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# A Review of Combat Support Training

by

Ernest K. Montague and Morris Showel

HumRRO Division No. 3

November 1969

Prepared for:

Office, Chief of  
Research and Development  
Department of the Army

Contract DAHC 19-70-C-0012

# HumRRO

HUMAN RESOURCES RESEARCH ORGANIZATION

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DEPARTMENT OF THE ARMY  
OFFICE OF THE CHIEF OF RESEARCH AND DEVELOPMENT  
WASHINGTON, D.C. 20310

CRDBES

December 22, 1969

SUBJECT: A Review of Combat Support Training

TO:

1. The research described in this report entailed observation of current training practices and problems in Army Training Centers as they relate to the wide range of individual ability in the Army enlisted population. The ultimate objective is to develop approaches to training and training methods that will ensure more effective training for both fast and slow learners.
2. Data were collected for 1300 soldiers in 23 classes of eight combat support courses at four Army Training Centers. The Field Wireman and General Supply courses were chosen for more intensive observation because these courses are given to trainees with a very wide range of ability, represent a variety of basic job procedures and physical skills, and have had relatively high attrition rates.
3. This report should be of interest to personnel concerned with selecting and organizing training content and methods in general, and to those concerned with training and utilization of low-aptitude personnel in particular.

FOR THE CHIEF OF RESEARCH AND DEVELOPMENT:

A handwritten signature in cursive script, appearing to read "Lynn E. Baker", is written over the typed name.

LYNN E. BAKER  
US Army Chief Psychologist  
Acting Chief  
Behavioral Sciences Division

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*by*

**Ernest K. Montague and Morris Showel**

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HumRRO Division No. 3  
Presidio of Monterey, California  
**HUMAN RESOURCES RESEARCH ORGANIZATION**

Technical Report 69-19  
Work Unit SPECTRUM  
Sub-Unit I

The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University, Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation. HumRRO's mission in work performed under contract with the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

**The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.**

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## FOREWORD

The overall aim of Work Unit SPECTRUM of the Human Resources Research Organization is to develop procedures for selecting and organizing training content and methods for more effective training across the wide range of student ability now present in high density courses. This report of SPECTRUM I presents a review of current training practices and problems as they relate to differences in learning capacity between high and low aptitude soldiers. The magnitude and nature of these differences have been explored in SPECTRUM II. The information gained in Work Sub-Units I and II will be utilized in the development of effective methods of individualizing training being undertaken in SPECTRUM III.

The SPECTRUM I study was conducted by HumRRO Division No. 3 at Presidio of Monterey, California. Director of Research at the time of the study was Dr. Howard H. McFann.

Military coordination and support for the study were provided by the U.S. Army Training Center Human Research Unit. Military Chief of the Unit was LTC David S. Marshall.

Another Work Unit SPECTRUM report, *Aptitude Level and the Acquisition of Skills and Knowledges in a Variety of Military Training Tasks*, by Wayne L. Fox, John E. Taylor, and John S. Caylor, has been published as HumRRO Technical Report 69-6, May 1969.

HumRRO research for the Department of the Army is conducted under Contract DAHC 19-70-C-0012 and, for Training, Motivation, and Leadership Research, under Army Project 2Q06210A712.

Meredith P. Crawford  
President  
Human Resources Research Organization

# SUMMARY AND CONCLUSIONS

## Military Problem

With a greatly increased input of low mental aptitude (AFQT Category IV) trainees into the Army since mid-1966, new training problems have arisen and concern on this topic has become more acute with continuing training experience. These problems relate to the broad spread of individual ability to be handled instructionally in any given course and to the increasing need for functionalization of training.

## Research Problem

With a requirement to explore methods of adapting military instruction to a wide range of individual ability, there existed a basic need to determine present practices and problems in training, the effect of such practices on the range of abilities now present in training, the degree of intensification of problems by the fact of wide range of student ability, and present training adaptation to these new problems.

## Research Approach

During late 1966 and early 1967, data were collected from 23 classes of eight combat support courses in a typical training brigade. Attrition rates, educational achievement, and other statistical data from this initial review stage provided the basis for choosing two courses in the same brigade, Field Wireman and General Supply, for further intensive observation of training. These two courses were selected because they were given to trainees with a very wide range of ability, represented a variety of basic job procedures and physical skills, and had relatively high attrition rates.

For several weeks, each course was carefully observed with particular attention to:

- (1) The characteristics of the student population; spread of abilities; attrition patterns.
- (2) The actual training system as it works with the problem of wide range of ability, to include the presence or absence of clear training objectives, sequence and organization of course content, suitability of method to student ability, usage of facilities, instructor capabilities, and the general administrative support of training efforts.
- (3) The types and processes of student evaluation.
- (4) Efforts and methods in individualizing training.

After consolidation of the information thus gained, and the briefing of appropriate headquarters on the findings, the same type of observation was conducted at three other widely separated training centers (the basic Clerk course was substituted for the General Supply course at one of these posts). Class coverage was made at a 15% sampling level, with all phases of training represented.

## Results

The research team observations indicated that there are many strengths and certain problems in present combat support training. The main strengths are in the fundamental

training structure and in the general dedication of instructors and administrators; they were not considered in detail in the review since the opportunity for improvement lies with the problems rather than existing strengths. The problems most common to all training centers observed were those related to practices crystallized in Army Subject Schedules and to the difficulties inherent in the very wide range of student ability.

The nature of the training system works against the less literate student and makes very difficult the simultaneous handling of Category I and Category IV students. The highly verbal nature of training objectives, the continuing prevalence of platform-centered instruction, and the heavy use of paper-pencil examinations in these occupational courses make a functional and job-related approach to instruction very difficult.

Attrition patterns show much higher levels of recycling associated with low AFQT category. Recycling remains the primary means of handling students in academic difficulty; although there is some remedial evening study work, this tends to be of a highly verbal nature.

The present system is not optimally oriented toward the handling of a wide range of abilities. High-level students are not challenged and low-ability students are not able to cope with the large verbal-academic components in these combat support courses. Logical aims for instructional change are increased functionalization toward job-related objectives, job-like instructional sequences, evaluation of a practical and job-like nature, and the development of means to fit training to ability level.

The implementation of USCONARC Reg 350-100-1, Feb 68, on the systems engineering of training will ameliorate some of these problem situations, but such systemic improvement will necessarily require considerable time and will not be directly concerned with problems of individual differences.

## **Conclusions and Implications**

The results of the review of combat support training suggest several general conclusions regarding how combat support training could be made more effective. These conclusions, in turn, have implications for actions that can be considered for long- and short-range improvements in the training system, with special reference to wide range of aptitudes in the current Army input.

Key elements in improving the effectiveness of instruction for the wide range of abilities present in Army training courses are greater emphasis on job-related and behaviorally stated training objectives, functionalization of instruction, and evaluation based on job performance capabilities. While publication of USCONARC Reg 350-100-1 is a major step toward these ends, a series of additional and more immediate steps could be considered for improving various aspects of training. (They are not listed in order of importance or ease of implementation.)

## **Implications for Instructional Actions**

(1) The role and use of Army Subject Schedules in the training system need reconsideration. The need is for greater flexibility and adaptability in meeting the growing demands for functionalization of training, individualization of training, and the various modes of programming of instruction.

(2) Consideration should be given to the use of a professional educator at each major training center, to serve as staff advisor on training matters, with particular reference toward rapidly changing training modes and needs and to the continuing functionalization and individualization of training.

(3) Both generally and locally, emphasis on practical and functional training can be increased and emphasis on platform-centered verbal instruction lessened by reducing the physical and temporal separation of verbal and practical instruction and by making verbal instruction a genuine working adjunct of practical instruction.

(4) There needs to be reconsideration of the role and use of the instructional committee in the scheme of instruction. The broadening and overlapping of these committees to the point of requiring individual instructors to handle longer functional sequences with a given group of students might well result in a more personal relationship between instructor and student and in a more functionally organized sequence of instruction.

(5) Administrative practices may be revised in several particulars: to make training goals and the success of the instructor in attaining these goals the key point of training inspection; to make the many administrative and other appointments which now have precedence over training into a recognized part of the weekly schedule; and to insure that combat support courses enjoy the same degree of command attention that is given combat training.

(6) Much consideration needs to be given to any means that will lead toward the setting up of concrete and specific standards of performance which each student must master before graduating. This implies a move away from the percentage system of grading performance.

### **Individualization of Instruction**

The suggestions for possible actions toward improving training instruction in general could be expected to, in some instances at least, give especial assistance to lower-aptitude students. However, the basis for making specific suggestions for fitting instruction to the individual soldier is much less clear. Much more information is needed—for example, on the relative effectiveness of different instructional methods at different ability levels, and about the different motivations of trainees with differing abilities and background.

Promising approaches meriting further experimentation and consideration are:

(1) Track systems, with teaching method matched to track level and with different tracks finishing training in different time frames, that is, with training content held constant and varying training method and time.

(2) Holding time constant, but utilizing separate tracks to provide different amounts of material to different levels by different means, and giving added material to upper tracks.

(3) Integration of all students, with higher aptitude students acting as tutors for lower level students, and with suitable recognition or reinforcement to these student leaders.

(4) Small team training, with training for each individual ceasing immediately upon the mastery of required skills and knowledges.

These and other possible avenues require further study.

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**A Review of  
Combat Support Training**

## BACKGROUND AND PURPOSE

### BACKGROUND

Two distinct classes of problems are being recognized by military training personnel as of major importance in their mission to provide large numbers of men with instruction for practical application in military occupational specialties (MOSs).

First, the problems surrounding the instruction of students of very low and very high academic abilities at the same time and in the same framework have become a matter of acute interest in the past few years. Traditionally, military education systems, like civilian systems, have used a curriculum providing standard blocks of material to students of all aptitudes at the same time and pace. Attempts to individualize treatment took the form of delaying the promotion of slow students and accelerating the progress of able students.

In an earlier era, when civilian school groupings were moderately homogeneous after the seventh or eighth grade, this lockstep treatment of time and material did not present an insuperable problem. In recent decades, however, the extension of public schooling—and military training—to a vast range of students has brought serious problems of communication and instruction from or related to the principle of lockstep instruction. Students handicapped by low ability, by difficulties in communicating, or by culturally influenced deficiencies have repeated work or have passed along from grade to grade without really learning tool subjects that are essential to learning in the typical occupational course or performing in a job. At the same time highly able students have been held back to the point of boredom and disinterest.

In recent years extensive efforts have been, and are now being, made to develop approaches that would provide students of high, medium, or low ability with materials and learning pace more nearly appropriate to their particular capabilities and backgrounds. Such attempts to fit instruction more closely to the individual student have usually been termed individualized or individually managed instruction. These approaches show much promise, but not enough time has passed to allow their general effectiveness to be fully measured.

The second class of problems has led to the present comprehensive Army effort to clarify the objectives of training, relate training more closely to job function, and revamp evaluation procedures toward a more valid testing of student skills and supporting knowledges. Such "functionalization" in military occupational training is productive for the entire range of students but seems of particular value in the attempts to meet the needs of the lower-level students.

Making changes of this nature is not an easy process. A long heritage of academic and departmentalized platform instruction has made it difficult to move training goals and methods (even in combat support or military occupational courses) away from long-standing subject-centered approaches and toward job-centered and functional learning tasks and tests. The Army's concern and its commitment to the necessary program of changes is evidenced by the promulgation of USCONARC Reg 350-100-1, Feb 68, on the subject of systems engineering of training (1). Progress being made in this area is

demonstrated by the recent course modification and changes in the Army Medical Corpsman Course and the Radio Operators' Course.<sup>1</sup>

## MILITARY PROBLEM

Army training systems are being confronted by these types of problems in almost all aspects of training and to an increasing degree. Research and observation have long indicated that highly able students could finish Army training courses in a very short time or, given the same time, could successfully handle additional advanced material, but logistical and administrative considerations have made it desirable to maintain a single-group training.

Since mid-1966, however, the introduction of a large number of men of lower aptitude from the draft and from enlistment has placed considerable strain upon the traditional instructional system and has reopened the question of how best to train men of such a wide range of ability as those now going through the training centers. A variety of research efforts have been aimed at defining, studying, and devising solutions to training problems rising from this wide range of aptitudes.

## RESEARCH PROBLEM

One such research and development project is HumRRO Work Unit SPECTRUM, one phase of which is described in this report. The objective of SPECTRUM is "to develop procedures for selecting and organizing training content and training methods for high density combat and combat support Military Occupational Specialties in order to achieve more effective training at all aptitude levels." The overall study is made up of three Work Sub-Units: SPECTRUM I, SPECTRUM II, and SPECTRUM III.

