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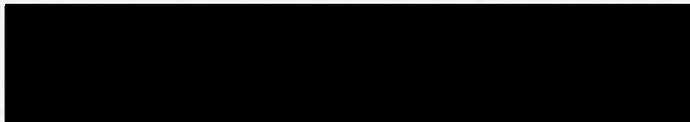
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"Training Research for the Army." Phi Delta Kappan, May 1967, pp. 18-20.

HumRRO Research and the Army's Training Programs. Professional Paper 36-69. Alexandria, Va.: Human Resources Research Organization, December 1969.

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Faculty In-Service Training Programs and the Process of Educational Change. Professional Paper 38-69. Alexandria, Va.: Human Resources Research Organization, December 1969.

"HumRRO: A Systems Approach." Educational Screen and Audiovisual Guide, January 1970, pp. 18-19, 25.

"Solving People Problems." Army Digest 25 (March 1970): 13-15.

A Summary Review of the Armed Forces Qualification Test. Staff Paper. Alexandria, Va.: Human Resources Research Organization, 1970.

An Uncritical Review of "The Curriculum Literature: 1955-1970." Staff Paper. Alexandria, Va.: Human Resources Research Organization, May 1973.

"Performance Testing in Education: Training Research Shows the Way." Keynote Address. Problems and Potentials of Applied Performance Testing: Proceedings of the National Conference on the Future of Applied Performance Testing. Portland, Ore.: Northwest Regional Educational Laboratory, December 1975, pp. 35-54.

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ABSTRACT

Title of Dissertation: Army Training Research: A Thirty-Five Year History With Implications for Educational Research and Development

Saul Lavisky, Doctor of Philosophy, 1977

Dissertation directed by: Professor Richard F. Neville

The United States Army initiated a formal training research program in its air arm during World War II as part of a scientific effort to man its aircraft with the best-qualified and best-trained crews possible. Ten years later, in 1951, the Army inaugurated a research program on the training of ground troops. The purpose of this study has been to examine the 35-year history of the Army's training research efforts, to describe how the current configuration of research-related Army agencies evolved, and to try to derive from the Army's experience some implications for the planning, management, and conduct of civilian educational research and development.

✓ The focus of this study has been upon the organizations which have been, and are, involved in Army training research, and upon their relationships to one another and to the Army's training establishment. Four types of organizations, or organizations performing four types of functions, appear to be necessary and sufficient for the conduct and utilization of training research in an operating system: (1) an organization

- A -

that has or can pose a problem whose solution would result in increased proficiency of human performance on the job, or an increased efficiency in training; (2) an organization that can perform the required research and development activities; (3) an organization that can support--with funds, materiel, and non-research manpower--the research and development activities; and (4) an organization that can act to cause implementation of a successful solution to the problem posed. ←

Using an expanded version of this framework as a data-collection guide, this study has reviewed official and unofficial documents in the Army's files and in the files of the civilian contract research agency which served as the Army's principal resource in training research for nearly a quarter-century, 1951 through 1973. In addition, several individuals who had served as key administrators in the training-research program over the past 35 years provided their personal observations and recollections.

The manner in which the Army conducted its training during World War II and during the Korean War was largely unaffected by the results of training research. However, by the mid-1950s, perceptible differences could be detected. Today, informed largely by the results of training research, the Army's approach to training has changed significantly. Among these changes are: (1) holding centralized training to a minimum; (2) development of a system for upgrading the individual soldier's proficiency through training conducted in his unit; (3) emphasis in both institutional and unit settings on performance-oriented, criterion-referenced (i.e., competency-based) training.

Over the past six or seven years, there has been an implicit recognition that the Army's process for getting training research results

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applied needed to be improved. Old organizations received new and explicit missions, and new organizations were created to accomplish functions that either had been performed inadequately in the past or not at all. Responsibility for all behavioral and social science research was vested in a single Army organization, the U.S. Army Research Institute for the Behavioral and Social Sciences. The translation, technological development, and dissemination functions were vested with such newly-created organizations as the Combat Arms Training Board, Training Management Institute, and Training Support Center. Through these actions, the Army's training research-into-practice system became, by evolution, a more thoroughly rounded and carefully articulated one.

In the final chapter, a number of implications for the civilian educational research and development domain are derived from the Army's experience. The major implication appears to be that the Federal Government should assume responsibility for strengthening educational research and development in this Nation by adopting policies and procedures to encourage the diverse elements which constitute the "national educational R&D system" to behave in a more systemlike manner.

ARMY TRAINING RESEARCH: A THIRTY-FIVE YEAR HISTORY
WITH IMPLICATIONS FOR EDUCATIONAL
RESEARCH AND DEVELOPMENT

by
Saul Lavisky

Dissertation submitted to the Faculty of the Graduate School
of the University of Maryland in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

1977

DEDICATION

TO MY BELOVED WIFE
DOROTHY F. LAVISKY
FOR MORE GOOD REASONS
THAN EVEN SHE
CAN EVER KNOW

ACKNOWLEDGEMENTS

In the course of researching and writing this dissertation, and in the studies which preceded it, the author enjoyed exceptional support from numerous individuals whose contributions he is pleased to acknowledge.

Dr. Richard F. Neville, Dean of the Division of Education, University of Maryland Baltimore County, served as my Advisor, and his patient guidance over several years perfectly exemplified all that title connotes. His willingness to allow me free rein, within bounds, has been specially appreciated. He was always available to provide help and advice when it was needed.

Dr. William A. McClelland, President of the Human Resources Research Organization (HumRRO), served as friendly critic of this work. He reviewed and commented on chapter drafts, and opened his doors to me whenever an important point needed threshing out or clarification. His obvious interest in my successful completion of this project was both a challenge and an inspiration.

In many ways, Dr. Meredith P. Crawford, former President of HumRRO, led me to select this dissertation topic. In many over-the-lunch-table conversations, he regaled me with anecdotes from his years in the program, first in the Army Air Forces and then presiding over HumRRO for a quarter-century. It was evident to both of us that this was a story worth telling, and he encouraged me to tell it.

Two HumRRO colleagues were especially helpful to me over the years in which I pursued the doctoral program. Dr. John E. Taylor and the late Dr. Eugene A. Cogan stimulated and encouraged me in the studies which culminate in this dissertation.

Special appreciation is also due to Mrs. Josephine R. Hunter, HumRRO Librarian, for her many efforts on my behalf, and to Mrs. Barbara A. Vermillion, Administrative Associate, for performing innumerable tasks that made my work much easier. Many other HumRRO colleagues--too many to cite individually--also helped by sharing their experiences and insights with me.

The following-named individuals were particularly helpful in providing or helping me to locate materials which contributed to this dissertation: Dr. John C. Flanagan, American Institutes of Research; Dr. Harry F. Harlow, University of Arizona; Dr. Charles W. Hill, University of New Orleans; Dr. J. E. Uhlaner, U. S. Army Research Institute for the Behavioral and Social Sciences; A. Q. Collier, Naval Training Equipment Center; Paul K. McClure, National Academy of Sciences; Dr. Robert E. Tostberg, University of Washington; Lt. Col. James J. Steinbach, Office of the Chief of Military History; and Patrick Garabedian, National Archives.

