

Technical Report 561



ABSTRACTS OF ARI RESEARCH PUBLICATIONS
FY 1982

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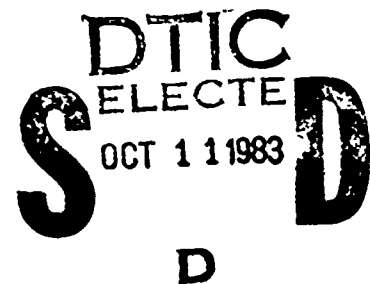


U. S. Army

Research Institute for the Behavioral and Social Sciences

May 1983

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A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

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Information systems	Systems effectiveness											
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ABSTRACTS OF ARI RESEARCH PUBLICATIONS

FY 1982

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Office, Deputy Chief of Staff for Personnel
Department of the Army

May 1983

Abstracts

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ARI Research Reports and Technical Reports are intended for sponsors of R&D tasks and for other research and military agencies. Any findings ready for implementation at the time of publication are presented in the last part of the Brief. Upon completion of a major phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or Disposition Form.

FOREWORD

The Army Research Institute for the Behavioral and Social Sciences (ARI) publishes a series of abstracts that summarize the research on which final or interim reports have been published during each fiscal year. The series began in 1957. This Technical Report contains the abstracts for Research publications for FY 1982, October 1981 to September 1982.

During this period, ARI was the Army's agency for behavioral and social science research and a field operating agency under the Office of The Deputy Chief of Staff for Personnel. Independent laboratories and supporting operational field units working together provided a flexible research program on personnel utilization, training and evaluation, leadership and management, simulation systems, manpower and educational systems, human factors in systems integration, state-of-the-art computer technology, and information sciences research for the modern Army.



EDGAR M. JOHNSON
Technical Director

ABSTRACTS OF ARI RESEARCH PUBLICATIONS FY 1982

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ABSTRACTS OF ARI RESEARCH PUBLICATIONS, FY 1982

INTRODUCTION

The present volume of abstracts, continuing the series begun in 1957, summarizes the research publications of the Army Research Institute for the Behavioral and Social Sciences (ARI) for the fiscal year 1982. Each volume of the series provides a synopsis of research efforts which reached publication stage during the period covered. The abstracts have been written, as far as possible, to describe the principal research findings in nontechnical terms; technical language is used to communicate efficiently the details of research analysis. Indexing by author and research area provides access to individual reports and topics.

Publication Categories

ARI Research publications are divided into separate, consecutively numbered categories appropriate to their intended audience and function. In FY 1982 the following categories of technical documentation were represented:

Research Report: A report of completed research intended primarily for dissemination to military managers. Research Reports may deal with policy-related issues but typically do not include specific policy recommendations.

Technical Report: A report of completed research intended primarily for dissemination to researchers. Technical Reports should closely approximate journal articles in outline, technical scope, and level of detail.

Research Note: This may be either an interim or a final report, but is typically of limited interest outside of ARI and is not printed or distributed except to Defense Technical Information Center. Included in this category are in-house reports and appendix materials to Research or Technical Reports.

Research Product: A user-oriented document intended for distribution to field personnel. Examples are handbooks, manuals, and guidebooks. Non-textual materials which are intended to be part of a Research Product, such as computer cards, electronic storage discs, videoc or audio tapes or cassettes, and special types of packaging, should ideally be a contract "deliverable" and not something which needs to be duplicated by ARI as a separate effort.

Distribution of ARI Publications

Initial distribution of these reports was made directly by ARI. Research Reports, Technical Reports, and Research Products were distributed primarily to operational and research facilities and their sponsors in the Defense Department, to other interested Government agencies, and to the Defense Technical Information Center (DTIC), and were also sent to the Library of Congress, which sends documents to Federal depository libraries. Research Notes were deposited in DTIC, and are available only from DTIC or its coordinating agency, the National Technical Information Service (NTIS), in hardcopy or microfiche.

Qualified requesters may obtain copies of reports deposited in the Defense Technical Information Center directly from DTIC, Cameron Station, Alexandria, Va., 22314. Anyone may purchase documents from NTIS, Department of Commerce, Springfield, Va., 22161. The multidigit AD number given for each report is the accession number that should be used in requesting documents from DTIC or NTIS.

Research Reports, Technical Reports and Research Products may also be obtained on loan from depository libraries in many metropolitan and university centers. A list of these libraries is given at the end of this publication.

ABSTRACTS OF RESEARCH PUBLICATIONS

Research Reports

RR 1248. Callahan, C. A., Blum, R. W., Witus, G., & Graulich, M. (Vector Research, Inc.). Guidelines for managing the flow of information in an automated battlefield command and control system. May 1980. (AD A107 297)

This report documents research on the development and evaluation of guidelines for Standing Operating Procedures (SOP) for managing information flow in automated battlefield command and control systems. This research was performed during the second phase of a project to develop information management concepts and procedures for tactical operations systems. Three stages of SOP guideline development are discussed: (a) identifying critical problems; (b) developing candidate management procedures to address the critical problems; and (c) evaluating the efficacy and side effects of the candidate procedures.

RR 1249. Blum, P. W., Callahan, C. A., Cherry, P., Kleist, D., Touma, G., & Witus, G. (Vector Research, Inc.). Information management for an automated battlefield command and control system. May 1980. (AD A109 285)

This executive summary presents synopses of seven documents produced in the second phase of a project to develop information management concepts and procedures for automated battlefield command and control (ABCC) systems. ARI Research Report 1248 describes considerations in and procedures for the management of contemporary ABCC systems. ARI Technical Report 458 presents an analysis of procedures for the extraction, summarization, and presentation of critical information.

ARI Research Note 80-12 describes an analysis of information flow in the Tactical Operations System (TOS), an example ABCC system. ARI Research Note 80-13 describes the mathematical model used in the information flow analysis. ARI Research Notes 80-14 and 80-15 describe the operation programming of the computer programs implementing the model. ARI Working Paper HF80-XX discusses design issues associated with the emerging All-Source Analysis System (ASAS) concept.

RR 1263. Evans, K. L., Thompson, T. J., & Smith, S. FORSCOM/US Army Marksmanship Unit M16A1 rifle and .45 cal pistol marksmanship training evaluation. August 1980. (AD A109 470)

The FORSCOM/US Army Marksmanship Unit M16A1 rifle and .45 cal pistol training evaluation was conducted to evaluate two candidate programs of instruction (POI) for rifle and pistol training at the field unit level. Performance and attitudinal measures were collected from soldiers of the 1/504th Infantry Bn (Airborne) who participated in the rifle and pistol training programs. The subjects were males from a combat-ready battalion.

Soldiers in both the rifle and pistol programs who received FULL-AMU treatment performed better and expressed greater confidence in training than did those receiving the PART-AMU, or abbreviated, training. Both groups

performed better and expressed greater confidence in training than did those in standard annual qualification training treatments. A unit using the AMU POIs for rifle and pistol training could elect to use the FULL or PART POIs based on available training time and resources and expect improved performances over current standard procedures. If time is available, the FULL POIs (rifle and pistol) would provide the greatest performance increases in terms of number of soldiers qualified and level of qualification.

RR 1264. Smith, S., Thompson, T. J., & Nicolini, A. Human factors and training evaluation of the Improved TOW Vehicle (ITV) during OT/DT III. August 1980. (AD A101 917)

The TRADOC System Manager (TSM) for the Improved TOW Vehicle (ITV) asked for ARI assistance in assessing human factors and training during the operational and developmental testing (OT/DT III) of the ITV. This report details this technical advisory service effort. The intent was to provide the TSM with quantified information on human factors and training problems to aid in making equipment and/or training modifications before the ITV system was fielded. Questionnaires, interviews, and field observations were used to obtain information from test soldiers, personnel playing the role of the threat force, and project personnel.

The ITV was judged to be good in concept but to be lacking in durability and reliability throughout OT/DT III. It was also judged to have problems keeping up with other vehicles and to be somewhat slow getting into or out of action. Boresighting was a problem. Command and control problems were evident at the squad leader's station. Many recommendations were made to improve the vehicle and training to operate it.

RR 1256. Maxey, J. L., Klein, R. D., & Dempster, R. J., Jr. (Litton-Mellonics Systems Development Division). Comparison of rifle defeatable threat criteria and the Infantry Remoted Target System (IRETS). May 1978. (AD A109 312)

The Army is considering the procurement of the Infantry Remoted Target System (IRETS) as a replacement for current Record Fire ranges. This report presents the findings of comparisons of the IRETS specifications and descriptive threat-oriented criteria. It concludes that the IRETS is an upgrading of older marksmanship evaluation concepts. Further, unless corrections of problems and limitations are made, the system should not be viewed as representing a quantum leap from current Record Fire ranges to a threat-oriented Record Fire facility.

RR 1267. Klein, R. D., & Maxey, J. L. (Litton-Mellonics Systems Development Division). Analysis of the threat oriented marksmanship training capabilities of the Infantry Remoted Target System (IRETS). September 1980. (AD A109 468)

At present, Army rifle marksmanship training is conducted on TRAINFIRE ranges, which were developed and installed during the late 1950s at selected Army Training Centers and other major U.S. Army installations. These ranges are rapidly becoming obsolete. Most are maintenance liabilities and are not

cost-effective. Further, the control systems for these ranges are antiquated. As a consequence, the U.S. Army is considering the procurement of a new, improved live fire training system, the Infantry Remoted Target System (IRETS).