While the SPECTRUM I staff was making a detailed study of combat support courses as they are now constructed and conducted, concurrently the staff of SPECTRUM II studied the specific relationships between aptitude level and complexity of task in a controlled series of experiments in a work laboratory situation. That study (4, 5) has demonstrated that high or low performance is related to high or low general aptitude across a variety of learning tasks, from the most basic simple visual response task to the learning of multiple verbal and visual symbols. Of much interest were the sizable difference between high and low ability groups and the consistency of this difference from task to task. SPECTRUM III, now beginning, is a series of studies of miniature training situations, aimed at determining the effects of various training methods on different ability levels and different complexities of learning task.

SPECTRUM I, which is described in this report, was undertaken for several reasons. There was a need to observe variations of presently used training methods and to consider these as material for experimentation in SPECTRUM III. There was a need to study the reactions of and adaptation of local trainers to the increasing input of Category IV persons, with reference to the general attitude and approach of training personnel as well as to their technical adaptations. Also, as specific information on the differences between high and low aptitude soldiers emerged as findings in SPECTRUM II, it was desirable to observe the learning behavior of these men in the daily training routine. In brief, a survey of training objectives, practices, evaluations, and changes in these areas as they relate to student differences was a necessary step in relating field and laboratory work.

<sup>1</sup> Both of these efforts were part of HumRRO Work Unit SUPPORT. The medical course is described in a HumRRO Technical Report in preparation (2), dealing with the effect of an integrated Basic Combat Training/Advanced Individual Training sequence of instruction in the Medical Corpsman training program (MOS 91A10). Portions of the program are already being implemented in corpsman training. The development of modified radio operator training is described in another HumRRO Technical Report in preparation (3), and a new Army Subject Schedule 11-05B20 for Radio Operators is soon to be published.

## RESEARCH APPROACH

Combat Support Training Brigades at four Army Training Centers were visited in 1967 and early 1968. Certain courses, to be described later, were chosen for intensive observation because they represented a wide range of physical and mental skills, had an adequate sampling of all levels of student ability, and were experiencing difficulties of high attrition or recycling. The research team observed instructional practice and method, obtained information on common problems and on problems especially related to ability range, and looked for both strengths and weaknesses that might be exploited or modified in future planning.

The observations at different centers indicated that there were, indeed, many strengths and that many good technicians were being trained. It was equally evident that certain common problems were reducing training efficiency, markedly in some instances, moderately in others. In particular, the introduction of growing numbers of students of low academic ability accentuated those problems in present Army Training Schedules that relate to verbalized objectives and highly verbalized instruction and evaluation.

This report is an attempt to review those problems that seemed to have the most effect in reducing efficiency in combat support training, and in a preliminary way to discuss possible remedial actions. The report is focused on problems rather than on existing program strengths, since the possibilities for constructive action center in finding solutions for the problems. Most of the attention has been given to problems in the context of the local training situation, although systemic considerations do enter in. Over time, the actions outlined in USCONARC Reg 350-100-1 (1) will gradually influence some of these areas, but implementation had not begun at the time of this review.

SPECTRUM I observations are confined to training. Other areas will need attention in the effort to make the best use of men of all aptitudes during their Army service. In this connection, HumRRO Work Unit UTILITY is organized to study the performance of Project 100,000 personnel in daily work and in progress made within the military framework. HumRRO Work Unit REALISTIC (6, 7, 8) is analyzing the reading, listening, and arithmetic skills required for major MOSs, and developing guidelines and methods for lessening the differences between these skill levels as now required on jobs and the range of trainee aptitudes available for these jobs.

## METHOD AND PROCEDURES

### COLLECTION OF DATA

Since courses that handled large numbers of men at all levels of ability were the major interest, the groundwork for this review was laid in late 1966 and early 1967 by collecting data on eight of the nine combat support courses conducted at one Army Training Center. The courses in this initial study, which included 23 classes and more than 1300 students, are listed in Table 1. Student aptitudes, analyses of course content, instructional and evaluation procedures, and student achievement and attitudes were among the data obtained.

By the time of this study, the input of a large number of new accession Category IV soldiers had been in effect three or four months and a wide distribution of aptitudes was reflected in the trainee population in most courses. This distribution of students is shown in Table 2 as it existed in the initial sample.

The General Supply and Field Wireman courses were selected for further, more detailed study because of the wide range of abilities of the trainees in these courses and because lower ability students were having considerable trouble in them. Between them, the two courses reflect a wide range of physical and mental skill requirements.

Table 1

### Combat Support Course Representation in Initial Sample

MOS and Course	Number		Course Duration (weeks)
	Classes	Students	
70A10 Clerk	3	328	4
71B20 Clerk Typist <sup>a</sup>	3	95	4
71H20 Personnel Specialist <sup>a</sup>	3	81	4
94B20 Food Service	2	77	8
76A10 General Supply <sup>b</sup>	4	181	6
36K20 Field Wireman <sup>b</sup>	2	200	8
63B20 Wheel Vehicle Mechanic	3	152	7
64A10 Light Vehicle Driver	3	199	5
05B20 Radio Operator Course <sup>c</sup>	None		10

<sup>a</sup>Input is entirely from Clerk Course 70A10.

<sup>b</sup>Course selected for study in depth.

<sup>c</sup>This course, already under study in Work Unit SUPPORT (3), was not used for the present study.

Table 2

### Distribution of Students in AFQT Categories, by Course, in Initial Sample

Course	AFQT Score and Category <sup>a</sup>				Total (N)
	10-30 IV (%)	31-64 III (%)	65-92 II (%)	93-100 I (%)	
70A10 Clerk	16	38	36	10	328
71B20 Clerk Typist	7	40	46	7	95
71H20 Personnel Specialist	5	36	42	17	81
94B20 Food Service	18	65	17	0	77
76A10 General Supply	34	39	25	2	181
36K20 Field Wireman	24	42	30	4	200
63B20 Wheel Vehicle Mechanic	14	37	41	8	152
64A10 Light Vehicle Driver	30	48	16	6	199
Overall	20	42	31	7	1313

<sup>a</sup>The Armed Forces Qualification Test (AFQT) is a paper-and-pencil test administered to all new enlisted persons. Mental categories are then defined by centile rank.

There tends to be a higher proportion of high ability soldiers in the clerical courses, due in part to the literacy requirements in clerical work. The relatively low proportion of Category IV persons in Clerk Typist and Personnel Specialist courses reflects the process of selection from the basic Clerk course to these two advanced courses.

The achievement records for students in all courses is summarized in Table 3 in terms of graduation, recycling, and dropout records. It is quite apparent that AFQT group and academic success are positively related.

It needs to be remembered that these data portray the situation in late 1966 and early 1967. Changing administrative practices in handling low level students through 1967 and 1968 may well have changed failure and recycle rates from those shown in Table 3

Table 3

**Graduation and Recycling Record of Students  
by AFQT Group, all Courses, in Initial Sample<sup>a</sup>**

AFQT Group	Graduate With Class (%)	Academic Recycle (%)	Adminis- trative Recycle (%)	Adminis- trative Drop (%)	Other Drop <sup>b</sup>		Total (N)
					(%)	(N)	
I 93-100	98	0	1	1	0	0	89
II 65-92	92	1	6	1	0	1	406
III 31-64	89	3	7	1	1	3	551
IV 16-30	77	12	7	2	4	6	238
10-15	52	25	20	0	4	1	25
Overall	88	4	6	1	1	11	1309

<sup>a</sup>This table includes early transfers to other schools, listed here as successful graduates, but does not include several students whose final records were not found.

<sup>b</sup>Includes persons in confinement, hospital, or AWOL. Only one person, from Category III, was an academic drop.

for the initial sample. Continuing observation of several posts suggested that the attrition rates of late 1967 and early 1968 reflected implicit policy (i.e., maintaining a low attrition rate) as well as actual student success or failure in learning course content, particularly at the lower ability levels. During this period, with an increase in Category IV population and with no noticeable change in training techniques, attrition rates tended to hold steady or diminish.

These observations on problems of evaluation were given added weight by the differences in learning levels recorded in the studies of SPECTRUM II (4) and in a 1965 study (9) of the Category IV soldier in basic training. These studies and Army basic training statistics agree in showing that while most soldiers do indeed complete basic training, there is a performance gap between the most and least able. This gap increases as training progresses and becomes more complex,<sup>1</sup> and the whole problem of attrition remains full of questions.

Following analysis of data from the observation of the initial 23 classes, and briefing of and conference with military training authorities on findings from the initial stage, the review was continued in more detail and on a broader scale. The General Supply and Field Wireman courses selected for intensive observation were studied in detail at various periods during early and mid-1967. Research team members attended more than half of all classes and field exercises in these courses and made careful observations of instructional method, content, facilities, and resources. In addition, during early 1968 similar observations were made on these courses at three other widely separated training centers (the Clerk Course was substituted for an unavailable Supply Course in one instance). In this part of the review, research team observations covered 15% samples of all aspects of training. At all centers, brief visits were made to other combat support courses.

## ANALYSIS OF OBSERVATIONS

While a training system may be analyzed or observed in many ways, in this research the primary objective was to gain information regarding the existing training of a diverse

<sup>1</sup> A typical report of the greater difficulty of New Standards men in handling advanced courses is an unclassified report from the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs), 16 Feb 68, describing attrition rates in various military courses.

and wide range of students, to note the special problems arising from this wide range and from efforts toward individualization of training, and to observe adaptation to these problems by students and instructors in the system.

In observations and subsequent analysis and interpretation, the research team concentrated on four general areas throughout all stages of the review:

**The Student Body.** Information was gathered on student aptitude and attitude and on the range of aptitudes involved in combat support courses, as well as on the progress and outcome of specific categories of students as they worked through the courses. The greater part of this information came from classroom and field observation of students, from school records, and from some interviews.

**The Conduct of Training.** Since training is closely tied to what teachers and students see as the goals of training, information was sought on the type and clarity of training objectives and the degree to which these were couched in terms of *performance*, either for learning or for evaluation. Secondly, information was collected on the actual conduct of training, in both structure and function. Included were the relationship of course and examination content for greatest learning efficiency, the relevance and adequacy of instructional method and use of physical resources to accommodate the extraordinary range of students, and the general effectiveness of both everyday pedagogy and administrative training support. Prolonged observation was the source of information. The observation sheet used for recording data is shown in Appendix A.

**The Evaluation of Students.** While evaluation of students is hardly a separate entity from the training system above, it is of such importance that it was given particular attention. Of special interest were (a) the problem of evaluating the lower-level student who is not proficient in either note-taking or handling written examinations, and (b) the efforts to make evaluation a more functional and practical procedure for all students. Information was gained by observation and by collection of samples of tests being used in evaluating various kinds and stages of instruction.

**Individualization of Training.** All training systems serving a range of students of necessity make some modification in time allotments of instructional content or method in an effort to reach as many students as possible. This effort may range from extra study time for certain students to sophisticated programs given at various levels, and may include a general lowering of instructional presentation in an effort to ensure that low-aptitude trainees are reached. Because of the growing need for and importance of modifications directed toward the differences among individual trainees, particular attention was paid to present training attempts of this sort.

Throughout the review, the emphasis was on training technology within the local training systems. Larger systemic matters or problems were addressed only tangentially and briefly, although final consideration of the sum of the local observations has some systemic applications and implications.

## THE TRAINING SYSTEM

### GENERAL CONSIDERATIONS

A training system consists of people, equipment, policies, procedures, and facilities organized to reach certain implicit or stated training goals. The framework of the combat support training review has been presented and important facets will be discussed in some detail. Since training statistics are available in official reports, this report has been directed toward describing, and attempting some analysis of, the observations of practices and problems encountered in trying to conduct training that will reach large numbers of students including both very high and very low ability.