Whatever is good in this work reflects, in large measure, the assistance the aforementioned persons provided. The shortcomings rest solely on the author's shoulders.

TABLE OF CONTENTS

	Page
DEDICATION	ii
ACKNOWLEDGEMENTS	iii
Chapter	
I. INTRODUCTION	1
Need for This Study	9
Purpose of This Study	10
Questions	11
Scope	11
Assumptions	15
Limitations	15
Research Approach	17
The Civilian "System"	17
The Military System	18
Definitions and Key Concepts	22
Training Versus Education	22
RDT&E	24
Army Training Research	24
Basic Research	26
Research-Into-Practice	29
Knowledge Production and Utilization	32
System Models	33
II. ARMY TRAINING RESEARCH IN TWO WORLD WARS: 1917-1918 AND 1941-1945	36
Introduction	36
World War I	37
Committee on Classification of Personnel in the Army	39
Committee on Education and Special Training	42
The War Ends	43
World War II	45
Army Training	46
Psychology Mobilizes	50
The Applied Psychology Panel	55
Psychological Research in the Army	60
Personnel Research Section, TAGO	61
The AAF Aviation Psychology Program	62
Summary	70

III. THE IMMEDIATE POST-WAR YEARS	73
Introduction	73
After the War	74
Civilian Research Organizations	77
NAS-NRC	77
The Psychological Profession	80
Military Research Organizations	82
The Joint Research and Development Board	82
Unification of the Services	84
Army Human Resources Research	86
Personnel Research and Procedures Branch, TAGO	88
The Operations Research Office	89
Navy Special Devices Center	91
The Buel Report	94
Other Research Reports	96
Summary	97
IV. ARMY TRAINING RESEARCH IN A FEDERAL CONTRACT RESEARCH CENTER, 1951-1973	99
Introduction	99
The Situation in 1951	100
Training Research, 1950-51	102
Establishing a Training Research Agency	106
HumRRO Personnel	108
Unique Features	109
HumRRO Organization	113
The HumRRO Research Program	116
Orientation Toward Usefulness	120
Diversification of Support	124
An Independent Corporation	126
The Relationship Changes	129
The Research Management Mechanism	133
Summary	136
V. THE CURRENT SITUATION	139
Introduction	139
Enlisted Personnel Management System	140
The Army Training System	143
Department of Defense	145
Interservice Training Review Board	145
Defense Research and Engineering	146
Advanced Research Projects Agency	148
Army Training Research and Development	149
Army Headquarters	150
Manpower Resources R&D Center	150
Army Research Institute	151
Combat Arms Training Board	157
Training Management Institute	160
Training Support Center	162
Summary	163

VI. SUMMARY AND CONCLUSIONS WITH IMPLICATIONS FOR EDUCATIONAL RESEARCH AND DEVELOPMENT	165
Summary	165
Discussion	170
A Training Research Model	172
On Deriving Implications	177
Implications	180
Recommendations	190
Conclusions	192

Appendices

A McCLELLAND'S MODEL OF THE ARMY'S RESEARCH-INTO- PRACTICE PROCESS	194
B GLOSSARY	196
C THE COMMITTEE ON CLASSIFICATION OF PERSONNEL IN THE ARMY	206
D THE COMMITTEE ON SERVICE PERSONNEL	209
E ARMY AIR FORCES AVIATION PSYCHOLOGY PROGRAM RESEARCH REPORTS	212
F THE COMMITTEE ON HUMAN RESOURCES OF THE JOINT RESEARCH AND DEVELOPMENT BOARD	215
G DELINEATION OF HUMAN RESOURCES RESEARCH BY THE RESEARCH AND DEVELOPMENT BOARD	219
H JOINT ARMY AND NAVY AGREEMENTS FOR ARMY PARTICIPATION IN THE NAVY SPECIAL DEVICES CENTER	222
I "CAREER-WISE MASTER PLAN" OF THE WORKING GROUP ON HUMAN BEHAVIOR	225
J DIFFERENTIATION OF THE HumRRO MISSION FROM THOSE OF OTHER HUMAN RESOURCES RESEARCH AGENCIES	228
K THE ROLE OF THE HUMAN RESEARCH UNIT CHIEF IN THE ARMY TRAINING RESEARCH PROGRAM, 1951-73	233
L TASK TRAINFIRE: CURRICULUM DEVELOPMENT FOR A SINGLE SUBJECT-MATTER AREA	236
M TASK SHOCKACTION: CURRICULUM DEVELOPMENT FOR A COMPLETE PROGRAM OF INSTRUCTION	241
N A SYSTEMS ENGINEERING APPROACH TO ARMY CURRICULUM DEVELOPMENT	245

0	INTRODUCING PERFORMANCE-ORIENTED TRAINING INTO THE ARMY TRAINING CENTER SYSTEM	249
	SELECTED BIBLIOGRAPHY	253

CHAPTER I

INTRODUCTION

The U.S. Department of Defense (DoD) operates the largest "school system" in the Nation, and perhaps in the entire world. In Fiscal Year 1977 alone, a year when the United States was at peace, this system provided 251,400 man-years of training and education at a cost of approximately \$6 billion. Some 130,100 military personnel and 61,200 civilians were engaged primarily in support of this training.¹

Even these large numbers tend to understate the magnitude of the Defense training enterprise. Since most military courses run for less than a full year (some for only a few weeks or a few months), the number of man-years, or "training load" reflects only the average number of students in training during the year. For example, the anticipated training load for Recruit Training for FY 1977 was about 79,000 for all Services but, actually, some 450,000 men and women entered Recruit Training programs during the year.² Thus, the number of military personnel in all Services actually undergoing some form

¹U.S., Department of Defense, Military Manpower Training Report for FY 1977, March 1976, p. IX-5.

²Ibid., p. III-2. Because of differences in their missions, the different Services approach recruit training differently, and their programs differ in length. In the Air Force, recruit training takes six weeks; in the Army, it takes seven weeks; in the Navy, nine weeks; and in the Marine Corps, eleven weeks.

of individual training or education during FY 1977 totaled about 1,500,000.³

If one disregards the relatively specialized subject-matter addressed in most military training, it is possible to identify a number of parallels between the DoD school system and the Nation's civilian educational enterprise. This is particularly true if one recognizes that military training is essentially a form of vocational education--the vocations being those of Soldier, Sailor, Airman, and Marine.

Were the typical civilian school teacher to have found himself, at any time over the past quarter-century, thrust suddenly into the role of Army trainer, he might have experienced temporary difficulty with the terminology, but he would likely have recognized the pedagogical framework in which he was operating. He would have been provided with an Army Training Program (ATP) which outlined the minimum essential training his students were to receive. This ATP would prescribe the subjects to be covered and the hours to be devoted to each subject. For each subject, he would have had an Army Subject Schedule (ASubjScd) which provided guidance for his preparation of lesson plans and for scheduling periods of instruction. He would also have had access to an Army Training Test (ATT) for assessing what his students had learned.