Because it is planned to replace selected rifle marksmanship live fire ranges with the IRETS, it is important to know to what extent the planned capabilities of the IRETS are consistent with current concepts of threat-oriented rifle marksmanship training. This report presents the findings of a comparative analysis of the specifications for the IRETS and the target presentation and training requirements for threat-oriented rifle marksmanship training.

RR 1268. Martinek, H., Johnson, E. M., and Jeffrey, T. E. Communications intelligence: Transcriber output enhancement. September 1980. (AD A107 296)

A workflow model of major transcriber functions was developed, and time data for these functions were collected on 52 operational personnel. A time analysis was performed with respect to individual functions and logical sets of functions for a representative sample of transcribers. The time analysis of transcriber functions indicated that about one-third of productive time was spent in the Listen, Rock, and Search functions and another one-third in performing these functions in conjunction with others. About 11% of the transcribers' time was spent in obtaining help from reference material, 5% in the tape-changing functions, and 8% in teamwork functions. Differences clearly existed between organizational groups in the time spent on specific transcriber functions. Development of procedures to enable transcribers to exploit digitization and computer storage of taped communications should improve productivity at least 10 to 20% by eliminating search and tape-changing functions, by reducing time spent in getting help from reference material and other transcribers and in giving help, and improving exploitation of source material.

RR 1270. Alderman, I. N., Ehrenreich, S. L., & Bindewald, R. Recent ARI research on the data entry process in battlefield automated systems. September 1980. (AD A107 667)

This paper reviews ARI research designed to improve the data entry process. The first and second sections of the paper describe the data entry process in general as well as in the context of a specific battlefield automated system, the Tactical Operating System (TOS). Because it was used as an exemplar of the data entry process, TOS played an important role in the development of improved data entry procedures. The third section of the paper reviews the findings and conclusions of the many ARI research projects concerned with data entry.

The fourth section of the paper reports on efforts to analyze the cause of operator errors. This section also discusses the development of a simulation of the data entry process. The simulation is intended to facilitate system design by permitting the inexpensive evaluation of alternate data entry procedures. The fifth section presents a general discussion of the problems that have been encountered by the ARI research program. Also included is a discussion on how this program might be improved in the future. The final section summarizes the operational implications of ARI's research results.

RR 1279. Berkowitz, M., & O'Neil, H. F., Jr. (ARI); & Wagner, H. (Human Resources Research Organization). A formative evaluation plan for the Automated Instructional Management System (AIMS). June 1980. (AD A109 194)

This report provides an evaluation plan to assess the Automated Instructional Management System (AIMS). The AIMS is a computer-based resource and training management system procured by the Training and Doctrine Command to support its service schools and Army Training Centers. Its capabilities include student tracking, resource scheduling, test generation and scoring, computer-managed instruction, graduation prediction, and report generation. The evaluation plan provides for an examination of the AIMS hardware, software, courseware, training management capabilities, training effectiveness, costs, and organizational factors influencing its implementation.

RR 1287. Cox, R., & Ruffner, J. W. (Canyon Research Group, Inc.). Development and evaluation of the tactical premission planning training module. June 1980. (AD A117 550)

This research developed a training module for tactical premission planning and evaluated the module in a field setting. The module contained three components that enabled an aviator to identify tasks to be considered in premission planning, to determine how to accomplish each task, and to assess premission planning performance.

The evaluation was conducted in two air cavalry units. Half the aviators in each unit were given the opportunity to use the module. Data collected prior to the introduction of the module indicated that the aviators performed little premission planning, yet expressed a need for a premission planning training module. The results of a questionnaire administered after a 90-day trial period indicated that those aviators who were given the opportunity to use the training module judged the module to be acceptable and useful in its present form for both training and self-assessment. The implications of this research are discussed, along with recommendations for future research.

RR 1290. Barber, H. F., & Solick, R. E. MILES Training and Evaluation Test, USAREUR: Battalion command group training. June 1980. (AD A109 192)

The Multiple Integrated Laser Engagement System (MILES) Training and Evaluation Test was designed to address multiple objectives concerning improved methods of unit training and evaluation for echelons from squad to battalion. This research focused on command post exercises (CPX) using the Computer Assisted Map Maneuver System (CAMMS) and the feasibility of integrating CPX and field exercise techniques using CAMMS and the MILES.

RR 1292. Smith, S. (ARI); Osborne, A. D. (Litton-Mellonics Systems Development Division); & Thompson, T. J., & Morey, J. C. (ARI). Summary of the ARI-Benning research program on M16A1 rifle marksmanship. June 1980. (AD A109 467)

This report summarizes the major products of research on rifle marksmanship conducted by ARI at Fort Benning, Ga. It includes research designed to identify the problems existing in basic marksmanship training and training

equipment (e.g., poor instruction, insufficient practice, and inadequate knowledge of shooting results). Several experiments are reported that examined promising solutions to these problems. These solutions include simplified fundamentals, an improved zeroing target, better diagnostic checkpoints, down-range feedback, and other procedures to improve knowledge of results, improved transition to firing, and steps to improve instructional quality.

Based upon the research findings, a new basic rifle marksmanship program was developed and tested. It was found to improve record fire (final exam) performance by 29%. This new program has been put into effect in the Infantry Training Brigade at Fort Benning and is soon to be adopted Army-wide.

The report also summarizes the main problems remaining to be resolved if fully adequate basic marksmanship training is to be realized. It concludes with information about the continuing research directed toward development of improved advanced individual and unit level training in marksmanship.

RR 1295. Parrish, R. N., & Stevens, G. W. (System Development Corporation); & Stewart, S. R. (ARI). A resource planning aid for assessing the personnel and logistics implications of tactical operations. June 1981. (AD A109 286)

This report describes research to develop data processing techniques to enhance the performance of personnel and logistics at corps and subordinate echelons. The research focused on admin/log functions that relate directly to tactical command and control. Resource planning was determined to be the function most needing support. A conceptual job aid was then developed to support the area under investigation and was tested using a modified CGSC scenario to determine feasibility. An evaluation briefing on the methodology was prepared and presented to staff officers in the European Theater to determine its ability to fulfill user needs. The major finding was that the methodology is needed and should be considered for implementation in the European Theater.

RR 1296. Allnutt, M. F., & Everhart, C. D. Retraining Army aviators following a protracted absence from flying. October 1980. (AD A117 548)

A group of Individual Ready Reserve (IRR) Utility Helicopter (UH-1) aviators who had not flown for several years was retrained by ARI instructor pilots at the U.S. Army Aviation Center (USAAVNC). The main emphasis of the training was on daytime contact maneuvers, the evaluation of which was carried out by Standardization Instructor Pilots (SIPs) for USAAVNC. Conclusions are drawn about the optimum nature and content of the training program; the hours required to reach a satisfactory standard; and the relationship between the training hours required, total flying time, and years away from flying.

RR 1300. Bloom, R. F., & Hamilton, J. W. (Dunlap and Associates, Inc.). Development of a lexicon for intra-cockpit communications while navigating at nap-of-the-earth (NOE) altitude: Final report. October 1980. (AD A117 615)

This report describes the background, approach, and completion of a project to develop a lexicon (word list) of terrain descriptors, terrain locators,

and navigational commands to facilitate efficient intra-cockpit communications while flying at nap-of-the-earth (NOE) altitudes. A draft version of the lexicon was prepared, and a preliminary validation exercise was conducted with experienced Army NOE aviators. Revisions were made, and a full-color illustrated lexicon was produced. Application of this lexicon can provide the Army with useful training, experience, and research information. Before general release, however, it should be assessed (and modified, if necessary) on the basis of comprehensive in-flight NOE demonstration trials in the context of a controlled comparative experiment with Army aviators.

RR 1301. Maier, M. H., & Grafton, F. C. Scaling Armed Services Vocational Aptitude Battery (ASVAB) form 8ax. January 1981. (AD A110 210)

New forms of the Armed Services Vocational Aptitude Battery (ASVAB) were used beginning 1 October 1980. This report covers the calibration of the new forms based on a sample of applicants for enlistment and on a combined sample of applicants and recruits. Independent scaling efforts were conducted on samples of enlistees and of high school students. The three calibration efforts were in close agreement in the critical score region (10th through 30th percentile scores). The results indicate that the score scale for ASVAB 8, 9, and 10 accurately tracks to the Department of Defense traditional reference population.

RR 1303. Kane, J. J. (Science Applications, Inc.). Personnel and training subsystem integration in an armor system. January 1981. (AD A109 202)

This study conducted an audit trace of the personnel and training subsystem development of the XMI Abrams Tank System as a case study of the major systems acquisition process. From this case study, lessons learned from the XMI experience have been formulated that may be helpful in developing recommendations for improving personnel and training subsystem integration in the Army Life Cycle System Management Model (LCSMM).

The scope of the study was restricted to personnel and training issues that occurred between program initiation and ASARC III. Other events in the XMI development process were included only if they had a major impact on personnel and training issues or were required to make the development process comprehensible.

RR 1304. Smith, N. D., & Heuckeroth, O. H. (ARI); & Warnick, W. L., & Essig, S. S. (Human Resources Research Organization). Evaluation of a new approach to target acquisition training: The Combat Vehicle Identification (CVI) training program. November 1980. (AD A111 732)

This report describes the background for and development of a prototype Combat Vehicle Identification (CVI) program. The ability of U.S. and allied forces to quickly and accurately discriminate between friendly and hostile vehicles at extended ranges of engagement is critical for success on the fluid battlefield of the future.