Before turning to specific review areas, it is appropriate to note the existence of local command policies and interpretations, usually unwritten, that influence the identity and character of training units to the point that different centers present markedly different pictures to the observer, even though written policies are quite similar. While there is no lack of strong and intelligent leadership at high levels at the centers, it is apparent that there are differences in the degree of command interest in combat support training as such, and in the thoroughness of training leader knowledge of modern pedagogy and of military training and training research developments in recent years. Since these factors are of much import in handling the training of a wide spectrum of students, they will be discussed briefly:

Upper level officers are intensely interested in training per se. However, with the effects being visible to varying degrees, there is an imbalance in the personal interest of these men—all *line* officers—in *combat support* course content as compared with *combat* course content. All leaders identify with combat courses. Identification is much more variable with large segments of support-type instruction dealing with supply records, typing, telephony, and other more mundane areas that make up these occupational courses. Manifestations of lack of identification vary, but tend to include sentiments that more military-type content (and thus presumably less technical training) would "make better soldiers" of the trainees, and that technical service officers would be handicapped as technical school leaders because they would tend not to bring about the needed soldierly qualities. Where such attitudes were present at command levels, they were reflected in similar feelings at lower levels in training administration and were accompanied by less effective combat support training, which in turn intensifies problems stemming from range of aptitudes among trainees.

The second point is no easier to document but seems also to be pervasive and can have equally strong effects on the training of lower aptitude soldiers. Professional officers generally have some practice, much interest, and often considerable pride in their training ideas and techniques. Yet only part of them are familiar with the progress in educational ideas and concepts. Army *schools* have tended to reserve the position of Educational Advisor for experts in education (although they may utilize them more in administration than in educational observation and planning). Training *centers*, however, are dependent on the educational expertise of unit commanders, training officers, and instructors. Predictably, at the centers, in those technical support courses where subject knowledge is simply not within the province of the commander or training officer, their attention tends to be on the form or the logistics of the courses. The result is that training observation, inspection, and reporting in such courses are more vigorously concerned with instructor agreement with the Army Subject Schedule for the course than with the truly educational aspects of the instruction. Instructors, keenly aware of the nature of training inspection, then tend to be reluctant to make instructional changes even though they may recognize changes are needed to meet changing input or conditions.

The combined effect of these factors, when strongly present, is very noticeable at all training levels. While generally detrimental to all combat support training, the effect is particularly marked on lower level soldiers, for in these situations less attention is paid to the special technical needs of these students.

Related to these general considerations are the occasional problems arising from the dual organization of housekeeping and training functions that is now prevalent. If training and administrative-housekeeping demands conflict, the odds are high that the latter will prevail, particularly in the scheduling of medical, administrative, and housekeeping activities. A soldier is estimated to lose about one-sixth of training time to these functions—a loss that can be absorbed by the very apt student but is not at all well handled by the less apt third of the group, particularly in skill courses which demand practice to achieve proficiency.

In the following sections are more specific observations on the training problems created by a wide spectrum of student abilities, and some analysis and discussion of possible approaches to dealing with these problems.

## THE STUDENT BODY

Typical student weekly input at a given training center runs from 30 to 50 students for the General Supply Course and from 50 to 100 students for the Field Wireman Course. An idea of the range of abilities of trainees in the courses at the time this study began was given in Table 2. As the input of Category IV persons has stabilized, it may occasionally contribute up to 40% of a given class, but normally runs somewhat lower.

Seasonal fluctuations in the input are quite noticeable to instructors. Summer months in recent years have been characterized by heavy input of National Guard and Enlisted Reserve soldiers of much higher academic status and ability than the Regular Army and inducted soldiers who make up the bulk of the classes during the remainder of the year.

While the range of aptitude stemming from trainee origin or seasonal inputs is great and is a training problem of magnitude, it is the consistent and broad spread of individual talents within each class that is at once striking and creative of difficulty for instructors. It is one thing to conceptualize from training statistics and attrition figures an abstraction called a "class" or "course." It is quite another to encounter daily and weekly the task of teaching the same material simultaneously to men who can barely read and to men with advanced degrees in the arts and sciences. This topic will be discussed further in following sections.

From many samples of soldiers at various AFQT levels in SPECTRUM I and II research and from Department of Defense statistics regarding Project 100,000, there emerge consistent findings with regard to the aptitude and educational qualifications of the men in the lower AFQT categories. As an example, the civilian educational record of 326 soldiers in five classes in Field Wireman, Light Vehicle Driver, and basic administration courses in one training center early in 1968 is presented in Table 4.

Table 4

### Educational Status of Combat Support Students by AFQT Category

AFQT	High School Graduate		Non-Graduate		Total
	N	%	N	%	N
Category I	13	87	2	13	15
Category II	60	77	18	23	78
Category III	88	61	55	39	143
Category IV	40	44	50	56	90
Total	201	62	125	38	326

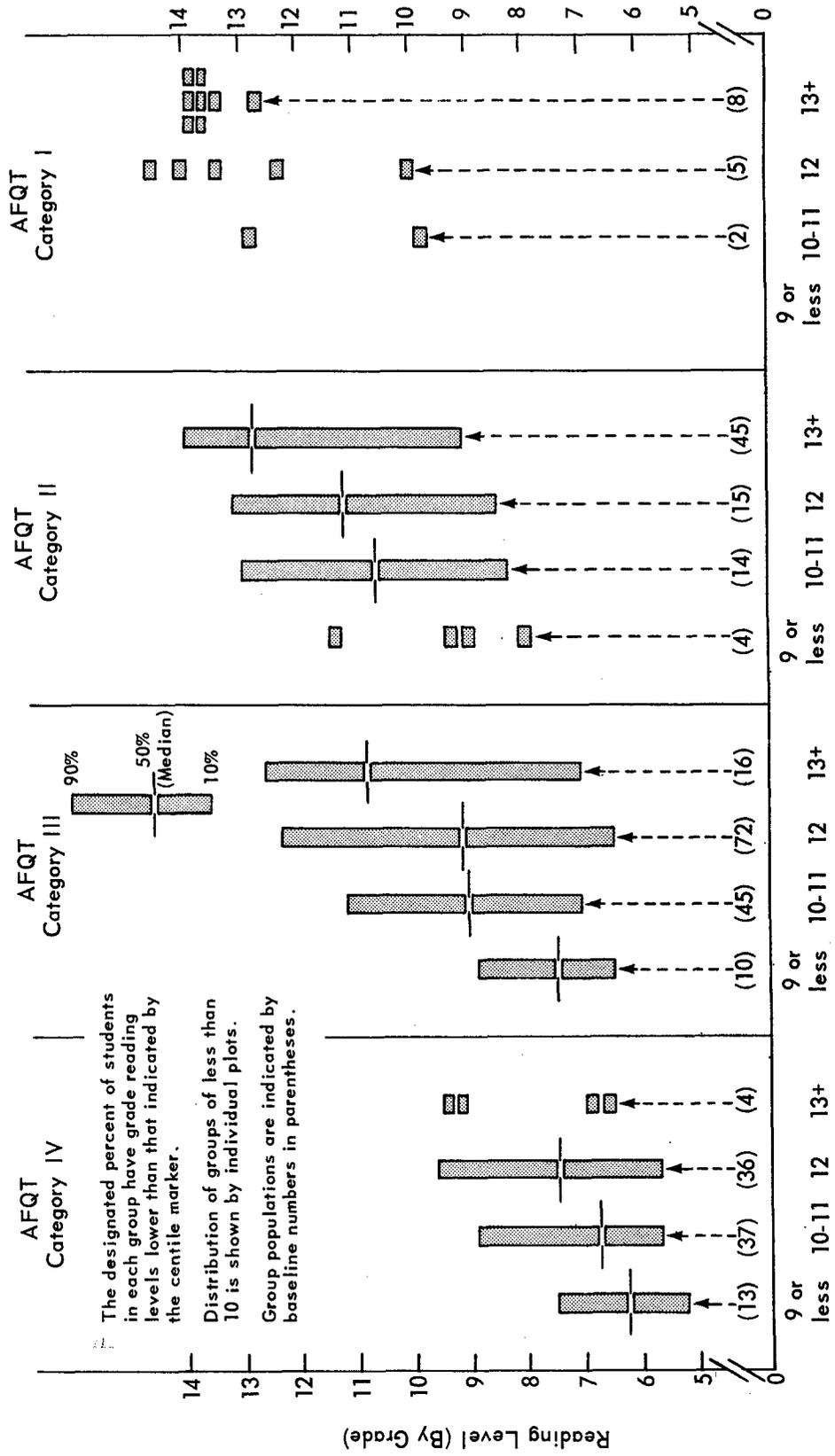
The percentage of Category IV high school graduates in this sample approximates the 40 to 45% typically reported in Department of Defense periodic reviews of Project 100,000. However, the amount of formal education completed is not necessarily a good predictor of trainability in the lower AFQT brackets. Completion of high school, or of eight or nine grades, may not mean that basic reading and arithmetical competences are at these levels.

Figure 1 shows the results of a reading test<sup>1</sup> given to the soldiers of the five classes reported in Table 4. (Arithmetic and similar tool skills are highly correlated

with reading ability.) The graph compares the actual reading test ability of groups of designated educational level (grades of school completed) and shows the considerable

<sup>1</sup> California Survey of Achievement, Reading, Junior High Level; McGraw-Hill, 1959. This is a group test. Because of its medium range, lower scores are distorted upward, higher scores downward, resulting in less apparent difference between groups than is actually the case. Data were gathered jointly for Work Unit SPECTRUM and Work Unit REALISTIC purposes.

# Reading Test Performance of 326 Soldiers, Grouped by AFQT Category and Education Level



Education (Grade Completed)

Figure 1

difference between AFQT categories. Each bar shows the position of the 90th centile and the 10th centile of that group in terms of reading ability score (grade reading level) and shows also the reading level position of the median or middle score in that group.

To take an example, the second bar from the left indicates that of the group in Category IV which completed 10th or 11th grade, the person in the 90th centile position, very high in the group, was at the grade reading level of 8.8; the middle person in the group was at grade reading level 6.6; and the person at 10th centile, low in the group, was at grade reading level 5.6. In contrast, that group in Category II which had finished 10th or 11th grade demonstrated grade reading levels, in the same respective centile positions, of 13, 10.6, and 8.3.

Clearly, completion of 10th or 11th grade for Category IV people has a much different meaning in terms of possession of basic skills than does completion of the same amount of schooling for Category II persons. Indeed, the bulk of *non-graduate* Category II persons surpass the *graduates* of Category IV. Assuming ninth grade reading level as the minimal competence needed to read high school or college level manuals or texts, even with difficulty, it appears that approximately half of the total group fall below this level of reading competence.<sup>1</sup>

It is thus evident that the potential of *reading* as a learning device for Category IV and much of Category III is not high. The implications are several. Textbooks and workbooks to be used by lower-aptitude personnel will need rather radical reappraisal and rewriting, to include photographic and other visual helps. The relevance of the typical "study hall" remedial work for Category III and IV persons will bear re-study. Tutorial and other practice sessions will need to be considered, with minimally theoretical and maximally functional training as the overall aim for such trainees.

## THE CONDUCT OF TRAINING

### Objectives

Consideration of the problems of training men with a wide range of aptitude must start with the statement of the course objectives—the performance expected of a student upon completion of the course of instruction. Based on the job for which the student is being prepared, the objectives should determine training content, instructional sequence, and evaluation standards for student performance. They need to specify clearly the *behavior* desired, the degree of *adequacy of performance* required, and the *conditions that will affect performance*. Instead of specifying that a student must be able to change tires, for example, the objective statement should specify the type of tire, tools available, environmental conditions expected, and reasonable time criteria.

The main source of objectives for combat support courses is the Army Subject Schedule for the course. Observation in this study indicated that a major difficulty in the objectives, as far as the lower level student is concerned, is that a high proportion call for verbal knowledge rather than job skill, emphasizing "nice-to-know" knowledge regarding the task as much as job performance. Objectives stated in this manner lead directly to verbalized and written instruction and to the same type of evaluation.

Several excellent works have appeared on this topic in the last few years to provide guidance and assistance to personnel developing statements of performance objectives, and materials based on them. Mager (10) deals with the importance of specifying the various components of the statement of objectives. Ammerman and Melching (11) and Smith (12) provide in some detail the steps involved in translating work performance

<sup>1</sup> Initial studies of HumRRO Work Unit REALISTIC show that a majority of publications commonly used in combat support training are written at the college level.

criteria into training and test criteria. In the past two years, USCONARC has developed two important publications. The first is USCONARC Pamphlet 350-14, *Training, Student Performance Objectives* (13), which deals with the actual generation of training goals from field jobs to school tasks. The second is USCONARC Reg 350-100-1, *Systems Engineering of Training* (1), which provides detailed and specific concepts aimed toward the accomplishment of thorough task analyses and the conversion of these analyses into viable and workable instructional objectives; it provides as well a general timetable for the redesign of existent school and training center courses.