³"Individual training" refers to the training that individual servicemembers receive in formal courses conducted by organizations whose predominant mission is training; this is to be differentiated from training conducted by operational units (i.e. unit or collective training) incidental to their combat, combat support, or combat service support missions.

Another similarity between the Army training and civilian educational systems is that both conduct and support research-and-development projects with the hope of improving their instructional programs. The beginning of the so-called "scientific movement" in education is dated with some difficulty; the beginning of Army training research, less so.

With regard to the former, some persons credit the establishment of a Federal education agency in 1867 (the forerunner of today's U.S. Office of Education). Congress charged this new department with ". . . collecting such statistics and facts as shall show the condition and progress of education in the several States and Territories, and of diffusing such information respecting the organization and management of schools and school systems, the methods of teaching, as shall aid the people of the United States in the establishment and maintenance of efficient school systems."⁴ Others credit Joseph M. Rice who, in 1897, lectured and published articles reporting on his own educational research, in which he had examined the relationship between the time devoted to teaching spelling and the ability of pupils to spell.⁵ Still others claim the honor for Edward L. Thorndike, who described his methods of quantitative research into education matters in a three-volume work, Educational Psychology, published in 1913.

⁴An Act to Establish a Department of Education, Statutes at Large 14, 434 (1867).

⁵Joseph M. Rice, "The Futility of the Spelling Grind," Forum 23 (April 1897): 163-172, and 23 (June 1897): 409-419.

There is less difficulty pinpointing the beginning of Army training research. Although scientific psychology was first used by the Army during World War I to improve the selection, classification, and assignment of military manpower, research designed specifically to improve military training dates back only to the 1940s and World War II. Since that time, the Armed Forces--and especially the Army--have conducted relatively large-scale, sustained programs of training research.

While the military and civilian educational establishments have, over the past 35 years, shared a common concern for establishing a scientific basis for their instructional practices, they have apparently achieved different results from their research programs. Educational research is frequently criticized for its lack of impact on educational practice in the United States. By contrast, military training research is frequently praised as the foundation upon which the Services have built their current, technologically-advanced training systems. Whether either the criticism or the praise is merited is a matter for examination.

An example of the criticism of civilian educational research is that offered by Benjamin S. Bloom in his 1966 Presidential Address to the American Educational Research Association (AERA). Bloom reported that he had reviewed the research scene for the preceding quarter-century (1940-1965), had found 70,000 research project titles, but had concluded that only one out of every thousand (or approximately three studies per year) had any significant impact on American education.⁶

⁶Benjamin S. Bloom, "Twenty-Five Years of Educational Research," Report of the President to the Annual Meeting of the American Educational Research Association (AERA), 18 February 1966, AERA Archives.

A 1969 report from the U.S. Office of Education described educational research activity in the United States but, in evaluating its practical effect, concluded that ". . . we have not been able to collect very good evidence on the impact of specified research and development activities and where evidence has been collected, it has generally tended to indicate rather low levels of effect."⁷

In a background report for the Select Subcommittee on Education, U.S. House of Representatives, Francis S. Chase reported on his commissioned examination of regional educational laboratories by writing, in 1972, that: "One who looks objectively upon the short and uncertain history of educational research and development organizations funded by the Federal Government will discern ineptness in planning and management, bloated expectations punctuated by failures, and frustrations enough to confound even the boldest of risk takers."⁸

The following year, the National Institute of Education went on record with the following observation:

We wish to stress again that despite the notable achievements of the past decade of research, product development, evaluation, and dissemination, the schools are much as they have always been, and not always by choice. We attribute this in part to the whole way R&D has been thought about--as an external

⁷[Hendrik D. Gideonse], Educational Research and Development in the United States (Washington: U.S. Office of Education, U.S. Department of Health, Education, and Welfare, December 1969), p. 153.

⁸Francis S. Chase, "Educational Research and Development in the Sixties: The Mixed Report Card," in Educational Research: Prospects and Priorities, Appendix 1 to Hearings on H.R. 3606 and Related Bills to Create a National Institute of Education, Before the Select Subcommittee on Education, U.S. House of Representatives (Washington: Government Printing Office, January 1972).

activity whose results will inevitably be found useful by operating agencies.⁹

This view of the modest impact of educational research upon educational practice is shared by numerous observers, including Robert N. Bush of the Stanford Center for Research and Development in Teaching, who recently wrote:

(Between 1954 and 1974) the expenditures for educational R&D rose dramatically . . . from approximately \$1 million in 1954 to \$14 million by 1963 and to almost \$200 million by 1968. . . . Thus in 1954 began a long and torturous journey to build an educational R&D System Obviously the millenium has not arrived. The educational system has not been dramatically transformed in the past ten years.¹⁰

Even more recently, the Committee on Vocational Education Research and Development of the National Research Council reported:

The Committee has found that the \$250 million spent by the U.S. Office of Education on vocational education research and development during the last ten years has not had documented, widespread impact. Although the Committee did not have adequate data and models for a rigorous evaluation, the available data do not indicate that vocational education research and development (R&D) findings and products have had an influence on the knowledge, skills, or employability of large numbers of students. The Committee believes that vocational education R&D shares with educational R&D a lack of both demonstrated impact on students and methods for rigorously measuring impact.¹¹

⁹National Institute of Education, Building Capacity for Renewal and Reform: An Initial Report on Knowledge Production and Utilization in Education (Washington: National Institute of Education, 1973), p. 6.

¹⁰Robert N. Bush, Educational Research and Development: The Next Decade, Occasional Paper No. 11 (Stanford, Calif.: Center for Research and Development in Teaching, Stanford University, June 1976), p. 12.

¹¹Committee on Vocational Education Research and Development, Assessing Vocational Education Research and Development (Washington: National Academy of Sciences-National Research Council, 1976), p. 1.

At the other end of the criticism-praise continuum is a recent report from the Defense Science Board Task Force on Training Technology, which described military training research as follows:

R&D on training methods is competent, relevant to the needs of the Services, and incorporates the current state-of-the-art in training devices, procedures, and data processing. The Services have pioneered (a) in the use of complex simulators to train personnel to operate and maintain major weapons systems, (b) in self-paced personalized methods of instruction, (c) in performance-oriented training, and (d) in managing the training of very large numbers of individuals.¹²

It should be noted that, despite the report's origin in the Department of Defense, this was not self-praise. The Task Force was not composed of in-house DoD personnel, but of outsiders. It was chaired by the head of a university psychology department and had, among its other eight members, representatives from four other universities and from the Smithsonian Institution.