The current ARI prototype CVI program described in this report provides maximum learning in minimal training time; requires minimal support; trains soldiers to recognize only those cues important for recognition at realistic combat ranges; provides an on-going measure for recognition training skills; is modular in design and usable in short training period; permits the simulation of all realistic engagement ranges with all optics, e.g., 3,000 meters for TOW gunners with 13 power optics; and provides for the simultaneous training of platoon size groups. The program package is so complete and simplified that most NCOs can present it with essentially no preparation.

The prototype basic program utilized 25 different NATO and Warsaw Pact vehicles and is designed to be expanded to utilize a significantly larger number of vehicles.

The research plan provides for an advanced CVI program that includes recognition and identification of masked vehicles; vehicles partially obscured by vegetation, fog, and smoke; and vehicles viewed through thermal imagery and passive night vision devices.

RR 1306. Bauer, R. W. (ARI); & Hahn, W. D. (U.S. Army Armor and Engineer Board). High mobility driver performance analysis. June 1981. (AD A108 723)

The Combat Vehicle Technology Program's High Mobility Agility (HIMAG) Vehicle Chassis Tests, conducted in 1978 and 1979, provided an opportunity to explore the prediction of human performance requirements and the implications of high mobility tracked vehicle design for driver performance. Preliminary analysis and projections, based on the vehicle concept during construction, were compared with data gathered during driver training and 20 kilometer testing.

Results supported the general hypothesis that cross-country driving on the higher horsepower per ton vehicles was significantly different from the same task on the M60A1 or M113. Course speeds, driver throttle use, driver errors, and critical incidents showed a differential pattern on HIMAG trials. Human factors and human engineering design deficiencies in the driver compartment, some of which were predicted in preliminary analysis and training but were not resolved, probably limited HIMAG speed and maneuver.

RR 1308. Maier, M. H., and Grafton, F. C. Aptitude composites for ASVAB 8, 9, and 10. May 1981. (AD A109 471)

Aptitude composites for the Armed Services Vocational Aptitude Battery (ASVAB) were developed using training success and Skill Qualification Test (SQT) scores, measures of job proficiency, as the criterion. The aptitude composites had high validity, in the range .52 to .75, for predicting job proficiency. Criticisms of the usefulness of SQTs as measures of job proficiency are addressed.

RR 1311. Smith, B. A. (Canyon Research Group, Inc.). Development and testing of the Map Interpretation, Terrain Analysis and Navigation at Night Program of Instruction (MITANN POI). May 1980. (AD A117 554)

There is a critical requirement for conducting Army combat flight operations at terrain altitudes (including nap-of-the-earth (NOE)) at night. Current courses of instruction are inadequate for meeting that need. This report describes the development of a course to help meet that requirement. This course is developed to teach night navigation and map/terrain interpretation using unaided (naked eye) and aided (Night Vision Goggles) vision techniques (MITANN). It includes the approach to the development of all course lecture, textual, and visual materials; the testing and validation of those materials; and a transfer of training effectiveness investigation.

Results of the transfer of training effectiveness from MITANN to in-flight performance showed that the group that received MITANN training (the experimental group) navigated at night along an NOE route with significantly more accuracy than the control group did. This increase in accuracy was accompanied by a reduction (although not significant) in the time it took to fly the route. These results indicated that MITANN was successful in training the critical aspects of night NOE navigation.

RR 1312. Coke, J. S., Crumley, I. M., & Schwalm, R. C. Emplacing, firing, and march ordering an M109A1 howitzer: Tasks and task times. June 1981. (AD A109 706)

If there is ever a conflict in Europe between NATO forces and current threat forces, crews operating weapons systems might be forced to fight around the clock for up to 8 consecutive days. To assess the effects of prolonged continuous operations on crew performance, the ARI Field Unit at Fort Sill, Okla., has developed a computer-based simulation model. One major component of this model is a task library. The task library, which will differ depending upon the weapon system being simulated, contains a definition of each task required to operate a weapon and numerical values for relevant task parameters, including the minimum, average, and maximum times required to perform the task. This report describes the development of a task library for the M109A1 155mm self-propelled howitzer, the weapon system chosen as the testbed for the research effort on continuous operations.

RR 1314. Elliott, M. P., Harden, J. T., Giesler, R. W., Scott, A. C., & Burke, N. (McFann, Gray and Associates, Inc.). The process and procedure used for job preparation: Field artillery and infantry officers and NCOs. January 1980. (AD A109 995)

Garrison/administrative requirements consume a large percentage of Field Artillery and Infantry officers' and NCOs' work days, allowing little time for combat training, the primary peacetime mission of the U.S. Army. This report examines the process and procedures by which these individuals are prepared to assume garrison/administrative responsibilities. Included in the report is an identification and description of the components of the job preparation system and an assessment of the adequacy of that system. Recommendations are provided

for modifying the current job preparation system to allow officers and NCOs to more effectively and efficiently perform their garrison/administrative duties.

RR 1320. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume I: Executive summary. February 1981. (AD A115 874)

This document is one of a series in the final report of Phase I of a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. The report is organized in five volumes. This report reviews activities and products of the project's first phase. Technical Report 536 contains a technical discussion of the project's objectives, methodologies, results, conclusions, and implications for the design of user/operator transactions with battlefield automated systems. Research Products 81-26, 27, 28, and 29 document analyses of four unique battlefield automated systems selected to represent different stages of system development and different Army functional areas. Technical Report 537 presents provisional guidelines and criteria for the design of transactions. Technical Report 538 provides a brief review of selected literature related to guidelines and criteria.

RR 1324. Schwalm, R. C., Crumley, L. M., Coke, J. S., & Sachs, S. A. A description of the ARI crew performance model. April 1981. (AD A113 793)

A computer-based model that simulates the performance of howitzer crews and other crew-served systems was developed. The model can be used to simulate the speed of performance of crews varying in size and/or task assignments. The model is based on probabilistic modeling methods and consists of three segments: a task library containing the relevant crew tasks and their associated performance times; an input program for entering the crew size, the tasks to be performed by each man, and the order in which the tasks are to be performed; and the main program for integrating the input information and calculating summary performance measures based on that information. These performance measures can then be used for evaluating the speed and relative efficiency of crews varying in size or structure.

Technical Reports

TR 448. Freda, J. S., & Shields, J. L. An investigation of the adoption process in training technology transfer. June 1980. (AD A109 200)

This study focused on the adoption process in the transfer of Army training technology from the researcher to the user. The training product chosen for this investigation was the Training Extension Course (TEC) program.

A two-part survey questionnaire was completed by 111 Army participants attending TRADOC/FORSCOM Training and Evaluation Workshops. The questionnaire requested attitudinal and usage information relating to the adoption of the TEC program by unit training managers. Sources of TEC-related

information were matched with the awareness, acceptance, and utilization stages of the adoption process to help understand the dissemination activity within training technology transfer. The attitudinal responses were factor analyzed and, with selected biographic information, were entered in a regression analysis to assess the utility of these measures as predictor variables of TEC utilization.

Two major findings emerged. First, the acceptance (PERSUADE stage) of the TEC program is influenced predominantly by internal sources of information (e.g., work environment), while the initial awareness (INFORM stage) and later utilization of TEC are influenced by internal and external sources (support groups, briefings, etc.). Second, prior familiarity with TEC is a better predictor of TEC usage than are attitudinal measures taken from the innovation literature (for this particular sample). However, familiarity alone does not ensure extensive TEC usage, since there is an approximate 50-50 split between TEC users and nonusers who were familiar with TEC. The majority of TEC users scheduled TEC less than 10% of their training time. The findings suggest that periodic scheduled TEC assessments might increase TEC use and that job performance data should continue to be collected for evaluating TEC utilization. Suggestions are provided to improve and evaluate TEC utilization.

This report is intended primarily for behavioral and social scientists interested in applying multivariate analytic techniques to the study of technology transfer.

TR 452. Gernas, J. E., & Baker, J. D. *Embedded training: Utilization of tactical computers to train tactical computer operators.* July 1980.
(AD A119 152)

The concept of Embedded Training (ET) involves programming and using the extra capacity of Army tactical data processing systems to train tactical system users in how to use the system. ARI has developed embedded training that does not require previous knowledge by the trainee and that progresses from basic individual skills to complex team interaction. It can also be used in a stand-alone mode to teach nonsystem skills, as the initial test demonstrated.

The initial test of the ET concept successfully used the PLANIT author language on the Army's Developmental Tactical Operations System (DEVLOS) to teach basic infantry skills and GED math. A subsequent test examined the ET concept using TACFIRE (Tactical Fire Direction System) as the target computer system. To accomplish this, PLANIT-based CAI software was translated into the language of the TACFIRE computer and installed.

The field evaluation of the primary role for ET demonstrated that ET is at least as effective as traditional methods of training. A preliminary cost and training effectiveness analysis indicated a saving of \$6 million if the ET procedure is used in place of the system proposed in the original TACFIRE Individual-Collective Training Plan (ICTP). Current indications are that ET will be adopted in place of the original ICTP.