Since training centers use objectives derived from the Army Subject Schedule with little change, it is increasingly important that they be the result of actual task analyses. Revision of courses under USCONARC Reg 350-100-1 works toward the goal of task analysis, but the problem will remain major for some time to come. While communication regarding schedules is open between training center and proponent school, procedure for modification of programs is unwieldy and it is difficult for local instructors to make more than minor modifications of objectives.

### Organization and Sequence of Instructional Content

With minor exceptions, organization and sequence of instruction at all posts visited followed the appropriate Subject Schedules. This means that instruction is set up in isolated subject blocks, many conveniently tailored to the weekly unit of time. Under these circumstances artificial boundaries tend to rise; separate faculties grow and become semi-autonomous training structures with their own modes and examinations; functional training becomes less likely. If, for example, pole-climbing is taught as an isolated skill, it is not clear that wire-tying and telephone-connecting are the key skills and that pole-climbing is a tool to enable telephones to be connected.

Many blocks in the General Supply and Wireman courses observed were indeed relatively isolated. While the bright and able student, with his practice from high school or college, probably can master and integrate these seemingly unrelated blocks into a coherent whole, there is growing evidence that the average or below average student is not very capable of welding these unrelated facts and principles together so easily. The work of HumRRO Work Unit SUPPORT I and II and earlier curricular studies suggests that all students, not only slow learners, benefit by a sequence and organization of content into what may be called a *functional context*.

This functional concept, in contrast to the sequence of blocks of instruction, specifies the adding of meaning and interrelationship to the material being taught. The goal may be reached in different ways, but will involve acquainting the student with the objectives of the course and allowing a brief overall view. His first learning will be related to his present background of knowledge and skill, presented in terms and ways he already knows. Added materials, as he continues, will be related both to past learning and to the job for which he is being prepared. At all times, relationships between the course content and the job are kept open. In some ways, training may imitate the job and the job environment. In brief, every effort is made to make the actual context of training a functional and joblike one.

Implementation of such functional approaches probably would require drastic changes in the format of Subject Schedules or, as in the case of courses in which most of the instruction is given by programmed materials, some sort of new format.

Meanwhile, the cause of the lower level student, in particular, would be helped by recurring practical exercise of important skills and knowledges introduced in previous weeks. In the courses observed, there was little opportunity for such practice. In addition, certain tool courses could become the vehicle for functional learning, as in using typing to learn Army forms. Often, now, such courses are rather isolated and self-contained.

Such emphasis on functionalization of training would call for the broadly or generally informed instructor, capable in several areas, and would discourage the development of rather narrow, subject-bound instructors capable of deep instruction in their own specialties (deeper than is needed or desirable for this instruction) but not well informed in adjacent skills.

References of aid in clarifying these concepts are Shoemaker's (14) article on the functional context method, Chapter 5 of Smith's volume on *The Design of Instructional Systems* (15), and an address by McClelland (16).

### Instructional Practices

This topic has been the target of a vast amount of research and writing and many references are available. Smith's bibliography (17) on instructional systems is an excellent source book and his previously mentioned publication (12) on objectives has many implications for instructional methods. The publication most used by military teachers is FM 21-6, *Techniques of Military Instruction* (18); it is an excellent presentation of training methods for the more able student but does not touch upon the need for or methods of individualization made necessary by the increase in numbers of low ability students. Finally, the various Army Subject Schedules direct and influence much of what is done in this respect.

In this review the primary concern was the degree of relevance of present practices to the broad range of trainee abilities now represented in these occupational classes. The need for greater functionalization of material was pointed out in discussing organization of the material of a curriculum. While the greater share of combat support jobs and training would seem well suited to a highly functional and practical method of training, only Food Service and Vehicle Mechanic courses appear to have progressed far in this direction.

The instructional equivalent of a low degree of course functionalization is a high ratio of verbal presentation to actual practice of skills. In the courses observed, most teaching blocks were preceded by one to six hours of verbal introduction, although in most of these blocks a few minutes of introduction at the work site, followed immediately by practice, would be of more value to most students—particularly to the lower level students who have difficulty with large amounts of purely verbal material.

Trainers at one center estimated the proportional amounts of time used in the *presentation of knowledge*, as opposed to the *practice of skills*, as follows:

General Supply	86%
Clerk	60%
Mechanic	38%
Field Wireman	35%

Research team observations suggest that these estimates do not exaggerate.

A high ratio of verbal presentation involves three disadvantages for all students. It reduces the already small amount of time available for skill practice; it separates, often by hours, explanation and practice; it allows no easy way of determining which students are grasping the explanation. The handicap for the lower third of the class is apparent to the observer, as these students cannot take adequate notes and do not do very well in remembering what has been said. (The boredom of the upper quarter of the class is likewise apparent, but this aspect of the instructional problem will not be pursued in this discussion.)

What is needed is more of a mixture of brief explanation and demonstration followed immediately by ample, well-supervised, and corrected practice that is continually related to the actual job. This would be an improvement but would not, of

course, make a change in the lockstep pace which is the same for all students. Students of widely different abilities need in some way to progress as they master the material.

The ability of the instructor to manipulate environment, aids, facilities, and persons is an important element in maximizing the input of skill or knowledge to all levels of students. Because there seems to be a general tendency to isolate audiovisual or other types of training assistance as semi-autonomous disciplines, it is well to stress that *all* facilities are part of the total training activity; they are valuable insofar as their use is grounded in good understanding of the instructional process and the objectives of training. Thus, in preparing a manual for all levels of students, regulations should not merely be copied in their original language. In generating tape or film, it is not enough to represent a man talking; the advantage of the lens is its power to bring close for emphasis, or to move into the distance for overall comprehension, or to juxtapose related actions—any or all so as to clarify meaning and increase understanding, particularly for the less gifted student.

In the courses observed nearly all instructors had sufficient technical knowledge and taught it enthusiastically. The rapid turnover of instructors and the increasing number of very young instructors have limited the number of people who could become good general teachers across broad but related areas, but this is not a crucial problem. Pedagogical knowledge varied, as would be expected.

Perhaps the greatest shortcoming observed was the number of extraordinarily impersonal instructors, who tended to address themselves to a point beyond the student body, to overuse technical nomenclature, to speak in a monotonous singsong. Whether this was the end result of years of committee instruction is difficult to say; where it was present, it had obvious deadening effects on the interest of students at all levels.

## EVALUATION OF STUDENTS

Student testing serves at least four functions—determination of student progress, diagnosis of student knowledge, diagnosis of the instructional system, and motivator for those being judged. To these might be added its occasional utility as a teaching device—more potential than practiced. Although publications on the topic are plentiful, the two sources most used by Army instructors are Chapter 12 of FM 21-6 (18) and Appendices E and F of USCONARC Reg 350-100-1. An added military reference is Smith's report on quality control in training (19).

Of the problems relating to the presence of a wide spectrum of ability in combat support training, inadequate and misleading evaluation was the most widespread and one of the most severe. The problem has various sources and takes multiple forms but may be discussed under four main types of difficulties:

(1) The greater portion of the tests at nearly all Centers were paper-and-pencil in character. The proportion of academic grades determined by *written* test (usually multiple choice) ranges from 20% in Driver courses to nearly 100% in Clerk courses, with the average for all combat support courses at about 60%. The fact that these are occupational skill courses makes reliance on written evaluation particularly ineffective as a measure of proficiency. Category IV persons, with their low verbal skills, are clearly handicapped in attempting to compete with Category II persons in the medium of the written test, and are being tested on something other than their knowledge of the job.

(2) The written tests, based as they are on data and facts of secondary importance, measure memory for such facts rather than performance skill and are low in job validity. Again, the slow student fares badly on such a test even if he has the desired performance skills.

(3) Some of the tests are of questionable validity in regard to distinguishing between trainees of differing proficiency. In repeated recycling, poor students may tend to learn the tests as such, rather than a broader body of skills and knowledges of which a

test is a sample. The formalized 70% passing score does not specify whether the items passed are *must know* items or non-essential knowledge; both have equal weight in pass-fail decisions.

(4) In the performance tests that are used, standardization of testing tends to be low. Some evaluators used checklists; some did not. Some gave general instructions; others were specific. Some measured group performance (where apt students can carry the load); others measured individuals.

Cogent reasons exist for some of these difficulties. There is an inevitable relationship between verbalized objectives and instruction, and verbalized measurement. Precise grades on a 70% basis are a requirement and some poor students must, after all, be moved on after appropriate recycling. In addition, the design of any training system poses the question of whether the persons providing the training should also provide the evaluation of the training.

Present evaluation does not seem to be meeting the need for distinguishing various levels of performance by a broad range of students. In the absence of strong methods of individualized training and evaluation, there is no adequate solution to the problem of when to move the lower level students to their next assignments. Research team observations suggested that a moderate number of lower ability students were moving on without having mastered the skills.

## ATTEMPTS AT INDIVIDUALIZATION OF TRAINING

Individualization of training is based on recognition of individual learning differences among students, and the goal is to fit training and evaluation to these differences to the end that instructional objectives are reached as efficiently as possible for all students. In systems with relatively homogeneous groupings of students, the advancement of apt students and the repetition of work for the slower student have long been utilized. With the introduction of large numbers of students of all levels of ability, a reappraisal of methods of individualization in military training courses is much to the point.

Most of the observed efforts toward individualization were, as noted above, essentially remedial and aimed almost solely at slow students. In one training center studied, some systematic effort was being made toward prevention of student failure by *pre-instruction* rather than remediation-after-failure, but this effort was hampered by the demands of the larger single-track system.

Make-up sessions and "study halls" were the most common attempt at solution. Effectiveness varied. The best involved Saturday morning sessions with vigorous instructors helping students in small groups. The least effective involved automatic week-end restriction following academic failure (without tutoring or help during the week-end) and assignment to study hall for three evenings during the *following* week. Since typical study hall procedure involves study from texts and notebooks, the questionable reading ability of most slow learners minimized the effectiveness of this approach. In addition, this remediation was conducted while new material was being introduced during the day, nearly a week after the original failure.

A second and more successful approach to individualization was the attempt to counter the impersonal tone of the system by assigning advisors and counselors to the trainees. The vigor and success of this approach varied from center to center, but at all centers staff and commanders were active in these counseling efforts and in efforts to make reasonable decisions about student disposition.

The third and most direct remedial action was that of recycling the failing individual to allow him to repeat work with which he has had difficulty. Observation suggested that graduation after recycling tended to be more a function of learning the test than learning the material; it did not seem that using the same verbal approach for another week had much effect in the case of the usual failing student with reading and learning difficulties.

The demands brought about by the presence of large numbers of students of low ability require reappraisal of the entire question. Remediation does not seem sufficient to these demands. Possible approaches will be touched on in the final chapter, but recognition and statement of the problems come more readily than do solutions.

## CONCLUSIONS AND IMPLICATIONS

Three related key issues—inadequately stated objectives, overly verbalized instruction, and ineffective student measurement—have run through this review in one way or another. Basically, these are systemic difficulties and the successful implementation of USCONARC Reg 350-100-1 over the next few years will probably ameliorate them significantly. The regulation specifically and straightforwardly deals with establishing adequate objectives, developing instruction built around these objectives, and generating tests of skill and knowledge that relate directly to job performance.

A fourth key issue, individualization of instruction to better serve the wide range of talents now present in Army input, is not directly treated by provisions of the regulation (although its principles are necessary in dealing with any given level of ability). For this reason, the action implications in the areas covered in the SPECTRUM I review are discussed in two major groupings, those related to curriculum engineering in general and those bearing on the specific problem of individualization.

### IMPLICATIONS FOR INSTRUCTIONAL ACTION

These curriculum-related implications arising from the review of current instructional patterns are dealt with in terms of broad, long-range undertakings and short-range local options. In some cases there is overlap in that implications have both long- and short-range facets. While these candidates for Army action are discussed primarily in terms of training per se, the actions often would have special significance for the problems of training to fit a wide range of aptitudes.

#### Long-Range Command Actions

Four areas of need or desirability can be noted as subjects for high-command action with long-range implications.

The first is the oft-stated need for the rapid working-up of job-related and behaviorally defined training objectives for occupational courses. This program is already under way with the publication of USCONARC Pam 350-14 and Reg 350-100-1. Development of objectives will need to be followed by development of workable machinery to review, update, and feed these objective statements into training channels.