Ten years earlier, following a major seven-month study, the Department of the Army Board to Review Army Officer Schools reported that:

Educational practices and techniques in the Army school system are generally outstanding, and innovations in methods and equipment is continuous. The schools are assisted in the development of innovations by both in-house and Army-sponsored

¹²Task Force on Training Technology, Summary Report of the Task Force on Training Technology (Washington, D.C.: Defense Science Board, U.S. Department of Defense, 27 February 1976), p. x. The Task Force was chaired by Earl A. Alluisi, Old Dominion University. Its other members were: O. S. Adams, Lockheed-Georgia Company; Davis B. Bobrow, University of Maryland; Ralph Flexman, University of Illinois; C. B. Gambrell, Jr., Florida Technological University; Howard H. McFann, Human Resources Research Organization; Jesse Orlansky, Institute for Defense Analyses; Joseph Rigney, University of Southern California; and H. Wallace Sinaiko, Smithsonian Institution. In addition to the Task Force's formal report, a "popularized" version of its findings appeared in Earl A. Alluisi, "Lessons from a Study of Defense Training Technology," Journal of Educational Technology Systems 5 (Winter 1976-77): 57-76.

research and development. . . . The Army should continue to sponsor an education and training research and development program, both in-house and by contract, and insure that the results are made available to all schools within the Army school system.¹³

The Department of Defense itself, as represented by its Assistant Secretary for Manpower and Reserve Affairs, evidenced satisfaction with the results it has obtained from its training research investment. In early 1976, in response to a request from Congress, the Secretary submitted a Report on the Defense Training Establishment in which he said, in part:

As a starting point, it should be realized that the Military Services are generally abreast of, or ahead of, the civilian sector in use of advanced training technology and have, in fact, pioneered many innovations in the field--the use of audiovisual techniques, utilization of a wide variety of training aids and equipment, and many other techniques. While further advances are under study, and many will be adopted and further increase training efficiency and effectiveness, these advances will be building on a base of wide experience and success in the use of educational technology.¹⁴

There may be little to be gained from arguing whether civilian educational research or military training research has been the more productive, or has had the greater beneficial impact upon its parent instructional system. There is, however, considerable potential value in examining the military training research system which, because of their respective information-dissemination mechanisms, is less well known to civilian educational researchers than vice versa.

¹³U.S., Department of the Army, Report of the Department of the Army Board to Review Army Officer Schools, Vol. 1, Summary and Recommendations, 1967, p. 72. This report is popularly known as "The Haines Board Report" because the Board was chaired by Lt. Gen. Ralph E. Haines, Jr.

¹⁴U.S., Department of Defense, Report on the Defense Training Establishment, March 1976, pp. C-3, C-4.

The study reported here focuses on the Army's training research program. The Army is the largest of the military Services and has had the longest history of formal training research.

Need for This Study

There are a number of reasons why this study should have been done. First, the history of Army training research is part of the history of educational research in this Nation; however, it has not been examined or reported upon in reasonable depth and breadth. Those studies which have been reported have, by and large, focused on substantive findings of the research without major attention being paid to the organizational context in which that research was conducted and its results used.

Second, while this study will not contribute to basic science (in the sense of theory-building or development of general laws), it does describe how one large organization with a major training mission has developed and used a research-and-development component to help improve its instructional programs and practices. For the military manager, this report provides a perspective on what the Army training research system has been, and what it is like today, and this information should be helpful in planning the system's future development. To the extent that there are important similarities between Army training research and civilian educational research, this report should also be of value to the planners and managers of civilian educational research. In fact, there are important similarities: in the purposes for which research is conducted (to improve instructional practices); in the functions that are involved

in the research-into-practice process; in the psychological and sociological processes studied; in the characteristics of the research performers; and in the research methodologies employed.

Third, it is possible that increased support for civilian educational research and development would follow from a visible increase in the impact of research results on educational practices. If Army training research has achieved such an impact on Army training practice, it is important to identify and to examine those aspects of its planning, management, and conduct that contributed to this accomplishment, as cues for civilian consideration.

Finally, a fourth reason for assuming potential value in this study is that which undergirds most historical research: "Those who do not remember the past are condemned to relive it." The obverse should also be true: a knowledge of the past should enable us to capitalize on our collective experience, to avoid repeating earlier mistakes, and to distinguish between that which is genuinely new and better from that which only seems so because of our lack of historical perspective.

Purpose of This Study

This study had three primary objectives: (1) to examine the 35-year history of Army training research, and to describe how the current configuration of research-related agencies evolved; (2) to identify the important organizational factors which led to the adoption and institutionalization of research results; and (3) to try to derive, from the Army's experience with its training

research program, some implications for civilian educational research and development.

Questions

In pursuing these objectives, attention was directed toward several clusters of questions.

1. What is Army training research? Why and how did the Army initiate its efforts in this area? How did the Army's training research program arrive at its present form (i.e., organizational structure), and what is that form?

2. How are the functions of research, development, diffusion, and adoption (RDDA) accomplished and by what agencies? How does the Army select its research topics, and how does it establish priorities among them? How is Army training research currently planned, conducted, and managed? By what mechanisms does the Army seek to achieve maximum appropriate utilization of the results of training research?

3. What kind of impact has training research had on Army training philosophy and practice? What organizational factors have been important in the acceptance or rejection of research-based innovations? How do training innovations become institutionalized in the Army?

4. In what ways is Army training research similar to, and in what ways different from, civilian educational research? Is it reasonable to expect to derive implications from the Army experience for the civilian setting? What are some of the major implications?

Scope

While all aspects of the Army's experience with its training research program are potentially of interest, the immediate concern

of this study has been with the program's organization, and specifically, with its structure and functions rather than with the actual conduct of research or with substantive findings from that research. There are several reasons for this particular emphasis.

First, the methodology employed by Army training researchers (i.e., research design, sampling procedures, data gathering, and data analysis) is substantially the same as that used by civilian educational researchers, deriving largely from practices followed in the behavioral and social sciences. There is little that is unique about Army training research methodology.

Second, much of the substance of training research conducted in military settings has been reported in the conventional educational research literature, as well as in several integrating compendia.¹⁵ Since this information is readily available, there does not appear to be a need for further examination, here, of the substantive aspects of Army training research.

However, most Army training research and a great deal of civilian educational research takes place in organizations for

¹⁵Examples of such studies include: Alonzo G. Grace and others, Educational Lessons Learned from Wartime Training (Washington: American Council on Education, 1948); Robert Glaser, ed., Training Research and Education (Pittsburgh: University of Pittsburgh Press, 1962); Robert Glaser, "Implications of Training Research for Education," in Theories of Learning and Instruction, ed. Ernest R. Hilgard (Chicago: National Society for the Study of Education, 1964); Harold L. Clark and Harold S. Sloan, Classrooms in the Military (New York: Teachers College, Columbia University, 1964); U.S. Department of Defense, Proceedings of the Engineering Systems for Education and Training Conference (Washington: National Security Industrial Association, 1966); F. W. Norris, Review of Army Educational Systems (Washington, D.C.: Department of the Army, 1971); and Society for Applied Learning Technology, Proceedings, Volume II: Third Triennial Symposium on Cost-Effective Learning Through the Application of Technology (Washington: National Security Industrial Association, July 1976).

which such research is either the sole, or a major, activity. How such organizations interface with one another and with the instructional systems they support has considerable influence on whether or not their research results are adopted and used. This aspect of the Army's training research system has not received the attention it would appear to deserve.

