentucky**

University of Kentucky  
University Libraries  
Continuation Division  
Acquisition Department  
Lexington, Kentucky 40506

University of Louisville Library  
Documents Librarian  
Louisville, Kentucky 40208

Western Kentucky University Library  
Director of Library Services  
Bowling Green, Kentucky 42101

**Louisiana**

Louisiana State University Library  
Government Documents Department  
Baton Rouge, Louisiana 70803

**Maine**

University of Maine  
Raymond H. Fogler Library  
Documents Librarian  
Orono, Maine 04473

**Maryland**

University of Maryland  
McKeldin Library  
Social Science Department  
College Park, Maryland 20742

Johns Hopkins University Library  
Acquisitions  
Baltimore, Maryland 21218

Montgomery County Board of  
Education  
Curriculum Laboratory  
Educational Services Section  
North Washington Street  
Rockville, Maryland 20850

**Massachusetts**

University of Massachusetts  
Amherst, Massachusetts

Boston College  
Bapt Library  
Serials Librarian  
Chestnut Hill, Massachusetts 02167

**Michigan**

Detroit Public Library  
5201 Woodward Avenue  
Detroit, Michigan 48202

University of Michigan Library  
Documents Librarian  
Ann Arbor, Michigan 48104

Michigan State University Library  
Documents Librarian  
East Lansing, Michigan 48823

Wayne State University Library  
Documents Librarian  
Detroit, Michigan 48202

Western Michigan University  
Dwight B. Waldo Library  
Documents Librarian  
Kalamazoo, Michigan 49001

Central Michigan Library  
Mount Pleasant, Michigan 48858

Documents Library  
Oakland University  
Rock, Michigan 49880

**Minnesota**

University of Minnesota  
Walter Library  
Documents Division  
Minneapolis, Minnesota 55455

Mississippi

Mississippi State University  
Mitchell Memorial Library  
Acquisition Department  
Serials Section - Box 1517  
State College, Mississippi 39762

University of Southern  
Mississippi Library  
P. O. Box 53, Station A  
Hattiesburg, Mississippi 39401

Missouri

Kansas City Public Library  
Documents Division  
1211 McGee Street  
Kansas City, Missouri 64106

University of Missouri Library  
Serials Documents  
Columbia, Missouri 65202

Nebraska

University of Nebraska Library  
Documents Librarian  
Lincoln, Nebraska 68508

New Hampshire

Dartmouth College  
Baker Library  
Reference Department  
Hanover, New Hampshire 03755

New Jersey

Princeton University Library  
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Princeton, New Jersey 08540

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Rutgers University Library  
Periodical Department  
New Brunswick, New Jersey 08901

New Mexico

University of New Mexico  
Zimmerman Library  
Serials Department  
Albuquerque, New Mexico 87106

New York

Brooklyn Public Library  
Documents Division  
Grand Army Plaza  
Brooklyn, New York 11238

Columbia University Libraries  
Documents Acquisition  
535 West 114th Street  
New York, New York 10018

Cornell University Libraries  
Government Documents  
Ithaca, New York 14850

New York Public Library  
Government Documents  
5th Avenue and 42nd Street  
New York, New York 10018

New York State Library  
Gift and Exchange Section  
Albany, New York 12224

Syracuse University Library  
Serials Division  
Syracuse, New York 13210

Documents Librarian  
Hunter College of the City  
University of New York,  
605 Park Avenue  
New York, New York 10022

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Dag Hammarskjöld Library  
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State University College  
Milne Library  
Geneseo, New York 14454

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Alfred, New York 14802

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James M. Milne Library  
Oneonta, New York 13820

Hofstra University Library  
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Hempstead, New York 11550

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City of New York  
42 West 114th Street  
New York, New York 10036

Nassau Library System  
Reference Department  
Lower Concourse, Roosevelt Field  
Garden City, New York 11530

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Head, Documents Section  
Rever Campus Station  
Rochester, New York 14627

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Duke University Library  
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Durham, North Carolina 27706

North Carolina State College  
D. H. Hill Library  
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University of North Carolina Library  
BA/SS Division - Documents  
Chapel Hill, North Carolina 27515