The second need is for the drawing up of genuinely functional, well-integrated curricula for these occupational courses, along with the appurtenances thereto. This might call for considerable revision in the format of the Subject Schedules. For example, the transformation of an entire course into programmed instruction would require an entirely new concept and format which could take into account the varying speeds of different levels of students. In the case of courses not entirely programmed, there is need for the development of much guided and recurrent "hands-on" practice; of clear and understandable written or audiovisual programs where necessary; of workbooks in clear and uncomplicated language; of good prototypes of successful models, mockups, and aids. Along with these curricula aids there would need to be clear statements of performances which would be required in locally handled examinations.

Third is consideration of the desirability of appointing a professional educator of high competence at each training center. Not concerned with problems of training

schedules but with problems of curricula, instructional technique and procedures, examinations, and overall instructional efficiency, he might work at staff level in advising and consulting with brigade trainers. Similar to medical and legal staff in function, this person would provide professional educational guidance and continuity at each center.

Finally, the responsibilities and roles of proponent school and training center make it eminently desirable that communication relating to proposing and implementing instructional change be as free and open as possible.

### **Possible Actions at the Local Level**

There are some actions that might be considered now at the local level, quite apart from the longer-range aims and projects of USCONARC Reg 350-100-1. Primarily, these actions would be related to functionalization of training and curriculum and to the better evaluation of students.

(1) **Less verbal and more practical or functional training sequences.** With higher level permission, several approaches might be attempted. In particular, sequences involving both knowledge and skill learning could be programmed in such a way as to intersperse, systematically, practice and explanation in the field; for example, the student would learn nomenclature as he worked with the new materials. This integrated sequence could replace the several hours of platform explanation followed by several hours of practice.

(2) **More effective handling of personnel, both instructor and student.** At this time it often happens, in group exercises, that abler students participate more vigorously and with greater understanding, to the point that less able students often do not get the practice they need and to which they are entitled. Frank use of these highly able students as tutoring assistants who could provide guided practice for slow students would be beneficial in both classroom and outdoor problems.

Closely related is the proper utilization of assistant instructors and those students who are designated as class leaders. In some centers, these persons are now used only to report to visiting inspectors or functionaries. Other centers have a more effective plan that might well be adopted much more widely: the assistant instructors are used vigorously in the classroom or in the field as circulating teachers, and class leaders are used as acting noncommissioned officers with responsibility and authority.

(3) **Improved training sequence, and better utilization of training personnel and facilities.** With higher level permission, some modification could be made in the present instructional system of isolated committees and content blocks. Personal interest in students as working individuals is not possible when the instructor will work with that student for only a week. Greater efforts to loosen committee boundaries, to encourage some cross-teaching and cross-supervision, with certain instructors following students for longer than the present one-week block would result in greater instructor-student interchange.

The physical counterpart of a changing atmosphere is the changing of the instructional space from a platform-centered formal classroom to a workroom with tables and chairs, with ample space for circulation of supervising instructors.

Tied also to the work atmosphere and the loosening of committee boundary lines is the possibility of using experienced and able instructors to handle integrated several-hour work exercises, combining review and practice (and evaluation) over major material and skill covered to that time, these to be held two or three times during the typical course.

(4) **Modifications in administrative support and review.** Increased familiarity with the job objectives of combat support training on the part of training officers could bring about desirable modification of training inspection, moving from emphasis on agreement with printed subject schedule to emphasis on the success with which instructors were proceeding toward the instructional goals. Appendix A provides headings around which the inspector might make comments on training. These inspections might gradually be

accomplished by company commanders and selected instructors as well as by S-3 persons, and need to have the strongest command support and recognition.

Administratively, the loss of time incurred by students in handling administrative activities which have precedence over training and which grossly interfere with the training capabilities of lower level students could be ameliorated by routine scheduling of company and other details as part of the weekly training schedule.<sup>1</sup>

The problems of student evaluation are not simple. The questions of proponent school role, of committee evaluation of students, and of the development of true performance tests will bear study. Nevertheless, some desirable changes could be made locally and without great difficulty. One brigade, for example, reversed the usual ratio of 60% written and 40% performance test to a ratio of 40:60 in one year.

In this same vein, it may well be feasible for evaluation committees, using clear objectives and criteria, to administer most evaluations and not only the final field exercise. Additionally, it might be feasible and would be desirable to increase the use of integrated work tests and reviews at regular intervals throughout training.

In any event, a seemingly minimal requirement would be to have able instructors from all departments work in the development of *all* tests, and to have a board of able instructors pass on tests and items in terms of their relevance, practicality, format, and scoring weight.

## INDIVIDUALIZATION

While there are numerous implications for action to improve various aspects of the engineering of training, the situation is less clear with regard to the challenge of devising systems that will fit instruction better to the background and abilities of the individual soldier. Many answers are needed. We know little about the relative effectiveness of different instructional methods at different ability levels; little of the effects, socially or educationally, of isolating ability levels for training purposes; and little about the different motivations of soldiers of differing abilities. We know only that the need for both information and consequent action is considerable.

Any scheme for individualization envisions diagnosis of individual status and the prescription of a choice from one or more curricula to fit the individual case. Recognizing the considerable individual differences in speed and depth of learning, plans may differentially adjust either available time of instruction or amount of material to suit the case. Time and content are the two basic ingredients, and options are numerous.

Given these two ingredients, the challenge is to fit them simultaneously to different levels of background and ability. One option is to set up a two- or three-track system in which the same content is given in each track, although in ways appropriate to the ability level of the students. With amount of content stable, and with teaching method matched to track level, the varying levels of students would finish their courses at different times—say at four weeks, six weeks, and eight weeks—depending upon track level. Such a system probably would not require a great deal of additional personnel and equipment; the upper portion of these classes, properly rewarded, could complete this work in a fraction of the present time and with much less instructional aid than is now given. There are, however, social and administrative problems attached to the isolation of different ability groups. The impact of these is difficult to estimate at this time.

Another approach would hold the time allotment constant but would utilize separate tracks to provide considerably different amounts of material by very different means to the students of the different levels. It is entirely conceivable that the upper level student could quite easily handle material presently given in separate advanced courses. Such

<sup>1</sup> Such scheduling of administrative details is part of the pending Army Subject Schedule 11-05B20 for the training of Radio Operators (MOS 05B20) and has been made official at five training centers by USCONARC letter of 4 June 1968, Subject: Training Program for Radio Operator (05B).

an approach would again assume the utilization of well-written programs, video programs, and training exercises, in different ways for different levels. It would assume also the means of motivating successful students by appropriate promotion or award of advanced MOS.

Still another possibility would provide for greater integration of different levels of students. Such an approach would utilize the higher level student as an active part-time tutor for the inept student. It would have some common instruction at the beginning of the course, but would require certain able students to take considerable extra work and to act as leaders and tutors in the latter three-quarters of the course. Again, it is assumed that the taking of such responsibility and extra work would be reinforced by suitable advancement in one way or another.

Regardless of the approach to be taken, information is badly needed. Much has to be learned of the relationship between method of training and level of student ability and of differential motivating practices for different types of students and some research is under way in these areas. In SPECTRUM III, study has already begun on the relative effectiveness of certain teaching methods for fast and for slow students. HumRRO Work Unit APSTRAT, now beginning, will use findings from SPECTRUM III and from already present training knowledge as the basis for setting up entire training sequences in combat support courses. These experimental sequences will field test various strategies aimed at handling different levels of students in different ways to maximize their learning potential. Tested and workable methods may later be available to help in the everyday handling of the pervasive problem of the need for individualization of instruction.

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AND  
APPENDIX**

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Appendix A

**TRAINING OBSERVATION SHEET**

**Combat Support Survey**

Course, MOS \_\_\_\_\_ Date, Time \_\_\_\_\_ Observer \_\_\_\_\_

Instructor \_\_\_\_\_ Period \_\_\_\_\_ Place \_\_\_\_\_

Stated Objective \_\_\_\_\_

% Time Distribution of Instruction: Lecture \_\_\_\_\_ Conference \_\_\_\_\_

Demonstration \_\_\_\_\_ Practical Exercise \_\_\_\_\_ Test \_\_\_\_\_

**I. Student Body Information: (obtained by administrative means)**

**II. Instructor: (mark with X at or between descriptors)**

A. Manner	1	2	3
	helpful, encouraging	adequate	disinterested, discouraging

B. Prof Knowledge	1	2	3
	full, organized	adequate	vague, uncertain

C. Help and Supervision	1	2	3
	helpful, insightful	routine	discouraging

D. Pedagogical Skill	1	2	3
	molds aids & methods to good instruction	routine	mechanical, not a teacher

**E. Describe & Evaluate: (needs, innovations, lacks)**

**III. Content of Course and Tests (Appropriateness to objectives; functional sequencing and good integration of material)**

A. Material (Content)	1	2	3
	appropriate, must know	fair	inappropriate, vague, nice to know

**B. Material  
(Sequence)**

1	2	3
functionally integrated	fair	arbitrary block, lack of sequence

**C. Examination  
(Content)**

1	2	3
appropriate, must know	fair	inappropriate, nice to know

D. Describe & Evaluate:

**IV. Methods (Appropriateness to student, to material, to objectives)**

**A. Instruction  
(Method)**

1	2	3
appropriate	fair	inappropriate

Type \_\_\_\_\_ (L, C, Demo, Test, P. Ex.)

Describe and Evaluate:

**B. Examination  
(Method)**

1	2	3
appropriate	fair	inappropriate

Type \_\_\_\_\_ (group, written practical, individual, etc.)

How Administered \_\_\_\_\_ (subtle help: coaching? no help?  
group score? individual score?)

Comments, Recommendations:

**V. Use of Resources (mastery of material environment and aids)**

**A. Use of Classroom**

1	2	3
student centered	fair participation	platform centered

Describe and Evaluate:

**B. Use of Training  
Aids**

1	2	3
meaningful	routine	meaningless
(Specific use and appropriateness; adequacy of usage; relation of aids to material, students, and objectives; instructor controlling or controlled by aids?)		

Describe and Evaluate:

C. Outdoor Problems	<b>1</b>	<b>2</b>	<b>3</b>
	appropriate (appropriateness for outdoor exercise)		
	<b>1</b>	<b>2</b>	<b>3</b>
	good (degree of participation of <u>all</u> students in <u>all</u> phases)		
	<b>1</b>	<b>2</b>	<b>3</b>
	good (general fidelity and adequacy of exercise) actual teaching-learning value		

Describe and Evaluate:

D. Student Materials (Tools, objects, workbooks, equipment, etc.)

Types used:	<b>1</b>	<b>2</b>	<b>3</b>
	ample (adequacy of amount and quality of equipment)		
	<b>1</b>	<b>2</b>	<b>3</b>
	good (adequacy of usage of equipment)		

Describe and Evaluate:

Unclassified

Security Classification

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13. ABSTRACT Combat support training was observed at four Army training centers, with particular reference to training objectives, methods, and student evaluation, especially as these relate to increasing individualization of training. Training problems most relevant to individualization were in the areas of highly verbally-oriented objectives, a high degree of verbal instruction, and a high degree of use of written examination for evaluation of student performance. The addition of large numbers of soldiers of low academic ability has intensified these problems and has added new questions of appropriate training methods for the simultaneous training of students of a wide range of ability.		