The focus of this study is upon the organizations which have been, and are, involved in Army training research, and upon their relationships to one another and to the Army's training establishment. Four types of organizations, or organizations performing four types of functions, appear to be necessary and sufficient for the conduct of training research and the utilization of research results in an operating system. These are:

1. An agency that has and can pose a problem whose solution would result in increased proficiency of human performance on the job, or an increased efficiency in training.
2. An agency that can perform the required research and development activities.
3. An agency that can support, with funds, materiel, and non-research manpower, the R&D activities.
4. An agency that can act to cause implementation of a successful solution to the problem originally proposed.¹⁶

Chapters II through V describe, in chronological sequence, how the Army has sought over the past 35 years to provide these "necessary and sufficient" conditions and how, in doing so, it has built an integrated knowledge production and utilization system.

¹⁶Theodore R. Vallance and Meredith P. Crawford, "Identifying Training Needs and Translating Them into Research Requirements," in Training Research and Education, ed. Robert Glaser (Pittsburgh: University of Pittsburgh Press, 1962), p. 500.

Chapter II includes a brief description of the Army's first use of scientific psychology, in World War I (1917-18), but focuses primarily on the beginnings of Army training research during World War II (1941-45). The immediate post-war years (1946-51) are the subject of Chapter III, a period when training research received scant attention from the Army. Chapter IV covers the 23-year period from 1951 through 1973 when the Human Resources Research Organization (HumRRO), operating as a Federal Contract Research Center, was the Army's principal resource for training research and development. Chapter V describes the current situation, in which the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) conducts the research program with a mix of in-house and contract resources, and feeds research results into a network of new Army agencies which round out the research-into-practice system. Chapter VI includes a summary of the study, a set of implications for civilian educational research planners, and recommendations for further research.

Descriptions of several Army training research efforts are included as appendices to provide concrete illustrations of the substance and impact of this research. The specific examples have been selected to illustrate curriculum development for a single subject (appendix L), and for an entire program of instruction (appendix M), introduction of "system engineering" concepts into Army course design (appendix N), and the current movement toward performance-based training and evaluation (appendix O).

Assumptions

Four key assumptions helped shape this study: (1) that results from the Army's training research program have had a greater impact upon Army training practices than civilian educational research has had upon civilian educational practices; (2) that the Army's experience in supporting a relatively large-scale training research program over much of the past 35 years would have relevance for those who plan and manage civilian educational research; (3) that this relevance would inhere to a greater degree in the organization and management of the Army's program than in its specific products; and (4) that an historical analysis of the program, to be of most value to civilian educational research planners and managers, should focus on the training research organizations and on their relationships to the training establishment and to each other.

Limitations

This study examines only the Army's training research program. While it was the first, has been the largest, and has been sustained the longest, it is not the only such program being conducted within the Department of Defense. Some training research is conducted at the departmental level, and there are substantial programs in both the Navy and Air Force, as well as a smaller one in the Marine Corps.

Emphasis in this study is on the structural (i.e., morphological) facets of the Army's training research system. Other important aspects of the system are not addressed: organizational behavior; the effects of leadership; the characteristics, competence,

attitudes, values, and goals of organization members; and the quality of research products. Even within its focus on structure, this study is limited in that it emphasizes formal structure in preference to power structure, spatial structure, prestige or status structure, and communication structure. A complete understanding of organizational effectiveness would require an appreciation for each of these elements, and quite probably many others. This study does not purport to provide such a comprehensive picture of the Army's training research system, nor is it likely that any single study could. What it does attempt to offer is a depiction of the organizational context in which all these other organizational processes take place. As Sieber points out:

. . . to understand the barriers to the advancement of educational research, it is not sufficient to pay attention to the intellectual or theoretical content of research, as vitally important as this topic may be. The study of organizational setting is at least as important.¹⁷

In addition, this study suffers from most of the limitations that inhere in most historical research projects. It is qualitative rather than quantitative; the correspondence of record to fact is not always one-to-one; injustice is frequently done to some key participants in the events under study because no history can ever be a complete record of the past; and, it is a static recounting of dynamic events--a series of "snapshots," as it were, taken of a 35-year program in motion. Finally, there were the customary limitations of time, resources, and the capability of a single researcher.

¹⁷Sam D. Sieber, with the collaboration of Paul R. Lazarsfeld, The Organization of Educational Research (New York: Bureau of Applied Social Research, Columbia University, 1966), p. 21.

Research Approach

The approach taken in this study combines the features of both historical and case study research. Consequently, there was no "research design" in the sense in which this term is commonly applied to experimental projects. In both historical research and case study methodology, it is helpful to think of research design as the plan of study or the research strategy.¹⁸ The hope and expectation for this study was that, through an intensive, longitudinal examination of the Army's experience with a training research program that has been designed to make a practical difference, it might be possible to develop insights having generalizability to civilian educational research.

The Civilian "System"

Because this study was concerned with the Army's experience, an early problem that had to be faced was how one might extrapolate the "lessons learned" to the civilian educational research setting. Such extrapolation should obviously be based on as intimate a familiarity with the civilian system as with the Army's. Fortunately, the civilian educational research system (insofar as it is a system) has been the subject of a number of competent, in-depth studies. The

¹⁸Robert M. W. Travers, An Introduction to Educational Research, 2d ed. (New York: The Macmillan Company, 1964), pp. 127-28. As Van Dalen and Meyer suggest, the case study approach features an intensive, in-depth examination of a social unit, culminating in an integrated picture of the way in which that unit functions. Historical research seeks to determine "what happened," and to produce generalizations about the past. Deobold B. Van Dalen and William J. Meyer, Understanding Educational Research: An Introduction, 2d ed., rev. and enl. (New York: McGraw-Hill Book Company, 1966), pp. 218-220 and 196-202.

implications to be drawn and the recommendations to be made in this study report are based in part on the composite picture painted by these studies. Primary dependence has been placed on the following works:

Matthew B. Miles, ed., Innovation in Education (New York: Bureau of Publications, Teachers College, Columbia University, 1964), 689 pp.

Sam D. Sieber with the collaboration of Paul F. Lazarsfeld, The Organization of Educational Research in the United States (New York: Bureau of Applied Social Research, Columbia University, 1966), 499 pp.

Ronald G. Havelock and others, Planning for Innovation Through Dissemination and Utilization of Knowledge (Ann Arbor, Mich.: Center for Research on Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan, 1969), 538 pp.

[Hendrik D. Gideonse], Educational Research and Development in the United States (Washington: National Center for Educational Research and Development, U.S. Office of Education, 1969), 200 pp.