Ohio

Bowling Green State University Library  
Documents Department  
Bowling Green, Ohio 43402

Kent State University Library  
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Kent, Ohio 44240

Ohio University Library  
Documents Section  
Athens, Ohio 45701

Miami University Library  
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Oxford, Ohio 45056

Ohio State University Libraries  
Documents Division  
1858 Neil Avenue  
Columbus, Ohio 43210

Oberlin College Library  
Documents Librarian  
Reference Department  
Oberlin, Ohio 44074

Oklahoma

Oklahoma Department of Libraries  
109 State Capitol  
Oklahoma City, Oklahoma 73105

Central State College  
Max Chambers Library  
Documents Department  
Edmund, Oklahoma 73034

Oregon

University of Oregon Library  
Documents Division  
Eugene, Oregon 97403

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Free Library of Philadelphia  
Department of Public Documents  
Philadelphia, Pennsylvania 19103

Carnegie Library of Pittsburgh  
Reference Department  
Pittsburgh, Pennsylvania 15213

University of Pittsburgh  
Hilman Library  
Documents Library, G8  
Pittsburgh, Pennsylvania 15213

Pennsylvania State University Library  
Documents Librarian  
University Park, Pennsylvania 16802

Pennsylvania State Library  
Technical Services, Room 46  
Box 1601  
Harrisburg, Pennsylvania 17126

Community College of Philadelphia  
Library  
34 South 11th Street  
Philadelphia, Pennsylvania 19103

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Brown University Library  
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University of Rhode Island Library  
Kingston, Rhode Island 02881

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University of South Carolina  
Education Library  
Columbia, South Carolina 29208

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University of Tennessee Library  
Documents Librarian  
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Dallas Public Library  
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Dallas, Texas 75201

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Denton, Texas 76103

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Austin, Texas 78712

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Texas State Library  
U. S. Documents Section  
Drawer DD, Capital Station  
Austin, Texas 78711

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at Arlington  
The Library  
Arlington, Texas 76010

Texas Christian University  
Mary Coutts Burnett Library  
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University of Utah  
Library Periodical Room  
Salt Lake City, Utah 84112

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Documents Section  
Provo, Utah 84601

Utah State University Libraries  
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Seattle, Washington 98105

Washington State University Library  
Serial Record Section  
Pullman, Washington 99163

Washington State Library  
Library Building  
Olympia, Washington 98501

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Morgantown, West Virginia 26506

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Milwaukee, Wisconsin 53233

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2500 E. Kenwood Boulevard  
Milwaukee, Wisconsin 53211

Wyoming

University of Wyoming Library  
Documents Librarian  
Laramie, Wyoming 82071

## U. S. ARMY PERSONNEL PROGRAMS

utilizing psychological research test products of the  
Behavioral Science Research Laboratory