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Abilities						
Aptitudes						
Combat Support Training						
Individual Differences						
Training Methods						
Training Objectives						
Training System Analysis						

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- 2 NASA SCI & TECH INFO FACILITY COLLEGE PARK MD
- 1 CTNC US EUROPEAN COMD ATTN SUPPORT PLANS BR J3
- 1 CTNC USA PACIFIC ATTN G3 CDO APO SAN FRAN 96610
- 2 CG SOUTHERN EUROPEAN TASK FORCE APO 96168 NY
- 1 CG US ARMY JAPAN APO 96343 SAN FRAN ATTN G3
- 10 CG USA FORCES SOUTHERN COMD ATTN SCARGO FT AMADOR C2
- 2 CG US ARMY EUROPE APO 09403 NY ATTN OPNS DIV
- 1 CG ARMY TRANS RES COMD FT EUSTIS ATTN TECH LIB
- 1 CG US ARMY AD COMD ENT AFB ATTN ADGCB
- 6 CG 1ST ARMY ATTN DCSOT FT MEADE MD
- 1 CG 3RD ARMY ATTN DCSOT FT MCPHERSON
- 2 CG 4TH ARMY ATTN ARADC-B(UT) FT SAM HOUSTON
- 1 CG FOURTH ARMY FT SAM HOUSTON ATTN G3
- 2 CG FIFTH ARMY FT SHERIDAN ATTN ALFGC TNG
- 1 CG USA ATTN AG-AC APO 96301 SAN FRAN
- 1 CLIN PSYCHOL SERV DEPT OF NEUROPSYCHIAT WALTER REED GEN HOSP
- 1 DIR HEL APG MD
- 1 CG USA CDC EXPERIMENTATION COMD FT ORD
- 2 ENGR PSYCHOL LAB PIONEERING RES DIV ARMY NATICK LABS NATICK MASS
- 1 TECH LIB ARMY NATICK LABS NATICK MASS
- 3 CO DEF DEVEL ENGR LAB EDGEWOOD ARSENAL
- 2 INST OF LAND CBT ATTN TECH LIB FT BELVOIR VA
- 1 CG USA CDC CBR AGCY ALA
- 1 REDSTONE SCIENTIFIC INFO CTR US ARMY MSL COMD ATTN CHF DOC SEC ALA
- 1 CG USAPRA HBLTV DIV TOBYHANNA ARMY DEPT
- 1 CG FT HUACHUCA SPT COMD USA ATTN TECH REF LIB
- 12 CG 1ST AIR DEF GUIDED MSL BRGD TNG FT BLISS
- 1 SIXTH USA LIB DEPT BLDG M 13 14 PRES OF SAN FRAN
- 1 CHF DEPT OF CLIN & SOC PSYCH WALTER REED ARMY INST OF RES WASH D C
- 1 PLANS OFFICER PSYCH HQDTRES USACDCEC FORT ORD
- 5 CG FT ORD ATTN G3 TNG DIV
- 1 CG DUGWAY PG UTAH ATTN TECH LIB
- 1 DIR WALTER REED ARMY INST OF RES WALTER REED ARMY MED CTR
- 2 DIR WRIGHT WALTER ARMY MED CTR ATTN NEUROPSYCHIAT DIV
- 1 CG HQ ARMY ENLISTED EVAL CTR FT BENJ HARRISON
- 1 TECH LIB BOX 22 USACDC EXPERIMENTATION COMD FT ORD
- 1 HUMAN FACTORS TEST DIV (ADHZ) USAF HOSF EGLIN AFB
- 1 CG USA MOBILITY EQUIP RED CTR ATTN TECH DDC CTR FT. BELVOIR
- 1 CG FRANKFORD ARSNL ATTN SMUFA-N6400/202-4
- 1 CG 2D RGN ARADCOM RICHARDS-GEBAUR AFB
- 3 6TH RGN USARADCOM FT BAKER
- 1 4TH ARMY MSL COMD AIR TRANSPORTABLE SAN FRAN
- 1 PERS SUBSYS DIV CREW SUBSYS DRCT AERONAUT SYS DIV WRIGHT-PATTERSON AFB
- 1 DIR ARMY BD FOR AVN ACCIDENT RES FT RUCKER
- 2 CG PICATTINNY ARSNL DOVER N J ATTN SUPMA VCI
- 1 DEF SUPPLY AGY CAMERON STATION ATTN LIB
- 2 CG USA CDC AG AGCY FT BENJ HARRISON IND
- 1 REF M HS IS NASA ALA
- 1 CBT OPNS RES GP USACDC SP OPNS ANALYST HUMAN FACTORS ALEX VA
- 1 CG ARMY CDC INF AGY FT BENNING
- 1 CG ARMY CDC ARMOR AGY FT KNOX
- 8 ARMY CDC SPEC WARFARE AGY FT BRAGG
- 1 EVAL DIV DAO ARMY SIG CTR & SCH FT MONMOUTH
- 1 CG US ARMY CDC AVN AGCY FT RUCKER
- 1 CHF CURRICULUM BR RESIDENT INSTR DEPT ARMY LOGISTICS MANGT CTR FT LEE
- 3 CG ARMY CBT DEVEL COMD CBT SUPPORT GP
- 1 CG USCONARC ATTN DCS INTEL FT MONROE
- 15 CG USA TNG CTR AD ATTN ACOFS G3 FT BLISS
- 1 CG USA TNG CTR ARMOR ATTN ACOFS G3 FT KNOX
- 12 CG USA TNG CTR (FA) ATTN ACOFS G3 FT SILL
- 1 CG USA TNG CTR & FT LEONARD WOOD ATTN ACOFS G3
- 1 CG USA TNG CTR INF ATTN ACOFS G3 FT BENNING
- 1 CG USA TNG CTR INF ATTN ACOFS G3 FT DIX
- 1 CG USA TNG CTR ATTN ACOFS G3 FT JACKSON
- 1 CG USA TNG CTR INF ATTN ACOFS G3 FT LEWIS
- 1 CG USA TNG CTR INF & FT ORD ATTN ACOFS G3
- 30 CG USA TNG CTR INF ATTN ACOFS G3 FT POLK
- 5 CG USA MED TNG CTR ATTN DIR OF TNG FT SAM HOUSTON
- 1 CG USA TNG CTR INF ATTN ACOFS G3 FT BRAGG
- 1 CG USA TNG CTR INF ATTN ACOFS G3 FT CAMPBELL
- 2 CIVLN PERS OFCR US ARMY SPT CTR ST LOUIS ATTN EMPLOYEE DEVEL OFCR
- 3 LIB ARMY WAR COLL CARLSLE BKS
- 1 COMDT USA INTELL SCH ATTN ABH-S-AD FT HOLABIRD
- 1 COMDT COMD + GEN STAFF CO FT LEAVENWORTH ATTN ARCHIVES
- 1 DIR OF MILIT PSYCHOL + LDRSHP US MILIT ACAD WEST POINT
- 1 US MILIT ACAD WEST POINT ATTN LIB
- 1 COMDT ARMY AVN SCH ATTN DIR OF INSTR FT RUCKER
- 2 COMDT ARMY SECUR AGY TNG CTR + SCH FT DEVENS ATTN LIB
- 1 COMDT INDSTR COLL OF THE ARMED FORCES FT MCNAIR
- 2 COMDT NATL WAR COLL FT LESLEY J MCNAIR ATTN CLASSF RECORDS BR LIB
- 1 MED FLD SERV SCH BROOKE ARMY MED CTR FT SAM HOUSTON ATTN STIMSON LIB
- 3 DIR OF INSTR ARMOR SCH FT KNOX
- 1 COMDT ARMY ARMOR SCH FT KNOX ATTN WEAPONS DEPT
- 1 COMDT USA CHAPLAIN SCH ATTN DDI FT HAMILTON
- 1 COMDT ARMY CHEM CORPS SCH FT MCCLELLAN ATTN EDUC ADV
- 1 COMDT USA FINANCE SCH ATTN CHF DOC DEV LTN PLN DIV ODOI FT BENJ HARRISON
- 1 USA FINANCE SCH FT BENJ HARRISON ATTN EDUC ADV
- 4 COMDT ARMY ADJ GEN SCH FT BENJ HARRISON ATTN EDUC ADV
- 1 EDUC ADV USAIS ATTN AJJIS-H FT BENNING
- 1 DIR OF INSTR USAIS ATTN AJJIS-D-SPAD FT BENNING
- 1 HQ US ARMY ADJ GEN SCH FT BENJ HARRISON ATT COMDT
- 1 LIB ARMY QM SCH FT LEE
- 1 COMDT ARMY QM SCH FT LEE ATTN EDUC ADV
- 1 COMDT ARMY TRANS SCH FT EUSTIS ATTN EDUC ADV
- 1 CG USA SEC AGY TNG CTR & SCH ATTN LATEV RSCH ADV FT DEVENS
- 1 COMDT ARMY MILIT POLICE SCH FT GORDON ATTN DIR OF INSTR
- 2 COMDT US ARMY SOUTHEASTERN SIG SCH ATTN: EDUC ADVISOR FT GORDON
- 1 COMDT USA AD SCH FT BLISS
- 1 CG USA DRD CTR & SCH OFC OF OPS ATTN ABH-D APO MD
- 5 ASST COMD ARMY ATTN DEF SCH FT BLISS ATTN CLASSF TECH LIB
- 4 CG USA FLD ARTY CTR ATTN AVN OFCR FT SILL
- 1 COMDT ARMY DEF INTEL SCH ATTN SI+AS DEPT
- 1 COMDT ARMED FORCES STAFF COLL NORFOLK
- 1 COMDT USA SIG CTR & SCH ATTN DDI FT MONMOUTH
- 1 COMDT JUDGE ADVOCATE GENERALS SCH U OF VA
- 1 DPTY COMDT USA AVN SCH ELEMENT GA
- 1 DPTY ASST COMDT USA AVN SCH ELEMENT GA