[William Paisley and others], 1976 DATABOOK: The Status of Education Research and Development in the United States (Washington: National Institute of Education, 1976), 90 pp.

National Council on Educational Research, Educational Research in America: Annual Report, 1975 (Washington: National Institute of Education, 1976), 49 pp.

American Educational Research Association, Educational Researcher, a monthly newsmagazine (Washington: the Association), issues from 1971 to the present.

The Military System

In studying the Army's training research system, the research strategy involved: (1) locating and collecting relevant data; (2) examining, analyzing, evaluating, and interpreting these data; (3) synthesizing important data into an organizational history of the system's development; and (4) deriving implications and

developing recommendations on the basis of the study. An attempt was made to apply the criteria suggested by Kerlinger, to answer the research questions "as validly, objectively, accurately, and economically as possible."¹⁹

The primary sources of data for this study were the collections of the U.S. Army Center for Military History, Carlisle Barracks, Pa., and the U.S. Army Library in the Pentagon, Washington, D.C., as well as the library and files of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Rosslyn, Va., and the library and files of the Human Resources Research Organization (HumRRO), Alexandria, Va.²⁰ In addition, the author of this report has, for the past 14 years, been a HumRRO research administrator, in which capacity he has been directly involved in the Army's training research program. His own files and his contacts with some of the principal actors in the Army's program have also produced relevant data. Among those providing personal information for the study were: Dr. John C. Flanagan, who headed the

¹⁹Fred N. Kerlinger, Foundations of Behavioral Research: Educational and Psychological Inquiry (New York: Holt, Rinehart & Winston, Inc., 1964), p. 276.

²⁰The amount of material available to anyone interested in researching Army history is enormous, particularly material generated within the past 35 years. As historian Wood Gray says: "In World War II, the Armed Forces of the United States came at last to a realization of their needs in this field and began to sponsor the most extensive program of historical studies that the world has yet seen." Wood Gray and others, Historian's Handbook (Boston: Houghton Mifflin, 1964), p. 6. Official Army records are available from three principal sources: the National Archives (for materials from 1776 to 1939); the Adjutant General's record centers (for materials from 1940 to 1955); and both these record centers and the originating offices (for materials from 1956 to the present). In addition, there are many unofficial but important documents relating to the Army in the Manuscript Division of the Library of Congress.

Army Air Force Aviation Psychology Program during World War II; Dr. Harry F. Harlow and Dr. Charles W. Hill (Colonel, USA-Retired), who played key roles in getting the training research program back into operation in 1951; Dr. Meredith P. Crawford, who directed HumRRO and its program of research for the Army for 25 years; and Dr. Julius E. Uhlaner, who has been a key administrator in, or Director of, ARI and its predecessor organizations for more than 30 years.

An effort was made to use primary sources for this study wherever feasible. However, secondary sources of data have occasionally been used where (1) the data appeared as part of a consolidated report and the continued existence of its original repository (the primary datum) was in considerable doubt; and/or (2) a search for the primary source was clearly beyond the resources available for this study. In every case where a secondary source was used, it was even more thoroughly evaluated for authenticity and validity than were the primary sources.²¹

²¹An interesting problem arose in this study in the effort to categorize certain sources as "primary" or "secondary," insofar as the criterion of first-hand observation was concerned. Several comprehensive reports on subjects under examination were authored by individuals who played key roles in the events described. Examples include Dr. Robert M. Yerkes on psychological examining during World War I (he headed the program); Dr. Charles W. Bray on the work of the Applied Psychology Panel during World War II (he was an aide and then Executive Secretary of the Panel); and Dr. James P. Baxter on the work of the National Defense Research Committee (he was official historian for the Committee and observed many, but not all, of the events he recorded). It is not clear from the reports themselves when statements are based on first-hand observation, and would therefore qualify the reports as "primary sources," and when this was not the case.

An early problem that had to be faced was finding a framework to guide the data-collection activity--a framework that could also be used in synthesizing the study results. To make the conceptual leap from Army experience to civilian potentialities as straightforward as possible, several models of the research-into-practice process from the civilian literature were considered. Each one was rejected because it lacked "goodness-of-fit" to the process as it occurs in the Army. Among those considered were the Research-Development-Diffusion-Adoption (RDDA) and Configurational models proposed by Guba and Clark, the Output-Oriented model offered by Gideonse, and the Linkage model recommended by Havelock.²² Finally, a Systems model developed by McClelland²³ specifically to describe the Army's training research-into-practice process was adopted, even though its applicability to the civilian situation was clearly conjectural. The representational accuracy of the model (i.e., its fidelity-to-fact) was considered to be more important for the purpose at hand than its questionable value as a "translational" device. A

²²David L. Clark and Egon G. Guba, "An Examination of Potential Change Roles in Education," in Rational Planning in Curriculum and Instruction, ed. Ole Sand (Washington: National Education Association, 1967), p. 116; Egon G. Guba and David L. Clark, The Configurational Perspective: A View of Knowledge Production and Utilization (Washington: Council for Educational Development and Research, 1974); Hendrik D. Gideonse, "Research, Development, and the Improvement of Education," Science 162 (1 November 1968):541-45; and Ronald G. Havelock and others, Planning for Innovation Through the Dissemination and Utilization of Knowledge (Ann Arbor, Mich.: Center for Research on the Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan, 1969).

²³William A. McClelland, The Process of Effecting Change, Professional Paper 32-68 (Alexandria, Va.: Human Resources Research Organization, October 1968).

depiction of this model appears as appendix A. Although this model is extremely detailed and situation-specific, or perhaps because of these qualities, it was found to be quite helpful in focusing and structuring the data-gathering activity, and in framing the historical chapters. It should be noted that, even though a "systems" model was used, no systems analysis of the Army training research system was undertaken in this study. The primary purpose of the model was to identify key aspects of the system for careful examination.

Definitions and Key Concepts

Military terms which are likely to be unfamiliar to the general public, and other terms which are reasonably susceptible to misinterpretation, will be defined in the body of this report (or in footnotes) where they first occur. This should minimize the distraction of having to refer to a Glossary, although one is provided as appendix B. However, there are several definitions and key concepts that should be understood from the beginning.

Training versus Education. Like civilian educators, military training managers also differentiate between training and education, although for the sake of convenience, they frequently use the term training to encompass both activities.

The term 'training' generally refers to instruction in military subjects either at a basic level, as in Recruit Training, or in a military or job-related technical specialty, such as pilot training or training in radar repair. 'Education' generally refers to study either in more advanced subjects or in military subjects which apply to an entire Service

or to the broad mission of national security, as for example, the curriculum of the National War College.²⁴

Without intending that one instructional activity be considered superior to, or more important than, the other, it is generally understood that training is undertaken to serve the needs of a particular system, while education is intended to help an individual fit himself into any of a large number of possible systems. Both activities are concerned with learning and teaching, and both are intended to increase the trainee's (the student's) competence.²⁵

In addition to military training and education, the Army also conducts an educational program intended to help the individual soldier develop personally to his maximum potential, while serving on active duty. This is the General Educational Development (GED) program which provides educational opportunities at the basic, high school, undergraduate, and graduate levels. An historical description of the development of this program is provided in an unpublished doctoral dissertation, "Higher Education in the United States Army," by David C. Berry (University of Maryland, Ph.D., 1974). However, despite this program's importance to the Army, it is not normally included in discussions of Army training and education.