| PROGRAM                                                                                                                                                                                                                                                                                                                                   | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <u>Pre-enlistment Screening of Male Enlistment Applicants</u><br><br>To screen men enlisting or reenlisting from civilian life who must be tested prior to traveling to Armed Forces Examining Stations for Armed Forces Qualification Test (AFQT) administration.<br><br><u>Tests:</u> Enlistment Screening Test, EST.                   | 540,000                                    |
| <u>Screening of Male Enlistment Applicants</u><br><br>To screen men on mental acceptability prior to enlistment at AFEES.<br><br><u>Tests:</u> Armed Forces Qualification Test, AFQT.<br>Army Qualification Battery, AQB.                                                                                                                 | 707,000<br>622,000                         |
| <u>Pre-enlistment Screening of Female Enlistment Applicants</u><br><br>To screen women enlisting or reenlisting from civilian life who must be tested prior to traveling to Armed Forces Examining Stations for Armed Forces Women's Selection Test (AFWST) administration.<br><br><u>Tests:</u> Women's Enlistment Screening Test, WEST. | 11,900                                     |
| <u>Screening of Female Enlistment Applicants</u><br><br>To screen women for mental acceptability prior to enlistment.<br><br><u>Tests:</u> Armed Forces Women's Selection Test, AFWST.<br>Women's Army Classification Battery, WACB.                                                                                                      | 8,600                                      |
| <u>Screening and Counseling of Male High School Seniors</u><br><br>To screen high school seniors and provide guidance regarding their aptitude potential for Army jobs.<br><br><u>Test:</u> Armed Services Vocational Aptitude Battery                                                                                                    | 357,000                                    |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                        | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <p><u>Enlistment Screening of Male Reserve and National Guard Applicants</u></p> <p>To screen men for mental acceptability prior to enlistment in the Army Reserve or the Army National Guard.</p> <p><u>Tests:</u> Armed Forces Qualification Test, AFQT (Reserve Components Edition).<br/>Army Qualification Battery, AQB (Reserve Components Edition).</p>                                  | 200,000                                    |
| <p><u>Screening of Selective Service Registrants</u></p> <p>To screen Selective Service Registrants for mental acceptability prior to induction.</p> <p><u>Tests:</u> Armed Forces Qualification Test, AFQT.<br/>Army Qualification Battery, AQB.</p>                                                                                                                                          | 1,119,000<br>145,000                       |
| <p><u>Detecting Deliberate AFQT Failures</u></p> <p>To aid personnel psychologist in verifying AFQT failures among Selective Service Registrants with percentile scores of 0 through 9 on AFQT.</p> <p><u>Tests:</u> Included within Terminal Screening Procedures.</p>                                                                                                                        | 99,000                                     |
| <p><u>Screening of Insular Puerto Rican Selective Service Registrants</u></p> <p>To screen Selective Service Registrants in Puerto Rico who must undergo mental acceptability testing in Spanish prior to induction into the Army for training.</p> <p><u>Tests:</u> Examen Calificacion de Fuerzas Armadas, ECFA.<br/>English Fluency Battery, EFB.<br/>Army Classification Battery, ACB.</p> | 22,000                                     |
| <p><u>Initial Classification of Enlisted Male Personnel</u></p> <p>To determine MOS appropriate for direct award, and MOS recommended for advanced training of replacement stream enlisted personnel processed through Reception Stations.</p> <p><u>Tests.</u> Army Classification Battery, ACB. (Standard Scores on 11 tests are converted into 8 Aptitude Area composites.</p>              | 471,000                                    |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <p><u>Initial Classification of Motor Vehicle Drivers</u></p> <p>To screen individuals during Reception Station processing as a prerequisite to licensing for driver assignments.</p> <p><u>Tests:</u> Motor Vehicle Driver Selection Battery I, MDB-I</p>                                                                                                                                                                                                                                                                                                                                                                         | 556,000                                    |
| <p><u>Selection of Basic Trainees for Training as Acting NCOs</u></p> <p>To select basic trainees for training as acting NCOs. Selection is based on peer ratings of leadership potential obtained during the fifth week of Basic Combat Training. Individuals selected are given two weeks of NCO training upon completion of their Basic Combat Training, and serve as acting NCOs during Advanced Individual Training.</p> <p><u>Tests:</u> Leadership Potential Rating, LPR. (This procedure consists of a ranking procedure within training squads, followed by a rating of leadership potential on a seven-point scale.)</p> | 500,000                                    |
| <p><u>Licensing Drivers of Army Motor Vehicles</u></p> <p>To determine qualifications of military personnel, civilians, and indigenous personnel for standard driver licenses.</p> <p><u>Tests:</u> Motor Vehicle Driver Selection Battery II, MDB-II (unless previously qualified on MDB-I). Testing Procedures for Licensing Drivers of Army Motor Vehicles: Includes physical evaluation and driving performance test.</p>                                                                                                                                                                                                      | 358,000                                    |