- 1 USA AVN SCH ELEMENT OFC OF DIR OF INSTR ATTN EDUC ADV GA
- 1 EDUC CONSLT ARMY MILIT POLICE SCH FT GORDON
- 6 COMDT USA ENGR SCH ATTN EDUC ADV FT BELVOIR
- 2 COMDT US ARMY SCH EUROPE ATTN RFF LIB APO 09172 NY
- 1 CHF POLICY + TNG LIT DIV ARMY ARMOR'S SCH FT KNOX
- 1 COMDT ARMY AVN SCH FT RUCKER ATTN EDUC ADV
- 1 COMDT ARMY PRMRY HFL SCH FT MOLTERS
- 1 DIR OF INSTR US MIL ACAD WEST POINT NY
- 1 DIR OF MILIT INSTR US MILIT ACAD WEST POINT
- 1 USA INST FOR MIL ASSIST ATTN LIB FT BRAGG
- 4 USA INST FOR MIL ASSIST ATTN COUNTERINSURGENCY DEPT FT BRAGG
- 1 ARMY SIG CTR + SCH FT MONMOUTH ATTN TNG LIT DIV DAO
- 1 COMDT US ARMY MGT SCH FT BELVOIR
- 2 COMDT USA MSL & MUN CTR & SCH ATTN CHF OFC OF OPS REDSTONE ARSNL
- 2 COMDT US WAC SCH US WAC CTR ATTN AJMCT FT MCCLELLAN
- 2 HQ ABERDEEN PG ATTN TECH LIB
- 1 COMDT USA INTELL SCH ATTN DIR OF ACADEMIC OPS FT HOLABIRD
- 1 COMDT USA INTELL SCH ATTN DIR OF DOC & LIT FT HOLABIRD
- 1 COMDT USA CG&SC OFC OF CHF OF RESIDENT INSTR FT LEAVENWORTH
- 1 COMDT USA CA SCH ATTN DEPT OF RSCH ANALYSIS & DOC FT GORDON
- 1 COMDT USA CA SCH ATTN DDI FT GORDON
- 1 COMDT USA CA SCH ATTN EDUC ADV FT GORDON
- 1 COMDT USA CA SCH ATTN LIB FT GORDON
- 1 COMDT USA SCH & TNG CTR ATTN ACOFS G3 TNG DIV FT MCCLELLAN
- 1 COMDT USA SCH & TNG CTR ATTN ACOFS G3 PLNS & OPS DIV FT MCCLELLAN
- 10 COMDT USA INST FOR MIL ASSIST ATTN DDI FT BRAGG
- 1 COMDT USA CBR WPNS ORIENTATION COURSE ATTN DOI DUGHWAY UTAH
- 1 COMDT USA FLD ARTY SCH ATTN DDI FT SILL
- 1 COMDT USA ARTY & MSL SCH ATTN EDUC SERVICES DIV FT SILL
- 1 COMDT USA ARTY & MSL SCH ATTN EDUC ADV FT SILL
- 1 COMDT USA TRANS SCH ATTN DIR OF DOC & LIT FT EUSTIS
- 1 COMDT USA TRANS SCH ATTN LIB FT EUSTIS
- 1 USA INST FOR MIL ASST ATTN EDUC ADV FT BRAGG
- 1 COMDT ARMY QM SCH OFC DIR OF NONRESID ACTVY FT LEE ATTN TNG MEDIA DIV
- 1 COMDT USA ARTY & MSL SCH ATTN LIB FT SILL
- 1 CG USA SCH & TNG CTR ATTN ACOFS G3 FT GORDON
- 1 COMDT USA AD SCH ATTN AKBAS-DL-EA FT BLISS
- 2 DIR BRGD + BN OPNS DEPT USAIS FT BENNING
- 1 LEADERSHIP COM OPS DEPT US ARMY INF SCH FT BENNING
- 1 DIR COMD ELEC USAIS FT BENNING
- 1 DIR ABN-AIR MOBILITY DEPT USAIS FT BENNING
- 2 DIR COMPANY TACTICS DEPT USAIS FT BENNING
- 1 CG US ARMY SIGNAL CTR & SCH ATTN SIGDIL-3 (COBET II)
- 1 SECY OF ARMY, PENTAGON
- 1 DCS-PERS DA ATTN CHF C+S DIV
- 1 DIR OF PERS STUDIES & RSCH ODCSPER DA WASH DC
- 2 ACSFOR DA ATTN CHF TNG DIV WASH DC
- 1 CG USA MAT COMD ATTN AMCRD-TE
- 1 CHF OF ENGRS DA ATTN ENGT-E
- 1 HQ ARMY MAT COMD R+D DRCTE ATTN AMCRD-RC
- 1 US ARMY BEHAVIORAL SCI RES LAB WASH, D.C. ATTN: CRO-AR
- 1 OPD PERS MGT DEV OFC ATTN MOS SEC (NEW EQUIP) OPDAR
- 1 ARMY PROVOST MARSHAL GEN
- 1 DIR CIVIL AFFAIRS DRCTE ODCSOPS
- 1 OFC RESERVE COMPD DA
- 2 CG USA SEC AGCY ARL HALL STA ATTN AC OF S G1 VA
- 50 ADMIN DDC ATTN: TCA (HEAVY) CAMERON STA ALEX., VA. 22314
- 1 CG US ARMY MED RES LAB FT KNOX
- 1 CHF OF R+D DA ATTN CHF TECH + INDSTR LIAISON OFC
- 2 CG ARMY MED R+D COMD ATTN MEDDH-SR
- 1 US ARMY BEHAVIORAL SCI RES LAB WASH, D.C. ATTN CRD-AIC
- 1 COMDT USA CBT SURVEILL SCH & TNG CTR ATT ED ADV FT HUACHUCA
- 1 COMDT USA CBT SURVEILL SCH & TNG CTR ATTN ORG DOC & NEW EQUIP FT HUACHUCA
- 2 TNG + DEVEL DIV ODCS-PERS
- 1 COMDT USA CBT SURVEILL SCH & TNG CTR ATTN 1ST CBT TNG BRGDE FT HUACHUCA
- 1 CAREER MGT BR ATTN R DETIENNE CAMERON STA ALEX VA
- 1 PRES ARMY MAINT BD FT KNOX
- 1 DPTY PRES ARMY MAT COMD HQ ABERDEEN PG
- 15 CG USCONARC ATTN ATIT-RD-RD FT MONROE
- 2 CG USCONARC ATTN LIB FT MONROE
- 1 CG ARMY CBT DEVEL COMD MILIT POLICE AGY FT GORDON
- 1 US ARMY ARCTIC TEST CTR R & D OFFICE SEATTLE
- 1 CHF USA AD HRU FT BLISS
- 1 CHF USA ARMOR HRU FT KNOX
- 1 CHF USA AVN HRU FT RUCKER
- 1 CHF USA INF HRU FT BENNING
- 1 CHF USA TNG CTR HRU PRES OF MONTEREY
- 2 CG 4TH ARMORED DIV ATTN DCSOT APO NY 09326
- 1 CG 3D ARMORED CAV REGT APO 09034 NY
- 1 CG 14TH ARMORED CAV REGT APO 09026 NY
- 2 CG ARMY ARMOR & ARTY FIRING CTR FT STEWART ATTN AC OF S TNG OFCR
- 10 CG 1ST BN 63RD ARMOR 1ST INF DIV ATTN S3 FT RILEY
- 1 CG 1ST BN 64TH ARMOR 3RD INF DIV ATTN S3 APO NY 09031
- 8 CG 2ND BN 68TH ARMOR 8TH INF DIV ATTN S3 APO NY 09034
- 1 CG COMPANY A 3D BN 32D ARMOR 3D ARMORED DIV (SPEARHEAD) APO 09039 NY
- 1 CG 3RD BN 37TH ARMOR 4TH ARMORED DIV ATTN S3 APO NY 09066
- 2 CG 2ND BN 34TH ARMOR 25TH INF DIV ATTN S3 APO SAN FRAN 96266
- 1 CALIF NG 40TH ARMORED DIV LOS ANGELES ATTN AC OF S G3
- 1 55TH COMD HQ DIV ARMY NG JACKSONVILLE FLA
- 1 CG HQ 27TH ARMORED DIV NY AIR NG SYRACUSE
- 1 TEXAS NG 49TH ARMORED DIV DALLAS
- 1 CG ARMY ARMOR CTR FT KNOX ATTN G3 AIBKGT
- 2 CG 1ST INF DIV ATTN ACOFS G3 APO SAN FRAN 96345
- 1 CG 3RD INF DIV ATTN ACOFS G3 APO NY 09036
- 3 CG 4TH INF DIV ATTN ACOFS G3 APO SAN FRAN 96262
- 1 CG 7TH INF DIV ATTN ACOFS G2 APO SAN FRAN 96207
- 1 CG 8TH INF DIV ATTN ACOFS G2 APO NY 09111
- 1 CG 5TH INF DIV (MECH) & FT CARSON ATTN ACOFS G2 COLO
- 3 CG 82ND ABN INF DIV ATTN ACOFS G3 FT BRAGG
- 1 CG 197TH INF BRGD FT BENNING ATTN S3
- 1 CG 1ST BN (REINF) ATTN S3 FT MYER
- 7 CG 3RD BN 6TH INF REGT ATTN S3 APO NY 09742
- 1 CG 171ST INF BDE ATTN S3 APO SEATTLE 98731
- 3 CG 25TH INF DIV APO 96225 SAN FRAN
- 1 CG 2ND BN 15TH INF 3RD INF DIV ATTN S3 APO NY 09026
- 5 CG 24TH INF DIV ATTN ACOFS G3 FT RILEY
- 4 CG 1ST BN (MECH) 52ND INF 198TH INF BDE ATTN S3 APO SAN FRAN 96219
- 2 CG 4TH BN (MECH) 54TH INF ATTN S3 FT KNOX
- 1 CG USA PARTIC GP USN TNG DEVICE CTR FLA
- 2 CONSOL RES GP 7TH PSYOP GP APO 96248 SAN FRAN
- 2 DA OFC OF ASST CHF OF STAFF FOR COMN-ELCT ATTN CETS-6 WASH
- 1 CG MILIT DIST OF WASHINGTON
- 1 DIR ARMY LIB PENTAGON