TR 453. Hoyt, W. G. (System Development Corporation); & Baker, J. D. (ARI). The use of tactical computers to provide weapons and tactics training to combat NCOs: Results of a field test. July 1980. (AD A113 646)

A pilot field test in 1974 demonstrated the effectiveness of using an Army tactical data system for computer-assisted instruction (CAI) of soldiers when the system was not being used for tactical operations.

Courseware was written in the existing author language PLANIT to run on the Army's Developmental Tactical Operations System (DEVLOS) at Fort Hood, Tex. Lessons were developed in two proficiency test areas, Crew Served Weapons and Tactics, and the 120 participating NCOs were chosen for their previous low scores in these subjects. After a pretest, half the group studied with CAI, one-fourth studied from Army manuals, and one-fourth served as a control group by studying unrelated material. A posttest measured learning, and interviews with the CAI group recorded their enthusiastic comments.

The CAI group learned significantly more than the others. The automated instruction worked equally well for fast and slow learners and across differences in age, education, and pay grade. Slow learners seemed to use the same strategy as fast learners but took more time. The results, therefore, demonstrated the feasibility and benefits of the project.

TR 458. Samet, M. G. (Perceptronics, Inc.); & Geiselman, R. E. (Vector Research, Inc.). Guideline development for summarization of tactical data. May 1980. (AD A107 329)

The present study was conducted to validate and expand the generalizability of a set of guidelines for summarizing tactical message content and to develop guidelines for conducting a manual purge of a message file. Thirty-two Army staff officers studied a scenario and 30 enemy-situation-data (ESD) messages describing an enemy defensive operation. Their task was to summarize the tactical information in the form of an intelligence briefing. Half the officers were supplied with three general guidelines to follow in preparing the summary: "(1) provide an interpretation of the data, (2) give a dynamic portrayal, and (3) use conversational style." After the summarization task, the participants were asked to delete 15 of the 30 messages and to rank order the rest on the basis of importance. The 32 summaries were evaluated by seven military raters in terms of quality of content, interpretation, accuracy, organization, and style.

The raters judged the summaries prepared with the aid of the guidelines to be significantly "better" summaries on an overall evaluation scale and on four of five qualitative scales. Potent positive effects were revealed for all three guidelines. The 10 summaries that received the highest overall evaluations were used to derive a general suggested outline for describing the message content. The outline structures information according to levels of importance, from a description of immediate enemy threat to details about support units. The purging-task data also revealed general levels of clusters of messages on which to base guidelines for reducing the size of ESD files by different amounts. Future research needs to explore the development and usefulness of task-related schematic aids for supporting information management, utilization, and presentation.

TR 466. Hunt, D. P. (New Mexico Stat. University). Effects of human self-assessment responding on learning. A. just 1980. (AD A109 455)

A conceptual framework of a process by which persons assess and express levels of sureness in the correctness of responses that they anticipate making--or have already made but not yet received knowledge of results--is proposed. It is hypothesized that the rate at which a person's behavior is modified by knowledge of results is affected by the covert and overt sureness associated with the execution of responses that are being learned. Data are presented that show that acquisition in a paired-associates learning task may be enhanced by the concomitant performance of a self-assessment (SA) task.

Acquisition is more rapid and the self-assessments regarding levels of sureness are more accurate if the response to be learned is executed before the SA response rather than after it. Learning involved a decrease in the proportion of unsure-wrong responses and an increase in the sure-correct responses, with little change in the proportion of sure-wrong, and unsure-correct responses. Based on an analysis of the relation between the sureness/correctness of the responses and the speed with which responses are executed, it is suggested that the process and/or factors involved in determining the correctness of a response may be different from those involved in determining its sureness.

TR 469. Sterling, B. S., & Mietus, J. R. Factor stability of primary scales of the General Organization Questionnaire. October 1980. (AD A115 872)

The factor structure of the General Organization Questionnaire (GOQ) was studied. The GOQ is the primary paper-and-pencil diagnostic organization climate survey instrument in the U.S. Army's Organizational Effectiveness program. Two large samples of personnel within U.S. Army, Europe (USAREUR) were surveyed.

Responses to 69 of the 84 items in the GOQ were factor analyzed; these items measure primary organizational processes. Five- and four-factor solutions were generated for each sample. Both the solutions contain factors measuring Unit Climate, Supervisory Leadership, Group Cohesion, and Mission Accomplishment. Only two of the four original GOQ dimensions received empirical support. Not only was the factor structure stable between organizations, but the amount of variance accounted for by a particular factor (or psychological importance of that factor) was also stable. Results suggest that the GOQ, if organized along empirically supported lines, is a diagnostic instrument that is equally applicable to various Army organizations.

TR 474. Johnson, E. M., Halpin, S. M., & Andrews, R. S. Bibliography: ARI research on command and control (1970-80). February 1981. (AD A109 287)

This bibliography is a reference to research publications in the command and control area. Publications are divided into research areas and are listed in chronological order within each area. The major research categories are system operations and aids; information processing and presentation; surveillance, reconnaissance, and target acquisition; command staff simulation and gaming; and exploratory research and supporting technology. An author index is included.

TR 477. Abstracts of ARI research publications, FY 1978. September 1980.
(AD A109 839)

Abstracts and bibliography citations, including the DTIC accession number, are given for 118 Research Reports, Technical Papers, Utilization Reports, and Technical Reports published by ARI during FY 1978. To complete this record of research, abstracts or descriptions are included of five research products and 90 intra-agency Research Problem Reviews, Research Memorandums, and Technical Reports. All items are indexed by author and corporate author and by research area. The Federal depository libraries where the published reports may be obtained are also listed.

TR 478. Allen, J. P., & Bell, D. B. Correlates of military satisfaction and attrition among Army personnel. July 1980. (AD A109 456)

This study was conducted to determine relationships between Army organizational variables and levels of soldier satisfaction, as well as to assess correlates of attrition and battalion effectiveness ratings. The study was based on a secondary analysis of data collected in the Army Life-78 Study; subjects were 8,140 personnel assigned to 60 different battalions. In addition to the Army Life-78 survey, a variety of administrative data were considered.

The most striking finding of the project is that three types of satisfaction (job satisfaction, sense of equity from the Army, and overall satisfaction with the Army) are extremely closely related to variables of organizational climate (e.g., motivation and communication) and also very highly associated with several job characteristics. To a lesser, but still significant extent, satisfaction is a function of several types of endogenous Army life problems (e.g., salary, time off, etc.). This study suggests that at least three dimensions of satisfaction among military personnel are a function of organizational variables over which the Army likely exerts some influence. It may well be that modification of these organizational variables would affect levels of attrition as well. The study includes recommendations for methodological changes in future research in the area.

TR 480. Johnson, R. M. Target information processing: The effects on reaction time of terrain, downlook angle, and response processing level. October 1980. (AD A107 295)

This experiment explored the applicability of a serial exhaustive memory scan as a model of the observer's cognitive behavior in a target acquisition task. Reaction times were examined for identification, recognition (friend-enemy), and set responses to stimulus scenes consisting of armored vehicles varying in background (forest, road, or plain) and downlook angle (10, 20, or 30 degrees). Positive set size was either one, two, or four vehicles.

The results provided support for the serial exhaustive model in the linear set size function with a zero intercept of 1.4 seconds and a slope of .2 seconds. Parallel functions were obtained for the forest condition adding .2 seconds over the equivalent road and plain conditions. The 10-degree downlook angle resulted in the slowest response times, and the 20-degree angle the

fastest. The response times were the fastest for the positive set items only, followed in order by recognition and identification responses.

TR 483. Abstracts of ARI research publications, FY 1979. November 1980. (AD A110 164)

Abstracts and bibliographic citations, including the DDC accession number, are given for 159 Research Reports, Technical Papers, Technical Reports, and Research Notes released by ARI during FY 1979. To complete this record of research, abstracts or descriptions are included of four research products and 39 intra-agency Research Problem Reviews, Research Memorandums, and Technical Reports. All items are indexed by author and corporate author and by research area. The Federal depository libraries where the published reports may be obtained are also listed.

TR 484. Ehrenreich, S. L. Design recommendations for query languages. September 1980. (AD A115 894)

The existing human factors literature on query languages is both sparse and scattered. This paper seeks to collect and review that literature. The first section introduces the subject of query languages. In the second and third sections, the topics of natural and formal query languages are discussed. These two types of query languages are reviewed with the objective of determining their potential for expanding the population of computer users.

The fourth section considers some general issues pertinent to both types of query languages. These issues include the ability of people to deal with logical quantifiers, the user's concept of data organization, mixed initiative dialogs, and the use of abbreviations. Methods for experimentally evaluating specific query language features and research on person-to-person communication are also discussed here.

To focus on the findings reported in the preceding sections, the fifth section summarizes the implications of the research performed to date. The sixth section presents possible new research that would be of value to the designers of Army tactical information systems.

TR 497. Landee, B. M., & Samet, M. G. (Perceptronics, Inc.); & Gellman, L. H. (ARI). User-elicited tactical information requirements with implications for symbology and graphic portrayal standards. April 1980. (AD A110 161)

The purpose of this research was to elicit and organize selected battlefield information requirements of the command staff and to examine the adequacy of conventional symbology for satisfying these requirements. An elicitation procedure was developed and utilized with small groups of Army officers in a tactical role-playing exercise involving a specified division-level scenario. Information requirements in the form of tactical questions were generated and reviewed by participants, both individually and together. In addition, for each question, the participants completed a form that provided descriptive information, such as whether the answer to the question is available from a display with conventional symbology (FM 21-30). In an effort to organize the

information requirements, a hierarchical clustering technique was applied that analyzed the similarity between questions in terms of 58 semantic features (e.g., friendly, enemy, artillery, vulnerability, etc.).