| <p><u>Selection of Personnel for Foreign Language Training</u></p> <p>To screen personnel for foreign language aptitude as a prerequisite for application for training at the Army Language School.</p> <p><u>Tests:</u> Defense Language Aptitude Test, DLAT</p>                                                                                                                                                                                                                                                                                                                                                                  | 100,000                                    |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <p><u>Measurement of Foreign Language Proficiency</u></p> <p>To determine the extent to which military personnel meet qualifying standards of proficiency in specified foreign languages.</p> <p><u>Tests:</u> DOD Language Proficiency Tests in the following languages: Albanian, Arabic-Egyptian, Arabic-Iraqi, Arabic-Syrian, Bulgarian, Burmese, Chinese Cantonese, Chinese Mandarin, Czech, Danish, Dutch, Finnish, French, German, Greek, Hebrew, Hungarian, Icelandic, Indonesian, Italian, Japanese, Korean, Lithuanian, Norwegian, Persian, Polish, Portuguese, Portuguese-Brazilian, Romanian, Russian, Serbo-Croatian, Slovenian, Spanish-Latin American, Spanish-European, Swahili, Thai, Turkish, Ukrainian, Vietnamese-Hanoi, Vietnamese-Saigon, Yiddish.</p> | 57,000                                     |
| <p><u>Measurement of Skill in Shorthand and Typing</u></p> <p>To obtain typing and dictation scores for those enlisted personnel undergoing reception station processing who claim skill in typing and shorthand. Scores obtained are used in determining the individual's most appropriate training and assignment.</p> <p><u>Tests:</u> Typing and Dictation Test.</p>                                                                                                                                                                                                                                                                                                                                                                                                     | Data not<br>available                      |
| <p><u>Selection for Training and Assignment in Special Forces Organizations</u></p> <p>To determine the aptitude of enlisted volunteers in the Active Army and in the Army Reserve for training and assignment in Special Forces organizations.</p> <p><u>Tests:</u> Special Forces Selection Battery, consisting of:</p> <ul style="list-style-type: none"> <li>a. Special Forces Locations Test, SFL.</li> <li>b. Critical Decisions Test, CDT.</li> <li>c. Special Forces Suitability Inventory, SFI.</li> </ul>                                                                                                                                                                                                                                                          | 12,000                                     |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
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| <p><u>Selection of Personnel for Training as Army Aviators</u></p> <p>To screen male personnel who volunteer for fixed-wing or rotary-wing aviator training courses.</p> <p><u>Tests:</u> 1. For administration to officers applying for officer aviator courses.<br/>Flight Aptitude Selection Tests, FAST</p> <p>2. For administration to enlisted men and enlistment option applicants volunteering for Warrant Officer Candidate aviation courses.<br/>Flight Aptitude Selection Tests, FAST.</p> | <p>8,000</p> <p>20,000</p>                 |
| <p><u>Selection of ROTC Cadets for Fixed-Wing Aviation Training</u></p> <p>To select ROTC Cadets for fixed-wing aviation flight training.</p> <p><u>Tests:</u> Army Fixed-Wing Aptitude Battery</p>                                                                                                                                                                                                                                                                                                   | <p>2,000</p>                               |
| <p><u>Selection of Cadets for Junior College ROTC Training</u></p> <p>To select students at Military Schools Division Army ROTC units established at secondary level and junior college educational institutions for MST-5 and MST-6 ROTC training.</p> <p><u>Tests:</u> General Screening Test, GST. (Testing occurs during senior high school year.)</p>                                                                                                                                            | <p>1,000</p>                               |
| <p><u>Selection of Cadets for Senior Division Advanced ROTC Training</u></p> <p>To select cadets for Senior Division Advanced ROTC training from among students who are successfully completing or receiving credit for basic course (first two years college).</p> <p><u>Tests:</u> ROTC Qualifying Examination, RQ. (Testing occurs during sophomore college year.)</p>                                                                                                                             | <p>41,000</p>                              |
| <p><u>Selection of Male Officer Personnel for Training as Army Image Interpreters</u></p> <p>To determine qualifications of Army Intelligence and Security Branch (AIS) officers for training as Army image interpreters.</p> <p><u>Tests:</u> Image Interpreter Selection Battery consisting of:</p> <ul style="list-style-type: none"> <li>a. Image Orientation Test</li> <li>b. Image Interpreter Information Test</li> </ul>                                                                      | <p>5,000</p>                               |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