²⁴U.S., Department of Defense, Military Manpower Training Report for FY 1977, March 1976, p. I-3.

²⁵Robert Glaser, "Psychology and Instructional Technology," in Training Research and Education, ed. Robert Glaser (Pittsburgh: University of Pittsburgh Press, 1962), pp. 3-5; Meredith P. Crawford, "Concepts of Training," in Psychological Principles in System Development, ed. Robert M. Gagne (New York: Holt, Rinehart & Winston, Inc., 1963), p. 302.

RDT&E. The Army divides its Research, Development, Test, and Evaluation (RDT&E) process into six funding categories, each of which carries a label and a definition.

Research (6.1). Research is scientific study and experimentation directed toward increasing knowledge and understanding in the fields of physical, engineering, environmental, biomedical, and behavioral-social sciences related to national security needs. It provides fundamental knowledge for the solution of identified military problems.

Exploratory Development (6.2). Exploratory development programs are directed toward developing and evaluating the feasibility, practicability, and parameters of proposed solutions to specific military problems--short of major development efforts.

Advanced Development (6.3). This category includes all projects for which hardware is being developed for experimental or operational test rather than eventual military use. Program control is exercised on a project basis; whereas the research and exploratory development categories are controlled on a level-of-effort basis.

Engineering Development (6.4). Engineering development includes those development projects being engineered for military service use, but that have not been approved for procurement or operational deployment. Program control is exercised on a project basis.

Operational Systems Development. This category is not defined as a research and development category in the Five-Year Defense Plan program element structure. It represents a convenience grouping of major line item projects . . .

Management and Support (6.5). This category includes research and development efforts directed toward installations or operations required for and in general support of research and development. This includes test ranges, . . . maintenance support of laboratories, . . .²⁶

Army Training Research. It is not much easier to define Army training research than it has been to define educational research.

²⁶U.S., Department of the Army, Research, Development, Test, and Evaluation Management, Field Manual 38-70, August 1973, pp. 3-3, 3-4.

An acceptable definition should enable one to distinguish between phenomena which fall within and those which fall outside its scope. However, as Monroe pointed out some 35 years ago: ". . . any determination of the boundaries of the field of educational research must be arbitrary. There are no authoritative criteria on which to base decisions regarding how far to go into such related field as psychology, statistics, sociology, architecture, and political science. Another difficulty is created by the lack of adequate specification of what constitutes research in the field of education."²⁷ The wide range of phenomena which some individuals and organizations would include within the domain is illustrated by the definition included in a recent position paper from the American Educational Research Association.

Education research and development entails the study of any aspect of the teaching and learning process or of the setting in which teaching and learning take place. It covers all aspects of the educational experience from how a child learns to read, to how to manage a classroom for optimal learning to occur, to how a mother may become a more effective influence in intellectual development of her own infant, to how a seventy-year-old retired auto-worker develops new skills and interests.²⁸

The Army Dictionary does not define training research, but there is an implicit definition in a recent Army Regulation.

The overall goal of . . . training RDTE is to develop, apply, and exploit scientific knowledge that improves operational practice and procedures in . . . the training of individuals (individual training) and units (collective training) and involves improving methods of developing, delivering,

²⁷Walter S. Monroe, ed., Encyclopedia of Educational Research (New York: The Macmillan Company, 1941), pp. viii-ix.

²⁸American Educational Research Association, "Education Research and Development: The Federal Role," a position paper by the Association, September 1976, p. 1.

conducting, and evaluating training. Training technology emphasizes training methods, instructional media, delivery systems, and development of instructional systems, including simulation and training devices.²⁹

Where "training research" is used in this study, the Army example will be followed; that is, the reference will be to research on the development, delivery, conduct, and evaluation of training. It should be noted that, in the Army, "training research" is a more restrictive term than "educational research." Some activities included in the latter term are defined by the Army as either "personnel research" or "human factors engineering research." In the Army, psychological tests and testing, including aptitude testing, fall within the field of personnel research. The interface between man and his equipment and/or environment fall within the field of human factors engineering. Civilian educational research is customarily conceived as including some aspects of both areas.

In common usage, the terms "training research" and "educational research" are frequently weighted with the additional notion of "and development," because many people think of research-and-development as a compound concept. Where the term "research" is used in this study, its context should reveal whether it is intended to stand alone or as an abbreviation or short-hand for the research-and-development compound.

Basic Research. Common usage frequently fails to distinguish between basic research and applied research, lumping them together under the single label "research." It would appear that this

²⁹U.S., Department of the Army, Personnel Performance and Training Program (PPTP), Army Regulation 70-8, 28 October 1976, p. 1.

oversimplification has caused, and promises to continue causing, problems for the educational research community.

Many "theories" of the process by which research results are moved along into educational practice include basic research as an element equivalent in weight to applied research, development, dissemination, demonstration, and diffusion. It is also true that the Army supports some "basic educational research," as do the National Institute of Education and other civilian agencies. However, a case can be made for excluding basic research from direct consideration when the focus of attention is on "how do the results of research on training and education come to be used in the actual practice of training and education?"

The issue is primarily a conceptual one and depends upon how "basic research" and "educational research" are conceived. In the behavioral sciences, basic research is frequently conceived and defined as research on the molecular (small-unit) level of behavior, in contrast to applied research, which concerns itself with behavior at the molar (large-unit) level. The National Science Foundation defines basic research as "primarily motivated by the desire to pursue knowledge for its own sake. Such work is free from the need to meet immediate objectives and is undertaken to increase understanding of natural laws." Both educational research and Army training research come closer to meeting the NSF definition of applied research, which is research "carried out with practical applications in mind," and which "differs from basic research in that it seeks to show or indicate the means by which a recognized need may be met."

Dewey must have had something like this distinction in mind when, in 1929, he said "There is no more a special independent science of education than there is of bridge making."³⁰ Storer made the distinction more explicit recently when he suggested, with regard to educational research, "The very name of the field suggests that it is applied rather than basic, in the sense that its focus of interest as a whole is concrete rather than abstract, and is of direct concern to the public as well as to the researchers themselves."³¹ He described educational research as a "conjunctive domain" rather than a basic discipline, pointing out that the latter hang together regardless of man's interests while the former are defined by their relation to some special social need or problem area.

The issue is more than semantic or definitional. It is fundamental to theorizing in this entire area. As Winch points out: "People do not first make generalizations and then embody them in concepts; it is only by virtue of their possession of concepts that they are able to make generalizations at all."³² If we include basic research studies in our definition of educational research or training research, then we are obliged to explain their role in any theorizing we may do about the research-into-practice process.