The elicitation sessions resulted in the generation of a total of 272 distinct tactical questions. These questions formed seven major clusters, which were assigned the following names to reflect the central theme of their respective information content: friendly, enemy, time/capability, status, activities/procedures, terrain/routes, and planning. The descriptive data about the questions, analyzed for each cluster of information individually and for the entire set of questions, indicated that conventional symbology fails in many respects to meet basic user needs. Furthermore, there appears to be a proliferation of personalized techniques being employed by users to portray their information requirements. Some major informational deficiencies in conventional symbology are identified, and examples are given of how the findings can be employed in development efforts toward making standardized, tactical symbology more useful and effective.

TR 498. Samet, M. G., Geiselman, R. E., & Landee, B. M. (Perceptronics, Inc.). An experimental evaluation of tactical symbol-design features. April 1980. (AD A115 895)

Sixteen nonmilitary participants learned each of two symbol sets (conventional, iconic) to a criterion. Each set contained three basic symbols representing unit types of armor, mechanized infantry, and infantry. After learning a symbol set, each participant was shown a series of situation displays, where some displays contained symbols coded with either perimeter-density or vector projection to convey supplementary unit-attribute information (unit strength or firepower reach) needed for typical tactical tasks. For each display, the participant was asked questions corresponding to different behavioral processes (identification, search, comparison, pattern recognition).

Overall, the results suggested that iconic symbols may not necessarily be preferable to conventional symbols in certain situations; and, although the portrayal of supplemental unit information can slow some aspects of information processing, certain symbol-design features appear to create less interference than others. Specifically, (a) iconic symbols did not yield faster identification performance than conventional symbols, and conventional symbols yielded faster pattern-recognition performance than iconic symbols; (b) the portrayal of supplemental unit attributes slowed processing of unit-type information in all four tasks, but vector projection created less interference than perimeter density in three of four tasks; (c) unit-strength information was processed faster when it was portrayed as perimeter density, and firepower reach information was processed faster when portrayed as a vector projection.

In a supplementary task that required integration of information from several symbols into an analytical judgment (threat value assessment), performance accuracy was found to be insensitive to the conventional versus iconic symbology comparison. The results were discussed in terms of the complexity of the implications involved in the selection of symbol design features and their correspondence with tactical concepts.

TR 499. Kaplan, I. T. Information flow in battalion command groups. June 1980. (AD A109 469)

Information flow in battalion command groups was measured via a questionnaire based on information presented during the brigade briefing. Data from 13 groups showed that a substantial amount of information was lost in the processes of communication and remembering. Averaged over all command groups, there were consistent differences in the percentage of available required information communicated through particular channels, varying from 17 to 80%. Among battalion commanders, those who transmitted more information received less from their staffs. The fact that information loss was concentrated in specific, identifiable areas indicates that efforts to improve communication can be focused where they are needed.

TR 502. Hiller, J. H. A methodology for estimating relative cost-benefits of alternative pretesting procedures. November 1980. (AD A115 877)

The purpose of this research was to develop a methodology for measuring the relative benefits of alternative pretesting procedures so that an optimal procedure may be selected. The research was accomplished as follows. Alternative pretest procedures were formulated. Variables that affect the amount of time saved or lost by employing pretests were identified and defined. Algebraic models that take into account measurement accuracy, pretesting time, and training time were constructed so that the amount of time saved (or lost) by pretesting could be estimated. A limited sample of empirical data was gathered and analyzed by applying these cost-benefit models. It was shown how these cost-benefit models can be used to identify the best procedure in a specified set of competing procedures.

TR 503. Matlick, R. K., Berger, D. C., Knerr, C. M., & Chiorini, J. R. (Litton-Mellonics Systems Development Division). Cost and training effectiveness analysis in the Army Life Cycle Systems Management Model. July 1980. (AD A109 198)

This report examines the requirements and purposes of cost and training effectiveness analysis (CTEA) in the context of the Army's Life Cycle Systems Management Model. Current CTEA methodologies are examined. Methods to augment existing models are developed, and a general synthesized model for use by CTEA analysts is proposed.

TR 504. Phelps, R. H., Halpin, S. M., & Johnson, E. M. A decision support framework for decision aid designers. January 1981. (AD A110 329)

A decision support framework is presented that serves two purposes: to organize and integrate various decision aids according to their function and to provide the decision aid designer with a systematic context in which to develop aids as well as to determine which aspects of the decision problem would most benefit from decision aiding. The main components of the framework are discussed in detail with Army intelligence decision-making examples: (a) analysis of the decision requirements; (b) development of decision aids to provide the decision maker with information as well as tools for evaluating, weighting,

and integrating the information to make a decision; and (c) evaluation of the success of the decision aids in leading to a logical, rational decision.

TR 507. Dyer, J. L., Tremble, T. R., Jr., & Finley, D. L. The structural, training, and operational characteristics of Army teams. June 1980. (AD A109 836)

Combat, combat support, and combat service support branches within the Army were surveyed to identify teams within each branch and to describe their structural characteristics according to official organizational tables of personnel and equipment. A total of 255 distinct teams were identified and described, with the Infantry, Field Artillery, and Armor branches containing the greatest number of teams. Results on such characteristics as team size, member rank, leader/rank, skill level of members, and equipment used are presented. Teams that perform nonroutine tasks were located within the Infantry, Armor, and Engineer branches.

Active Army units were also surveyed. These units rated their teams on the amount of team training received and needed, leader satisfaction with training, training constraints, team characteristics, operational problems, and team evaluation procedures. The primary training problems and constraints identified were the turnover of team personnel, understrength teams, unqualified personnel, insufficient time to train, and unrealistic training. Of team characteristics surveyed, only one was rated as atypical of Army teams--compensation by one member for inadequate performance by another member. The results provide a data base for future team research within the Army.

TR 511. Bunderson, C. V., & Campbell, J. O. (WICAT, Inc.); & Farr, B. J. (ARI). Instructional systems development model for interactive videodisc training delivery systems. Volume I: Hardware, software, and procedures. June 1980. (AD A109 197)

This report describes the hardware and software for videodisc training delivery systems (VTDS) and videodisc authoring and production systems (VAPS). It examines the range of capabilities in consumer-model videodisc players and intelligent videodisc systems. It also describes the interim field test delivery system for this project that will be used the second year. The report describes VAP systems hardware, including different levels of sophistication and complexity that might be available at an Army authoring site. The videodisc production process, which uses VAP systems, is summarized, and the interim authoring software to be used during this project is described.

This volume provides a framework for Volume II, the revised ISD model for videodisc development. In Volume III, preliminary prescriptions for graphics use in videodisc authoring are given.

TR 521. Kress, G. (Human Resources Research Organization). Validation of tank gunnery training tasks. September 1981. (AD A119 053)

Tank commander and gunner performance on nine critical tank gunnery training tasks, as well as experience measures, were correlated with performance on

Tank Gunnery Table VIII. Results showed that (a) performance on the subcaliber training range (1/60 scale cal. 22) was the best predictor of Table VIII performance, (b) there was no relationship between crew turbulence measures and gunnery performance, and (c) the gunner's job experience was positively correlated with Table VIII performance.

TR 526. Friedman, F. L., Rhode, A. S., & O'Connor, F. E. (Information Spectrum, Inc.). Integration of manpower, personnel, and training issues from the materiel system acquisition process into the planning, programming, and budgeting system. March 1981. (AD A117 553)

This publication describes the integration of the materiel systems acquisition process into the Planning, Programming, and Budgeting System (PPBS). The report discusses the manpower, personnel, and training (MPT) information requirements of the materiel systems acquisition process as they relate to the entry points of the PPBS. The report also identifies timing for the integration of required data and provides recommendations for updating procedures.

TR 527. Schulz, R. E., & Wagner, H. (Human Resources Research Organization). Development of job aids for instructional systems development. February 1981. (AD A109 815)

The purpose of the research was to develop and evaluate 18 job aids for use in the analysis, design, development, implementation, and control of military instructional systems. This report discusses the history of the research effort, the conduct of the needs assessment, and the development and formative evaluation of the job aids. The evaluation findings strongly support the usefulness of the job aids to military instructional development personnel.

TR 530. Rose, A. M., McLaughlin, D. H., & Felker, D. B. (American Institutes for Research); & Hagman, J. D. (ARI). Retention of soldiering skills: Review of recent ARI research. March 1981. (AD A119 307)

Sixteen research studies sponsored or conducted by ARI on the acquisition and retention of Army tasks and skills were reviewed. The findings of these studies were synthesized to determine what is known about how soldiers maintain or lose skill proficiency over time.

Some factors associated with training approaches, the nature of soldiering, and individual soldier differences were identified as influencing the retention and loss of skills. The variables investigated in these studies and the experimental procedures used will guide the development and execution of a current research study aimed at developing a practicable method for Army commanders to assess and maintain skill proficiency in units.