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| <p><u>Selection of Male Personnel for Officer Candidate School</u></p> <p>To screen Warrant Officers and enlisted men in the Active Army and in the Army Reserve not on active duty who are applying for Officer Candidate School. Minimum scores on Aptitude Area GT and Officer Candidate Test, OCT are required as a prerequisite to administration of the Officer Candidate Selection Battery to Active Army applicants.</p> <p><u>Tests:</u> Officer Candidate Selection Battery, consisting of:</p> <ul style="list-style-type: none"> <li>a. Officer Leadership Qualification Report, OLR-1.</li> <li>b. Officer Qualification Inventory, OQI-1.</li> <li>c. Officer Leadership Board Interview, OLB-1.</li> </ul> | <p>235,000</p> <p>73,000</p>               |
| <p><u>Selection of Female Personnel for Officer Candidate School</u></p> <p>To screen Warrant Officers and enlisted women in the Active Army and in the Army Reserve not on active duty who are applying for Officer Candidate School.</p> <p><u>Tests:</u> WAC Officer Candidate Selection Battery, consisting of:</p> <ul style="list-style-type: none"> <li>a. WAC OCS Biographical Information Blank.</li> <li>b. WAC Officer Candidate Applicant Interview.</li> <li>c. WAC Officer Candidate Applicant Evaluation Report. (Minimum score on Aptitude Area GT required as a prerequisite to administration of the WAC Officer Candidate Selection Battery to Active Army applicants.)</li> </ul>                     | <p>150</p>                                 |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
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| <p><u>Appointment of Male Personnel as Reserve Warrant Officers</u></p> <p>To select enlisted men in the Active Army and in the Army Reserve not on active duty for appointment as Reserve Warrant Officers.</p> <p><u>Tests:</u> 1. For administration to enlisted men in the Active Army (except aviation):</p> <ul style="list-style-type: none"> <li>a. Officer Qualification Inventory, OQI-1.</li> <li>b. Officer Leadership Board Interview, OLB</li> <li>c. Officer Leadership Qualification Report, OLR</li> </ul> <p>2. For administration to enlisted men not on active duty (except aviation):</p> <ul style="list-style-type: none"> <li>a. Officer Qualification Inventory, OQI-1.</li> <li>b. Officer Leadership Board Interview, OLB</li> <li>c. Interview Appraisal Sheet S</li> </ul> | 5,900                                      |
| <p><u>Appointment of Female Personnel as Reserve Warrant Officers</u></p> <p>To select enlisted women in the Active Army and in the Army Reserve not on active duty for appointment as Reserve Warrant Officers.</p> <p><u>Tests:</u> WAC OCS Biographical Information Blank.<br/>WAC Officer Candidate Applicant Officer Interview.<br/>Interview Appraisal Sheet S.</p>                                                                                                                                                                                                                                                                                                                                                                                                                               | 10                                         |
| <p><u>Appointment of Male Personnel to Commissions in the United States Army Reserve</u></p> <p>To select male personnel in the following categories for appointment to commissions in the United States Army Reserve: Warrant Officers and enlisted men currently serving in any component of the Army; Reserve Warrant Officers and enlisted men who are currently serving in an active status in the Army Reserve; and former warrant officers and enlisted men.</p> <p><u>Tests:</u> Officer Qualification Inventory, OQI-1.<br/>Officer Leadership Board Interview, OLB.<br/>Interview Appraisal Sheet M (for use with all applicants except technical experts or specialists) or Interview Appraisal Sheet S (for use with technical experts or specialists).</p>                                 |                                            |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
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| <p><u>Appointment of WAC Personnel to Commissions in the United States Army Reserve</u></p> <p>To select female personnel in the following categories for appointment to commissions in the United States Army Reserve: Warrant Officers and enlisted women currently serving in any component of the Army, Reserve Warrant Officers and enlisted women who are currently serving in an active status in the Army Reserve, and former warrant officers and enlisted women.</p> <p><u>Tests:</u> WAC OCS Biographical Information Blank.<br/>WAC Officer Candidate Applicant Interview.<br/>Interview Appraisal Sheet M (for use with all applicants except technical experts or specialists) or Interview Appraisal Sheet S (for use with technical experts or specialists).</p>                                                                                                                                                                                                                                                                                                                                                                             | 000                                        |
| <p><u>Appointment of Male Personnel to Commissions in the Regular Army</u></p> <p>To select male personnel in the categories indicated below for appointment to commissions in the Regular Army.</p> <p><u>Tests:</u></p> <ol style="list-style-type: none"> <li>1. For administration to officers on active duty, to former commissioned officers, and to applicants for commissions in Corps of the Army Medical Service:             <ol style="list-style-type: none"> <li>a. Interview Blank, Form 4.</li> <li>b. Biographical Information Blank, Form F.</li> </ol> </li> <li>2. For administration to Warrant Officers and enlisted men on active duty and to former Warrant Officers and enlisted men:             <ol style="list-style-type: none"> <li>a. Officer Qualification Inventory, OQI-1.</li> <li>b. Officer Leadership Board Interview, OLB.</li> <li>c. Officer Leadership Qualification Report, OLR.</li> </ol> </li> <li>3. For administration to ROTC Distinguished Military Graduates:             <ol style="list-style-type: none"> <li>a. ROTC Inventory, RI.</li> <li>b. ROTC Evaluation Report, ROE-..</li> </ol> </li> </ol> |                                            |

| PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | NUMBER OF<br>APPLICANTS<br>TESTED ANNUALLY |
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| <p><u>Appointment of Male Personnel to Commissions in the Regular Army (Continued)</u></p> <ol style="list-style-type: none"> <li>4. For administration to technical specialists possessing advanced degrees or possessing bachelor's degree with appropriate experience:               <ol style="list-style-type: none"> <li>a. Interview Blank, Form 4.</li> <li>b. Biographical Information Blank, Form F.</li> <li>c. Interview Appraisal Sheet S.</li> </ol> </li> <li>5. For administration to scholastically outstanding graduates of accredited colleges and universities who did not take ROTC training for valid reasons:               <ol style="list-style-type: none"> <li>a. ROTC Inventory, RI</li> <li>b. Officer Leadership Board Interview, OLB.</li> </ol> </li> </ol>                                                                                                                                                                                                                                                        | 5,500                                      |
| <p><u>Appointment of Female Personnel to Commissions in the Regular Army</u></p> <p>To select female personnel in the categories indicated below for appointment to commissions in the Regular Army.</p> <p><u>Tests:</u></p> <ol style="list-style-type: none"> <li>1. For administration to warrant officers and enlisted women on active duty and to former warrant officers and enlisted women:               <ol style="list-style-type: none"> <li>a. WAC Officer Candidate Applicant Interview.</li> <li>b. WAC Officer Candidate Applicant Evaluation Report.</li> <li>c. WAC OCS Biographical Information Blank.</li> </ol> </li> <li>2. For administration to applicants for Regular Army commissions in the Army Nurse Corps, the Women's Medical Specialist Corps, and the Medical Corps:               <ol style="list-style-type: none"> <li>a. Board Interview for Officers in the Army Medical Service.</li> <li>b. Biographical Information Blank for Women Officers in the Army Medical Service, BIB-AMS.</li> </ol> </li> </ol> |                                            |

Unclassified  
Security Classification

**DOCUMENT CONTROL DATA - R & D**

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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| 14.<br>KEY WORDS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | LINK A |    | LINK B |    | LINK C |    |
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| Research methodology<br>*Psychological research<br>*Behavioral science<br>Operations research modeling<br>*Personnel management<br>*Human performance experimentation<br>*Manred system research<br>Computerized manpower systems<br>*Selection--military personnel<br>*Classification--military<br>*Evaluation--human performance<br>Simulation studies<br>*Evaluation--systems effectiveness<br>*Personnel utilization<br>Mathematical manpower models<br>Statistical analysis<br>*Psychometrics<br>Differential classification<br>Image interpretation<br>Intelligence systems<br>Command systems<br>Decision making<br>Research design<br>Performance prediction<br>Monitor performance<br>Measurement techniques |        |    |        |    |        |    |