1 STRATEGIC PLANNING GP CORPS OF ENGR ARMY MAP SERV  
1 CHF OF MILIT HIST DA ATTN GEN REF BR  
1 CO USA 10TH SPEC FORCES GP FT DEVENS  
1 CO 24TH ARTY GP (AD) ATTN S3 RI  
1 CG 31ST ARTY BDE AD ATTN S3 PA  
1 CO 49TH ARTY GP AD ATTN S3 FT LAWTON  
1 HQS 4TH BN 59TH ARTY REGT ATTN S3 NORFOLK  
1 CO 28TH ARTY GP AD ATTN S3 SELFREDGE AFB  
1 CO 52ND ARTY BDE AD ATTN S3 FT HANCOCK  
1 HQS 45TH ARTY BDE AD ATTN S3 ARL HTS ILL  
1 CG 101ST ABN DIV (AIRMOBILE) ATTN ACOFS G3 APO SAN FRAN 96383  
1 CG 1ST CAV (AIRMOBILE) ATTN ACOFS G3 APO SAN FRAN 96383  
1 US ARMY GEN EQUIP ATTN TECH LIB FT LEE  
1 US ARMY TROPIC TEST CTR PO DRAWER 942 ATTN BEHAV SCIENTIST FT CLAYTON  
8 CO 111 CORPS & FT HOOD ATTN G3 SEC FT HOOD  
1 CO 15TH ARMORED DIV ATTN G3 SEC FT HOOD  
30 CG 2D ARMORED DIV ATTN G3 SEC FT HOOD  
25 CO 13TH SUPT BGDE ATTN S3 SEC FT HOOD  
10 CG USAFAC ATTN G3 SEC FT SILL  
20 CO III CORPS ARTY ATTN G3 SEC FT SILL  
20 CG USA AD CTR ATTN G3 SEC FT BLISS  
3 CG ATTN G3 SEC FT POLK LA  
1 BESD ARO OFC CHF OF RCD WASH DC  
1 CHF OF RCD DA ATTN SCI INFO BR RSCH SPT DIV WASH DC  
2 CINC US PACIFIC FLT PPO 96614 SAN FRAN  
1 CINC US ATLANTIC FLT CODE 312A USN BASE NORFOLK  
1 CDR TNG COMMAND US PACIFIC FLT SAN DIEGO  
5 TECH LIB PERS LIB BUR OF NAV PERS ARL ANNEX  
3 DIR PERS RES DIV BUR OF NAV PERS  
1 TECH LIB BUR OF SHIPS CODE 210L NAVY DEPT  
1 HUMAN FACTORS BR PSYCHOL RES DIV ONR  
1 ENGRN PSYCHOL BR ONR CODE 455 ATTN ASST HEAD WASH DC  
3 CO + DIR NAV TNG DEVICE CTR ORLANDO ATTN TECH LIB  
1 CO FLT ANTI-AIR WARFARE TNG SAN DIEGO  
1 CO NUCLEAR WEAPONS TNG CTR PACIFIC U S NAV AIR STA SAN DIEGO  
2 CO FLT TNG CTR NAV BASE NEWPTA  
1 CO FLEET TNG CTR U S NAV STA SAN DIEGO  
1 CLIN PSYCHOL MENTAL HYGIENE UNIT US NAV ACAD ANNAPOLIS  
1 PRES NAV WAR COLL NEWPORT ATTN MAHAN LIB  
2 CO + DIR ATLANTIC FLT ANTI-SUB WARFARE TACTICAL SCH NORFOLK  
1 CO NUCLEAR WEAPONS TNG CTR ATLANTIC NAV AIR STA NORFOLK  
2 CO FLT SONAR SCH KEY WEST  
1 CO FLT ANTI-SUB WARFARE SCH SAN DIEGO  
1 CHF OF NAV RES ATTN SPEC ASST FOR R & D  
1 CHF OF NAV RES ATTN HEAD PERS + TNG BR CODE 458  
1 CHF OF NAV RES ATTN DIR PSYCHOL SCI DIV CODE 450  
1 CHF OF NAV RES ATTN HEAD GP PSYCHOL BR CODE 452  
1 DIR US NAV RES LAB ATTN CODE 5120  
1 DIR NAVAL RSCH ATTN LIB CODE 2029 (ONRL) WASH DC  
1 CHF OF NAV AIR TNG TNG RES DEPT NAV AIR STA PENSACOLA  
1 CO NAV SCH OF AVN MED NAV AVN MED CTR PENSACOLA  
1 LIB NAV MED RES LAB NAV SUB BASE GROTON  
1 CO MED FLD RES LAB CAMP LEJUNE  
1 CDR NAV MSL CTR POINT MUGU CALIF ATTN TECH LIB CODE 3022  
1 DIR AEROSPACE CREW EQUIP LAB NAV AIR ENGR CTR PA  
1 CO + DIR NAV ELEC LAB SAN DIEGO ATTN LIB  
1 OIC NAV PERS RES ACTVY SAN DIEGO  
1 NAV NEUROPSYCHIAT RES UNIT SAN DIEGO  
2 NAV MSL CTR (CODE 5342) PT MUGU CALIF  
1 DIR PERS RES LAB NAV PERS PROGRAM SUPPORT ACTIVITY WASH NAV YD  
1 NAV TNG PERS CTR NAV STA NAV YD ANNEX CODE 83 ATTN LIB WASH  
1 COMDT MARINE CORPS HQ MARINE CORPS ATTN CODE AO-1B  
1 HQ MARINE CORPS ATTN AX  
1 DIR MARINE CORPS EDUC CTR MARINE CORPS SCH QUANTICO  
1 DIR MARINE CORPS INST ATTN EVAL UNIT  
1 CHF OF NAV OPNS OP-01P1  
1 CHF OF NAVL OPS OP 037 WASH DC  
1 CHF OF NAV OPNS OP-0772  
2 COMDT HQS 8TH NAV DIST ATTN EDUC ADV NEW ORLEANS  
1 CHF OF NAV AIR TECH TNG NAV AIR STA MEMPHIS  
1 DIR OPS EVAL GRP OFF OF CHF OF NAV OPS OP03EG  
2 COMDT PTP COAST GUARD HQ  
1 CHF OFCR PERS RES + REVIEW BR COAST GUARD HQ  
1 CO US COAST GUARD TNG CTR GOVERNORS ISLAND NY  
1 CO US COAST GUARD TNG CTR CAPE MAY NJ  
1 CO US COAST GUARD TNG CTR & SUP CTR ALAMEDA CALIF  
1 CO US COAST GUARD INST OKLA CITY OKLA  
1 CO US COAST GUARD RES TNG CTR YORKTOWN VA  
1 SUPT US COAST GUARD ACAD NEW LONDON CONN  
1 OPNS ANLS LAB DEF WPNS SYS MGT CTR AF INST OF TECH WRIGHT-PATERSON AFB  
1 AIR TNG COMD RANDOLPH AFB ATTN FTM  
1 TECH DIR TECH TNG DIV (HRO) AFHRL LOWRY AFB COLO  
1 CHF SCI DIV DRCTE SCI + TECH DCS R+D HQ AIR FORCE AFRSTA  
1 CHF OF PERS RES BR DRCTE OF CIVILIAN PERS DCS-PERS HQ AIR FORCE  
1 CHF ANAL DIV (AFDPDL (R)) DIR OF PERSONNEL PLANNING HQS USAF  
1 HQ AFSC SCBB ANDREWS AFB  
1 ROMÉ AIR DEVEL CTR RASH GRIFFISS AFB  
2 CDR ELEC SYS DIV L G HANSCOM FLD ATTN ESRHA BEDFORD MASS  
2 SMAMA (SMACU-PERS RSCH) MCCLELLAN AFB  
1 ATC ATXRD RANDOLPH AFB  
1 HQ SANSO (SMSTR) AF UNIT POST OFC LA AFS CALIF  
2 MILIT TNG CTR OPE LACKLAND AFB  
2 AFHRL (HRT) WRIGHT-PATERSON AFB  
1 AMD AMRH BROOK AFB TEXAS  
1 HQS ATC DCS/TECH TNG (ATTMS) RANDOLPH AFB  
4 HQS ATC (ATCTD-M) RANDOLPH AFB TEXAS  
1 CDR ELEC SYS DIV LG HANSCOM FLD ATTN ESTI  
1 DIR AIR U LIB MAXWELL AFB ATTN AUL3T-63-253  
1 DIR OF LIB US AIR FORCE ACAD  
1 COMDT DEF WPNS SYS MGT CTR AF INST OF TECH WRIGHT-PATERSON AFB  
1 COMDT ATTN LIB DEF WPNS SYS MGT CTR AF INST OF TECH WRIGHT-PATERSON AFB  
1 6570TH PERS RES LAB PRA-AEROSPACE MED DIV LACKLAND AFB  
1 TECH TNG CTR (LNTC/OP-1-L1) LOWRY AFB  
2 AF HUMAN RESOURCES LAB MRHTO WRIGHT-PATERSON AFB  
2 CO HUMAN RESOURCES LAB BROOKS AFB  
1 PSYCHOBIOLOGY PROG NATL SCI FOUND  
1 DIR NATL SECUR AGY FT GED G HEADE ATTN TOL  
1 DIR NATL SECUR AGY FT GED G HEADE ATTN DIR OF TNG  
5 CIA ATTN OGR/ADD STANDARD DIST  
1 SYS EVAL DIV RES DIRECTORATE DOD-DCD PENTAGON  
1 DEPT OF STATE BUR OF INTEL + RES EXTERNAL RES STAFF  
1 SCI INFO EXCH WASHINGTON  
2 CHF MGT & GEN TNG DIV TR 200 FAA WASH DC  
1 BUR OF RES & ENGR US POST OFC DEPT ATTN CHF HUMAN FACTORS BR  
1 EDUC MEDIA BR DE DEPT OF HEW ATTN T D CLEMENS  
1 OFC OF INTERNATL TNG PLANNING & EVAL BR AID WASH DC  
1 DEPT OF TRANS FAA ACQ SEC HQ 610A WASH DC  
1 SYS DEVEL CORP SANTA MONICA ATTN LIB  
2 DUNLAP + ASSOC INC DARIEN ATTN LIB  
2 RAC ATTN LIB MCLEAN VA  
1 RAND CORP WASHINGTON ATTN LIB  
1 DIR RAND CORP SANTA MONICA ATTN LIB  
1 GP EFFECTIVENESS RSCH LAB U OF ILL DEPT OF PSYCHOL  
2 U OF CALIF ELEC RES PERS RES  
1 COLUMBIA U ELEC RES LABS ATTN TECH EDITOR  
1 MITRE CORP BEDFORD MASS ATTN LIB  
2 SIMULATION ENGR CORP ATTN DIR OF ENGR FAIRFAX VA  
2 U OF PGH LEARNING R+D CTR ATTN DIR  
1 WESTERN ELECTRIC CO INC NY  
1 HUMAN SCI RES INC MCLEAN VA  
2 TECH INFO CTR ENGR DATA SERV N AMER AVN INC COLUMBUS O  
1 CHRYSLER CORP HSL DIV DETROIT ATTN TECH INFO CTR  
1 AVCO CORP AVCO RSL SYS DIV ATTN RSCH LIB WILMINGTON MASS  
1 DIR CTR FOR RES IN LEARNING + TEACHING U OF MICH  
1 RAYTHEON SERV CO ATTN LIBN BURLINGTON MASS  
2 EDUC & TNG CONSULTANTS ATTN CAC SILVERN LA  
1 GEN DYNAMICS POMONA DIV ATTN LIB DIV CALIF  
2 MARQUARDT INDSTR PROD CO CUCAMONGA CALIF  
1 OTIS ELEVATOR CO DIV ATTN LIB STAMFORD CONN  
1 MGR BIOTECHNOLOGY AEROSPACE SYS DIV MS 8H-25 BOEING CO SEATTLE  
2 CTR FOR RES IN SOCIAL SYS FLD OFC FT BRAGG  
1 IDA RSCH & ENGR SUPT DIV ARL VA  
1 HUGHES AIRCRAFT COMPANY CULVER CITY CALIF  
2 BATTEL MEMORIAL INST COLUMBUS LABS ATTN RACIO D  
1 CTR FOR RES ON LEARNING + TEACHING U OF MICH  
1 EDITOR TNG RES ABSTR AMER SOC OF TNG DIRS U OF TENN  
1 CTR FOR RES IN SOCIAL SYS AMER U  
4 BRITISH EMBY BRITISH DEF RES STAFF WASHINGTON  
3 CANADIAN JOINT STAFF OFC OF DEF RES MEMBER WASHINGTON  
3 CANADIAN ARMY STAFF WASHINGTON ATTN GS02 TNG  
3 ACS FOR INTEL FOREIGN LIAISON OFCR TO NORWEG MILIT ATTACHE  
1 ARMY ATTACHE ROYAL SWEDISH EMBY WASHINGTON  
1 DEF RES MED LAB ONTARIO  
3 AUSTRALIAN NAV ATTACHE EMBY OF AUSTRALIA WASH DC  
1 OFC OF AIR ATTACHE AUSTRALIAN EMBY ATTN: T.A. NAVGN WASH, D.C.  
2 AUSTRALIAN EMBY OFC OF MILIT ATTACHE WASHINGTON  
2 U OF SHEFFIELD DEPT OF PSYCHOL  
1 HENINGER FOUNDATION TOLEDO OH  
1 AMER INST FOR RES SILVER SPRING  
1 AMER INST FOR RES PGH ATTN LIBN  
1 DIR PRIMATE LAB UNIV OF WIS MADISON  
3 MATRIX CORP ALEXANDRIA ATTN TECH LIBN  
1 AMER TEL+TEL CO NY  
1 U OF GEORGIA DEPT OF PSYCHOL  
1 DR GEORGE T HAUTY CHMN DEPT OF PSYCHOL U OF DEL  
1 VITRO LABS SILVER SPRING MD ATTN LIBN  
1 HEAD DEPT OF PSYCHOL UNIV OF SC COLUMBIA  
1 TVA ATTN CHF LABOR RELATIONS BR DIV OF PERS KNOXVILLE  
1 U OF GEORGIA DEPT OF PSYCHOL  
1 GE CO WASH DC  
1 AMER INST FOR RES PALO ALTO CALIF  
1 MICH STATE U COLL OF SOC SCI  
1 N MEX STATE U ATTN PROF OF PSYCHOL  
1 ROWLAND + CO HADDONFIELD NJ ATTN PRES  
1 OHIO STATE U SCH OF AVN  
1 SCI RSCH ASSOC INC DIR OF EVAL CHICAGO ILL  
1 AIRCRAFT ARMAMENTS INC COCKEYSVILLE MD  
2 MICH STATE U DEPT OF MILIT SCI ATTN ADJ  
1 TUFTS U HUMAN ENGRN INFC + ANLS PROJ  
1 AMER PSYCHOL ASSOC WASHINGTON ATTN PSYCHOL ABSTR  
1 NO ILL U HEAD DEPT OF PSYCHOL  
1 BELL TEL LABS INC TECH INFO LIB WHIPPANY LAB NJ ATTN TECH REPORTS LIBN  
1 ENGRN LIB FAIRCHILD HILLER REPUBLICAN AVN DIV FARMINGDALE N Y  
1 WASHINGTON ENGRN SERV CO INC KENNINGTON MD  
1 LIFE SCI INC FT WORTH ATTN PRES  
1 AMER BEHAV SCI CALIF  
1 COLL OF WM + MARY SCH OF EDUC  
1 SO ILLINOIS U DEPT OF PSYCHOL  
2 COMMUNICABLE DISEASE CTR DEVEL + CONSULTATION SERV SECT ATLANTA  
2 WASH MILITARY SYS DIV BETHESDA MD  
1 NORTHWESTERN U DEPT OF INDSTR ENGRN  
1 HONEYWELL ORD STA MAIL STA 806 MINN  
1 NY STATE EDUC DEPT ABSTRACT EDITOR AVCR  
1 AEROSPAC SAFETY DIV U OF SOUTHERN CALIF LA  
1 MR BRANDON B SMITH RES ASSOC U OF MINN  
1 CTR FOR THE ADVANCED STUDY OF EDUC ADMIN ATTN IONE PIERRON U OF OREG  
1 DR V ZACHERT RT 2 NORMAN PARK GA  
1 P LYDON DIR JR ROTC SAN ANTONIO TEXAS  
1 DR E FOLKE DEPT OF PSYCH UNIV OF LOUISVILLE  
1 DR E PERKINS PROF OF PSYCH ST CLOUD STATE COLL MINN  
1 CHF PROCESSING DIV DUKE U LIB  
1 U OF CALIF GEN LIB DOCU DEPT  
1 FLORIDA STATE U LIB GIFTS + EXCH  
1 PSYCHOL LIB HARVARD UNIV CAMBRIDGE  
1 U OF ILL LIB SER DEPT  
2 U OF KANSAS LIB PERIODICAL DEPT  
1 U OF NEBRASKA LIBS ACQ DEPT  
1 OHIO STATE U LIBS GIFT + EXCH DIV  
1 PENNA STATE U PATTEE LIB DOCU DESK  
1 PURDUE U LIBS PERIODICALS CHECKING FILES  
1 STANFORD U LIBS DOCU LIB  
1 LIBN U OF TEXAS  
1 SYRACUSE U LIB SER DIV  
1 SERIALS REC UNIV OF MINN MINNEAPOLIS  
1 STATE U OF IOWA LIBS SER ACQ  
1 NO CAROLINA STATE COLL DH HILL LIB  
2 BOSTON U LIBS ACQ DIV  
1 U OF MICH LIBS SER DIV  
1 BROWN U LIB  
2 COLUMBIA U LIBS DOCU ACQ  
1 DIR JOINT U LIBS NASHVILLE  
2 LIB GEO WASH UNIV ATTN SPEC COLL DEPT WASH DC  
2 LIB OF CONGRESS CHF OF EXCH + GIFT DIV  
1 U OF PGH DOCU LIBN  
1 CATHOLIC U LIB EDUC & PSYCHOL LIB WASH DC  
1 U OF KY MARGARET I KING LIB  
1 SO ILL U ATTN LIBN SER DEPT  
1 KANSAS STATE U FARRELL LIB  
1 BRIGHAM YOUNG U LIB SER SECT  
1 U OF LOUISVILLE LIB BELKNAP CAMPUS  
1 EACH USA TNG CTRS  
1 US DEPT OF LABOR WASH DC  
1 US DEO WASH DC

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