TR 532. Kimmel, M. J. Senior leadership: An annotated bibliography of the military and nonmilitary literature. June 1981. (AD A115 890)

A literature search was performed to determine the state of the art of research and theory on senior leadership skills, functions, activities, and other job-related characteristics. One hundred thirty-five military and non-military contributions were annotated and organized into three sections: summary literature, empirical literature, and nonempirical literature. Within each section, the contents of each reference were classified as to (a) "Organization Type" (military, nonmilitary, or military-nonmilitary comparison), (b) "Target Population" (senior leaders only or level comparison literature), and (c) "Subject Matter" (focus on senior leader competencies--i.e., personal qualities, skills, abilities, etc.--and/or job-related variables).

TR 536. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume II: Technical discussion. February 1981. (AD A116 078)

This document is one of a series in the final report of Phase I in a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. See the abstract for Research Report 1320 for a complete description.

TR 537. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume IV: Provisional guidelines and criteria. February 1981. (AD A115 892)

This document is one of a series in the final report of Phase I in a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. See the abstract for Research Report 1320 for a complete description.

TR 538. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume V: Background literature. February 1981. (AD A115 908)

This document is one of a series in the final report of Phase I in a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. See the abstract for Research Report 1320 for a complete description.

TR 540. Sekuler, R., & Tynan, P. D. (Northwestern University); & Kennedy, R. S. (Canyon Research Group). Sourcebook of temporal factors affecting information transfer from visual displays. June 1981. (AD A109 907)

This report collects in one document the important research literature on temporal factors in vision. More than 350 scientific articles are cited,

which represent approximately 10% of the data base consulted. The literature searched comprised the following: (a) several thousand articles (under the general rubric temporal factors and information processing) from existing reprint files of the authors and others; (b) Ergonomics Abstracts, Psychological Bulletins, Psychological Reviews, and Human Factors for the last 12 years; and (c) a listing from two automated look-up systems (Psychological Abstracts, 1967 to present and National Technical Information System, 1964 to present).

An integrative review of the literature is provided, and three chapters are included that deal with the application of these findings to display design. The subject matter is perception of temporal events, specifically motion perception (real and apparent) and flicker/flash sensitivity. A small chapter covers some temporally based phenomena that distort or degrade perception. Features of these phenomena may be observed in visual displays. Only studies that reported findings robust enough to be expected to be important outside the laboratory are included. Where sufficient data were available, equations are provided to the engineer for the calculation of design criteria (e.g., peripheral motion threshold, contrast thresholds, contrast thresholds and age). Where gaps exist in scientific knowledge, recommendations are provided for applied research. General guidelines are offered for incorporating design criteria into Military Standard 1472 for perceptions due to temporal events.

TR 545. Hays, R. T. Training simulator fidelity guidance: The iterative data base approach. September 1981. (AD A119 159)

This report provides a preliminary organizational framework for a training simulator fidelity data base. Such a data base can provide a starting point for the development of a formal training simulator fidelity decision-making package and can also be the basis for the determination of future research.

The organizational structure of the data base is developed in three stages. First, the issue of determining the minimum required fidelity for a training simulator is located in its place within the context of the ISD process. Second, the necessary informational inputs to the fidelity decision process from task analyses are discussed with the goal of obtaining more useful information for making fidelity decisions. Finally, a proposed structure for making fidelity decisions and for conducting future research is presented. This structure is derived from the use of a proposed iterative data base of empirically derived data on the relationship between simulator fidelity and training effectiveness.

TR 546. Heffley, R. K., Clement, W. F., Ringland, R. F., Jewell, W. F., Jex, H. R., & McRuer, D. T. (Systems Technology, Inc.). Determination of motion and visual system requirements for flight training simulators. August 1981. (AD A117 555)

Fidelity requirements for Army flight training simulators are explored using a manual control theory approach. The first step, defining "simulator fidelity" in operational terms, provides a basis for each of the subsequent steps. This definition is accompanied by a taxonomy of measurable fidelity

parameters. The next step, also of a preparatory nature, is the analysis of Army flight training missions. It describes how specific flight tasks and piloting techniques can be cast in terms compatible with feedback control theory. Pilot modeling techniques are then discussed, first in terms of pilot control and then in terms of pilot perception. Next, armed with compatible descriptions of fidelity, the training context, and pilot behavior, a procedure is described for studying visual and motion stimuli.

It was found, however, that there are serious gaps in the experimental data base, precluding the systematic execution of this procedure. Because of the lack of data, it was not possible to accomplish fully the original objectives and, therefore, a formal bookkeeping scheme is outlined to guide the investigation of fidelity requirements. Conclusions and recommendations are then drawn.

TR 547. Hays, R. T. (ed.). Research issues in the determination of simulator fidelity: Proceedings of the ARI sponsored workshop. November 1981. (AD A118 253)

These are the proceedings from an ARI sponsored workshop on "Research Issues in Simulator Fidelity." Papers are included that (a) state the goals and organization of the workshop, (b) present topics addressed during the workshop, (c) summarize the efforts of the working/discussion groups, and (d) summarize the results of the workshop as a whole. Workshop topics included definitional, communications, research support, and research methodology issues.

Research Notes

RN 80-10. Pask, G., & Robinson, M. (eds.) (System Research Ltd.). Current scientific approaches to decision making in complex systems: III. Volume I: Conference proceedings. January 1980. (AD A105 119)

The Third Richmond Conference addressed foundational problems in decision making. The conference is reported in two volumes. Volume I contains an overview of each of the major papers presented, with the author's commentary and the discussion by conference participants, plus several general discussions. Volume II (ARI Research Note 80-11) provides the major papers themselves.

RN 80-11. Pask, G. (ed.) (System Research Ltd.). Current scientific approaches to decision making in complex systems: III. Volume II: Conference position papers. January 1980. (AD A105 171)

The Third Richmond Conference addressed foundational problems in decision making. The conference is reported in two volumes. Volume I (ARI Research Note 80-10) contains an overview of each of the major papers presented, with the author's commentary and the discussion by conference participants, plus several general discussions. This volume provides the major papers themselves: Observable Components of the Decision Process and a Revised Theoretical Position, by Gordon Pask; Decision Making as an Event-Search: Traffic on a Multi-dimensional Structure, by R. H. Atkin; Decision: Foundation and Practice, by Brian R. Gaines; Competing Modes of Cognition and Communication in Simulated

and Self-Reflective Systems, by Stein Braten; On the Spontaneous Emergence of Decision Making Constraints in Communicating Hierarchical Systems, by John S. Nicolis; and also a paper by Maria Nowakowska, on a new model of decision under risk.

RN 80-23. Price, H. E., Fiorello, M., Lowry, J. C., Smith, M. G., & Kidd, J. S. (BioTechnology, Inc.). Department of Defense and service requirements for human factors in the military system acquisition process. July 1980. (AD A107 891)

This research note presents an analysis of Department of Defense and service-level policy requirements for human factors in the military system acquisition process. It is intended as a companion document to ARI Technical Report 476 and as such provides detailed indoctrination to both the system development process and human factors R&D. It will be particularly useful to those who require a greater understanding of this process.

Beginning with an explanation of each system development phase, human factors R&D requirements are integrated into the system development framework. This is accomplished through direct referral to Department of Defense Directives, Specifications, and Standards. Recognizing that differences occur in Army, Navy, and Air Force implementation of human factors R&D, formal service documentation is presented for human factors in each phase of system development. These documents include service regulations and instructions. Formal service documentation provides only that human factors requirements be implemented, while not setting forth a particular implementation plan. Informal service documentation is presented to illustrate the processes by which human factors are implemented in system development programs initiated by each service.

RN 80-24. Ray, T. E., & King, R. B. (HRB-Singer, Inc.); & Narva, M. A. (ARI). Experimental investigation of near real-time interpretation techniques for transmitted imagery. August 1980. (AD A107 515)

Eight interpretation concepts that might be used at a ground terminal in conjunction with the handling of transmitted imagery were simulated. Four were one-man concepts; the other four utilized two-man teams viewing the imagery in sequence. The one-man concepts were formulated around different combinations of the elements of availability of film speed control, viewing area, and methods of target designation and location reporting. The two-man concepts differed on the availability of speed control and the decision criteria for the initial man of the team and the associated rescreening strategy of the second man of the team. Military image interpreters detected, identified, and reported targets on the imagery, presented on a motorized light table under two film input rates, using the conditions of the various experimental interpretation concepts.

Interpretation performance was found to be influenced by the size of the viewing area and the use of a magnifying reticle to localize targets, in the one-man concepts. The incorporation of the speed control option did not significantly affect performance. Provision for control of film movement or differential emphasis on accuracy or completeness had no significant effects in the two-man concepts.

RN 80-25. Root, R. T. (ARI); Ray, T. E., & Brahosky, A. E. (HRB-Singer, Inc.); & Narva, M. A. (ARI). Design and utilization of an infrared data base for an advanced image facility. August 1980. (AD A107 529)

A reference information data base for use in an advanced image interpretation facility was designed. The data base used three types of organization. Two types of organization used primarily representative infrared imagery examples. One type presented views of several targets under one set of acquisition parameters; the second type presented views of one target type under all of the acquisition conditions; and the third type of organization used primarily textual information. An indexing scheme and retrieval methodology were devised. The experimental data base, with associated software, was used to subject developed concepts to empirical test. One test was designed to ascertain if structured exposure to the data base would increase interpreter proficiency, while another test was designed to study the efficiency of such a data base as an aid during interpretation.

It was found that the request formats used on the CRT computer interface could be efficiently utilized with little training. The information presented on the slides in the data base could be easily utilized for training and as reference keys. Structured exposure to the data base in training sessions served to increase the participants' proficiency in identification, at the category level. However, no differences were found in performance between the two organizations of the imagery in the data base.

RN 80-39. Tiede, R. V., Burt, R. A., & Bean, T. T. (Science Applications, Inc.). On the design of simulations of command and control processes. November 1980. (AD A107 423)

This report covers two additional design requirements to an existing design for a battle simulation intended for research, development, or training. The first requirement is to simulate the command and control processes so that they reflect human performance in the information processing and decision-making sequences. The second is to provide alternative configurations for the "player" staff modules so that the investigator may select the configuration best suited to behavioral research objectives. Both problems are approached by combining the known human factors in command and control with a detailed structuring of the action processes employed by the command group/staff. All relevant aspects of human performance except the higher-level decision-making operations can be realistically simulated. A trade-off is found to exist in the alternative configurations between the realism of staff play, the ability to make behavioral measurements, and the cost of personnel and computer hardware and software.

RN 80-40. Tiede, R. V., Burt, R. A., & Bean, T. T. (Science Applications, Inc.). Some guidelines for effective task design in command and control simulations. November 1980. (AD A107 424)

This research developed principles of task design for interactive simulations in which staff players execute the command and control of a simulated battle. A companion report on the design of simulations of command and control processes presents the basic design framework of a battle simulation

capable of application alternatively to research, development, or training. This framework includes consideration of alternative configurations of the "player" staff modules so that an investigator may select a configuration best suited to behavioral research objectives. The guidelines for effective task design are developed from the alternative configuration.

RN 81-7. Motowidlo, S. J., Dunnette, M. D., & Rosse, R. L. (Personnel Decisions Research Institute). Reenlistment motivations of first-term enlisted men and women. February 1980. (AD A108 293)

The purpose of this research was to identify attitudes and motives underlying reenlistment decisions of first-tour soldiers. The research focused on determining what changes in reenlistment options and incentives might succeed in retaining effective soldiers for a second tour of service.

A questionnaire was developed to tap reenlistment motives and attitudes. It was administered to 4,671 soldiers stationed in the United States and Europe. In addition, supervisory ratings of effectiveness were obtained for 2,444 soldiers in this sample.

Relationships between soldiers' reenlistment intentions and their perceptions and expectations about the Army indicate that one of the most important issues in their reenlistment decisions is whether or not they can derive a sense of excitement, challenge, and pride from being soldiers.

Job characteristics seem to contribute to many soldiers' reluctance to reenlist. Soldiers in infantry, for example, see less variety, less meaningfulness, and fewer prospects for satisfaction in their work than do soldiers in administration and supply. These differences in job-related attitudes and perceptions may help explain why rates of intentions to reenlist are lower among infantry soldiers.

Nearly four out of five of the more effective soldiers in the sample who said they do not plan to reenlist said they would be more inclined to do so if they could leave the Army at any time with 3 months' notice. A little over half said they would be more likely to reenlist if they could reenlist for only 2 years.

RN 82-6. Goehring, D. J. Communication problem areas between black and white soldiers: 1974-1979. April 1980. (AD A113 433)

Subjects consisted of a random sample, stratified by gender and race, of 88 junior enlisted U.S. Army soldiers. A survey instrument that focuses on both verbal and nonverbal communication problems between blacks and whites was administered. Blacks generally seemed more aware of what whites perceive to be problems than whites are of the problem areas blacks perceive. Assuming comparability to an earlier sample, the data suggest that blacks have decreased in sensitivity to certain behaviors of whites, while whites have changed little in their sensitivity to the behaviors of blacks.

RN 82-23. Bonder, S., Doyle, T., & Miller, G. (Vector Research, Inc.); & Shields, J. L. (ARI). Exploratory research on personnel long range planning. May 1982. (AD A119 680)

The objective of this exploratory quick-response research project was to identify personnel-related research, data needs, and method developments required to support long-range planning in the personnel area. This objective was accomplished by performing three main tasks: (a) a conceptual analysis of personnel planning to determine the kinds of information that should be included in a personnel long-range plan (PLRP); (b) a demonstration personnel long-range planning exercise to determine if the information specified in task (a) could be generated and had utility; and (c) an evaluation of the demonstration planning exercise to identify research needs, data deficiencies, and method developments required to support effective personnel planning.

Results included research needs to support personnel long-range planning, a pilot personnel long-range planning system, and a demonstration personnel long-range plan.

Research Products

RP 80-24a. Schulz, R. E., Underhill, W. G., Hargan, C. S., & Wagner, H. (Human Resources Research Organization). The development of programming design guides. December 1979. (AD A109 203)

This research developed and evaluated a guide for the computer implementation of a manual job aid previously developed (ARI Research Products 80-13 and 80-14). The manual job aid of the prior research provided "how to do it" guidance for selected activities identified in the Instructional Systems Development Model (ISD, TRADOC Pamphlet 350-30). The present document describes the conduct of the research activities involved in creating a programming design guide. Companion documents (ARI Research Products 80-24b and 80-24c) provide the programming design guide and a supplemental handbook for users of the computer-based job aid.

RP 80-24b. Schulz, R. E., Underhill, W. G., & Hargan, C. S. (Human Resources Research Organization). Programming design guide for computer implementation of job aid for selecting instructional setting. December 1979. (AD A109 196)

This report describes research to develop and evaluate a guide for the computer implementation of a manual job aid previously developed (ARI Research Products 80-13 and 80-14). The manual job aid of the prior research provided "how to do it" guidance for selected activities identified in the Instructional Systems Development Model (ISD, TRADOC Pamphlet 350-30). The present document provides a programming design guide which enables computer programmers to implement the manual job aid for selecting instructional setting (ISD Block I.5) on any computer system. Companion documents (ARI Research Products 80-24a and 80-24c) provide the developmental history of the programming design guide and a supplemental handbook for instructional developers who will use the computer-based job aid.

RP 80-24c. Schulz, R. E. (Human Resources Research Organization). Supplemental guide: Sources of information for on-line implementation of ISD I.5 select instructional setting. December 1979. (AD A109 195)

This research developed and evaluated a guide for the computer implementation of a manual job aid previously developed (ARI Research Products 80-13 and 80-14). The manual job aid of the prior research provided "how to do it" guidance for selected activities identified in the Instructional Systems Development model. The present document provides a supplementary manual for instructional developers who will use the job aid for selecting instructional setting in the computer mode. Companion documents (ARI Research Products 80-24a and 80-24b) provide the developmental history of the programming design guide, which is intended to enable computer programmers to implement a manual job aid on any computer system, and the actual guide.

RP 81-25a. Gagne, R. M., Reiser, R. A., & Larsen, J. Y. (Florida State University). A learning-based model for media selection: Description. March 1981. (AD A109 472)

This report describes a new media selection model developed as part of a project aimed at improving procedures available for media selection in connection with U.S. Army training. The model addresses factors of learning effectiveness by means of a flowchart that permits successive exclusion of media from an initial candidate set. Derivation of the model focused particularly upon principles of human learning that affect decisions about media, in particular the nature of instruction.

The proposed model is described with consideration of some of the apparent limitations of guidelines for media selection in the Instructional Systems Development (ISD) model. Difficulties experienced in the use of these guidelines provided a partial reason for developing the new model. A description is given of the method of use of the new model and its incorporation into the ISD procedure. Benefits that may be derived from use of the model are also indicated.

RP 81-25b. Reiser, R. A. (Florida State University). A learning-based model for media selection: Development. March 1981. (AD A109 450)

This report describes a project conducted to collect information about instructional media selection procedures and problems in the U.S. Army and to recommend means of improving the media selection process. The media selection procedures and problems that were identified are described and analyzed. Also described are the procedures used during the development and formative evaluation of a new media selection model. Results of the formative evaluation effort are discussed and suggestions for disseminating the model are presented.

RP 81-25c. Reiser, R. A., Gagne, R. M., Wager, W. W., Larsen, J. Y., Hewlett, B. A., Noel, K. L., Winner, J. L., & Fagan, C. (Florida State University). A learning-based model for media selection: Media selection flowchart and user's guide. March 1981. (AD A111 356)

This report describes a new media selection model developed as part of a project to improve procedures available for media selection in connection with U.S. Army training. The model addresses factors of learning effectiveness by means of a flowchart that permits successive exclusion of media from an initial candidate set. Derivation of the model focused particularly upon principles of human learning that affect decisions about media, in particular the nature of instruction.

The proposed model is described with consideration of some of the apparent limitations of guidelines for media selection in the Instructional Systems Development (ISD) model. Difficulties experienced in the use of these guidelines provided a partial reason for developing the new model. A description is given of the method of use of the new model and its incorporation into the ISD procedure. Benefits that may be derived from use of the model are also indicated.

RP 81-26. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume III-A: Human factors analysis of user/operator transactions with TACFIRE--the Tactical Fire Direction System. February 1981. (AD A109 451)

This document is one of a series in the final report of Phase I of a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. The report is organized in five volumes. ARI Research Report 1320 reviews activities and products of the project's first phase. Technical Report 536 contains a technical discussion of the project's objectives, methodologies, results, conclusions, and implications for the design of user/operator transactions with battlefield automated systems. Research Products 81-27, 28, and 29; and this report, document analyses of four unique battlefield automated systems selected to represent different stages of system development and different Army functional areas. Technical Report 537 presents provisional guidelines and criteria for the design of transactions. Technical Report 538 provides a brief review of selected literature related to guidelines and criteria.

RP 81-27. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume III-B: Human factors analysis of user/operator transactions with TCT--Tactical Computer Terminal. February 1981. (AD A109 452)

This document is one of a series in the final report of Phase I of a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. The report is organized in five volumes; see the abstract for Research Product 81-26 for a complete description.

RP 81-28. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume III-C: Human factors analysis of user/operator transactions with administration/logistics. February 1981. (AD A109 453)

This document is one of a series in the final report of Phase I in a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. The report is organized in five volumes; see the abstract for Research Product 81-26 for a complete description.

RP 81-29. Parrish, R. N., Gates, J. L., & Munger, S. J. (Synectics Corporation). Design guidelines and criteria for user/operator transactions with battlefield automated systems. Volume III-D: Human factors analysis of user/operator transactions with IISS-FMS--The Intelligence Information Subsystem First Milestone. February 1981. (AD A109 454)

This document is one of a series in the final report of Phase I in a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. The report is organized in five volumes; see the abstract for Research Product 81-26 for a complete description.

RP 81-30. Fink, C. D., & Carswell, W. A. (Kinton, Inc.); & Kostyla, S. J., & Carroll, R. M. (ARI). Handbook for action officers and training developers for new materiel systems. August 1981. (AD A117 551)

This handbook is designed to provide guidance to TRADOC System Managers (TSMs) and training system action officers (AOs) on training information acquisition and input requirements of the Life Cycle Systems Management Model (LCSMM) for Army Systems. The handbook describes the relationship between the Integrated Personnel Support (IPS) management model and the LCSMM and identifies the major sources of input data and information required to accomplish key Integrated Personnel Support activities as specified in TRADOC Regulation 600-4.

RP 81-31. Goehring, D. J., & Thomas, J. A. U.S. Army female soldiers' career and racial attitudes and perceptions. October 1979. (AD A110 504)

Racial perceptions and attitudes as well as career orientations of 158 black and 187 white females from 22 U.S. Army installations were measured by questionnaire. Demographic characteristics between female groups and with a larger sample of males are compared. Specific areas of satisfaction with military life and general career orientations are reported. Perceptions of various aspects of the racial milieu of the Army are examined. Sharp distinctions exist between female groups concerning perceptions in a number of important areas.

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21-E University of Nevada Library
ATTN: Steven D. Zink (Doc Ex)
Federal Documents Section
Government Publications Department
Reno, Nevada 89557

NEW HAMPSHIRE

- 28 University of New Hampshire
ATTN: Library Serial Department
Durham, New Hampshire 03824
- 62 Dartmouth College Library
ATTN: Reference Department
Hanover, New Hampshire 03755

NEW JERSEY

- 86 Rutgers University Library
ATTN: Government Publication Department
New Brunswick, New Jersey 08901
- 83 Princeton University Library
ATTN: Document Librarian
Princeton, New Jersey 08540

NEW MEXICO

- 42-C University of New Mexico
ATTN: General Library - GPMO
Charles A. Seavey
Albuquerque, New Mexico 87131

NEW YORK

- 72 Lehman College Library
ATTN: Acquisition Division
Serials Section
Bedford Park Blvd West
Bronx, New York 10468
- 49 Brooklyn College Library
ATTN: Prof. E. Svuksts
Documents Division
Bedford Ave. & Ave. H
Brooklyn, New York 11210

- 79 Brooklyn Public Library
ATTN: Technical Services Center
Acquisitions Department
109 Montgomery Street
Brooklyn, New York 11238
- 5 State University of New York at Buffalo
ATTN: Acquisitions Department
Lockwood Library Annex
Buffalo, New York 14260
- 35 Cornell University Library
ATTN: Government Documents
Ithaca, New York 14853
- 23 Columbia University Libraries
ATTN: Documents Service Center, Rm. 327
420 West 116th Street
New York, New York 10027
- 32 New York City Association of the Bar
ATTN: Library
42 West 44th Street
New York, New York 10036
- 22 New York Public Library
ATTN: Government Documents
Fifth Avenue and 42nd Street
New York, New York 10018
- 108 New York Public Library
ATTN: Book Ordering Office - Periodicals
455 Fifth Avenue
New York, New York 10016
- 16 Paul, Weiss, Rifkind, Wharton & Garrison
ATTN: Library
345 Park Avenue
New York, New York 10154
- Readex Microprint Corporation
101 5th Avenue
New York, New York 10003
- 118 New York Law School
Library - Government Documents
57 Worth Street
New York, New York 10013
Attn: Joanne Scala Gov. Docs Asst.

- 24 United Nations
ATTN: Dag Hammarskjöld Library
Acquisitions Section
New York, New York 10163
- 21-B John Jay College of Criminal Justice
Library - Acquisitions Department
445 West 59th Street
New York, New York 10019
- 105 State University of New York at Stony Brook
ATTN: Main Library
Documents Section
Stony Brook, New York 11790
- 64 Syracuse University Library
ATTN: Serials Division
Syracuse, New York 13210

NORTH CAROLINA

- 98 University of North Carolina-Chapel Hill
ATTN: Serials Department
Wilson Library 024-A
Chapel Hill, North Carolina 27514
- 12 Duke University Library
ATTN: Documents Librarian
Durham, North Carolina 27706
- 90 North Carolina State University - D.H. Hill Library
ATTN: Acquisitions Dept. (S)
Raleigh, North Carolina 27607

OHIO

- 20-A University of Cincinnati
ATTN: Main Campus Library
Serials Department (Documents)
Cincinnati, Ohio 45221

- 95 Ohio State University Libraries
ATTN: Documents Division
Main Library
1858 Neil Avenue
Columbus, Ohio 43210
- 87 Kent State University
ATTN: Documents Librarian
Kent, Ohio 44240
- 38 Miami University Library
ATTN: Jean Sears, Documents Librarian
Oxford, Ohio 45056
- 41 The College of Wooster
Government Publications Department
Andrews Library
Wooster, Ohio 44691

OKLAHOMA

- 14 Oklahoma State University Library
ATTN: Documents Librarian
Stillwater, Oklahoma 74078

PENNSYLVANIA

- 80 Free Library of Philadelphia
ATTN: Public Documents Department
Logan Square
Philadelphia, Pennsylvania 19103
- 54 Temple University
ATTN: Documents Room
Samuel Paley Library
Philadelphia, Pennsylvania 19122
- 81 Carnegie Library of Pittsburgh
ATTN: Serials Unit
4400 Forbes Avenue
Pittsburgh, Pennsylvania 15213

RHODE ISLAND

77 Brown University
ATTN: Library
Documents Division
Providence, Rhode Island 02912

SOUTH CAROLINA

47 University of South Carolina
ATTN: Order Department
McKiesick Memorial Library
Columbia, South Carolina 29208

TENNESSEE

89 University of Tennessee Library
ATTN: Documents Librarian
Knoxville, Tennessee 37916

TEXAS

42-A Texas State Law Library
ATTN: Barbara Jo Serotc
P. O. Box 12367
Austin, Texas 78711

27 University of Texas
ATTN: Documents Librarian
Law Library
2500 Red River
Austin, Texas 78705-5799

34 University of Texas Library
ATTN: Central Serials Record
Austin, Texas 78712

21-J Texas A & M University
ATTN: Jan Swanbeck
Documents Division
Sterling C. Evans Library
College Station, Texas 77843

76 Dallas Public Library
ATTN: Documents Librarian
1515 Young Street
Dallas, Texas 75201

110 Baylor University
Library - Serials Department
P.O. Box 6307
Waco, Texas 76706

UTAH

20 Utah State University UMC-30
ATTN: Leona K Pisarz
Merrill Library - Ordering and Receiving
Logan, Utah 84322

21-D Brigham Young University
ATTN: Library
Documents Section
Provo, Utah 84601

2 University of Utah
ATTN: Serials Order Department
Documents Section
Salt Lake City, Utah 84112

VERMONT

13 University of Vermont
ATTN: Director of Libraries
Guy W. Bailey Library
Burlington, Vermont 05401

VIRGINIA

106 University of Virginia
ATTN: Public Documents
Charlottesville, Virginia 22903

- 103 George Mason University
ATTN: Acquisitions Librarian
4400 University Drive
Fairfax, Virginia 22030
- 21-C University of Richmond
ATTN: Ms. Judith B. Poynter, Library Assistant
Boatwright Memorial Library
Richmond, Virginia 23173
- 50 Virginia Commonwealth University
Government Publications Section
James Branch Cabell Library
901 Park Avenue
Richmond, Virginia 23284
- 107 College of William and Mary
ATTN: Documents Department
Swem Library
Williamsburg, Virginia 23185

WASHINGTON

- 46 Washington State Library
ATTN: Serial Section
Library Building
Olympia, Washington 98504
- 65 Washington State University
ATTN: Social Science Library
Pullman, Washington 99164
- 59 University of Washington Libraries, FM-25
ATTN: Serials Division
Seattle, Washington 98195

WISCONSIN

- 78 Milwaukee Public Library
ATTN: Serials Section
814 West Wisconsin Avenue
Milwaukee, Wisconsin 53233

OTHER

3 Bibliotheek Voor
 Hedendaagse Dokumentatie
 Parklaan 2
 B-2700 Sint. Niklaas Waas,
 BELGIUM

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