³⁰John Dewey, The Quest for Certainty: A Study of the Relation of Knowledge and Action (New York: G. P. Putnam's Sons, 1929), p. 19.

³¹Norman W. Storer, "Educational Research: A Conjunctive Domain for Scientific Inquiry," in The Educational Research Community: Its Communication and Social Structure, ed. Richard A. Dershimer (Washington: American Educational Research Association, 1970).

³²Peter Winch, The Idea of a Social Science and Its Relation to Philosophy (New York: Humanities Press, 1958), p. 44.

If, on the other hand, we treat basic research like any of the many other sources of knowledge which inform educational and training practice (e.g., experience, authority, mythology, tradition), we can view it as potentially important to, but outside of, our circumscribed research-into-practice system. (If we take a grander view and concern ourselves with the entire knowledge production and utilization system, we will, of course, have to include basic research. Given our current level of understanding, it would seem to make sense to concentrate on the smaller, and probably more manageable, problem of research-into-practice before concerning ourselves with the much more complex problem of knowledge-into-practice.)

Research-Into-Practice. Both Army training research and civilian educational research are intended to produce results that can make a desirable difference, that is, results that can be used to improve instructional practice. The presumption in both domains is that research produces new, validated knowledge that can somehow be used to make practice better. Although there has long been some interest in the process by which research results are moved along to a point where they can improve practice, this interest has been heightened in recent years--particularly with regard to educational research--by a public outcry for increased accountability by those who receive and spend public monies. Although less widely publicized, there has also been an increasing Congressional concern for the efficacy of military training research (as one aspect of the military human resources research program).

Research and analysis in this general area has tended to focus on the process by which results find their way into actual practice (or on some selected aspect of that process). Those nearest the research end of the process tend to refer to "the diffusion and adoption of innovations"; those nearest the practitioner end appear to prefer "planned educational change." However it is labeled, the topic has generated an enormous amount of literature, most of it of relatively recent origin. When Havelock prepared his 1969 bibliography on the dissemination and utilization of knowledge,³³ he reported finding fewer than 50 items dated earlier than 1955; however, nine years later, some 500 new items were appearing annually. Havelock's bibliography included 1,000 items culled from the 4,000 he reviewed, but he estimated at that time that there were probably an additional 6,000 items he had been unable to locate. Howard R. Davis of the National Institute of Mental Health, in the foreword to a distillation of this literature,³⁴ estimated the volume at more than 20,000 items by 1976. "With so many authors involved, it is not surprising to find not only different approaches and different conclusions, but also different conceptions of various terms employed."³⁵

³³Ronald G. Havelock and others, Planning for Innovation Through Dissemination and Utilization of Knowledge (Ann Arbor, Mich.: Center for Research on Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan, 1969), p. 1.19.

³⁴Howard R. Davis, "Foreword," in [Edward M. Glaser and others], Putting Knowledge to Use: A Distillation of the Literature Regarding Knowledge Transfer and Change (Los Angeles: Human Interaction Research Institute, 1976), p. vii.

³⁵[Edward M. Glaser and others], Putting Knowledge to Use: A Distillation of the Literature Regarding Knowledge Transfer and Change (Los Angeles: Human Interaction Research Institute, 1976), p. 2.

The variations in terminology to which the writer refers are stumbling blocks to our understanding of the process of planned educational change. This study uses the term research-into-practice to label the process by which research-based knowledge finds application in improving instructional practice. It is important to note that this label may or may not differ from the concept behind two increasingly popular terms in the literature, knowledge-into-practice and knowledge production and utilization (KPU). In some cases, writers will use these latter two terms to include only research-based knowledge; in other cases, they will really mean a more inclusive type of knowledge production.

Instructional practice is informed by knowledge, but not all such knowledge is based on research. Some teaching practices are based on experience, educational philosophy, and instruction received in teacher-training institutions. In this study, the concern is with the process by which research-based knowledge (and predominantly applied-research-based knowledge) finds its way into the act of instruction--the coming together of teacher (or instructional agent), subject-matter, and pupil.

There are several facets of this research-into-practice process to which we might reasonably direct our attention. Among them are: (a) the functions performed in the process; (b) the organizations responsible for performing those functions; (c) the characteristics of the personnel staffing those organizations; (d) the characteristics of the information or innovation which is to be "moved along" via the process; (e) the characteristics of the personnel who are expected to use that information or innovation;

or (f) the process itself. This study is concerned primarily with selected Army organizations and the research-into-practice functions they perform.

Knowledge Production and Utilization. The term "knowledge production and utilization" appears with increasing frequency in the educational literature of the past several years. Although it is occasionally used as an inflated substitute for "research and development," there are some who recognize it as defining a different, and broader, concept.

The emphasis in R&D, broadly defined, is on activity--namely research and development activity. The emphasis in KPU is on knowledge outcome as a socially useful commodity. The early planning, design, production, marketing or other dissemination, acquisition, and utilization of knowledge outcome can be analyzed more precisely within the KPU terminology than within the R&D terminology. . . . the terminology of educational KPU is used to denote the entire cycle of activities by which R&D creates a knowledge outcome, by which it is marketed and/or disseminated, and by which it is utilized in educational settings.³⁶

Thus, as a concept, KPU is a higher-order abstraction than R&D. It recognizes that knowledge is produced to be used and that, in most instances, this use will extend beyond contribution to theory-building to some sort of practical application. It incorporates dissemination and adoption (the D and A of the RDDA model) into the same system framework as research and development. And it shifts emphasis from the linkage between R&D systems and user

³⁶National Institute of Education, The Status of Educational Research and Development in the United States: 1975 DATABOOK, pre-publication draft release (Washington: National Institute of Education, May 1975), p. 1.

systems to the entire dynamic process by which research impacts on practice, and vice versa.

System Models. Many students of the Knowledge Production and Utilization Process use "models" to describe their understanding of that process. They formalize their views of the process by identifying key elements and relationships and presenting them as a more-or-less comprehensive whole. In doing so, they use one developing intellectual enterprise (model-building) to help understand a second, less-understood phenomenon (the KPU process). Thereby, they introduce additional complexities into an already complex situation. While many of the proposed models of the KPU process have heuristic value, these abstractions frequently contain less information than they appear to offer.

Models used by systems analysts are frequently explicit quantitative abstractions of the reality they are intended to represent. The elements and relationships have been derived from either experience or theory or both, and appear with related parameter values. This enables the systems analyst to manipulate the model (i.e., the system) to determine the effect of variations in those parameters. There is apparently no model of the KPU process which functions at this level of detail, nor have any been presented as though they did. The KPU process is most often represented by two types of models: (a) those borrowed from other fields and disciplines; and (b) those constructed from the proponent's own experience and analysis.

Into the first category would fall the Social-Interaction models (i.e., those focusing on individuals and deriving largely from the psychology of personality); the Problem-Solving models (focusing on group dynamics and human relations and deriving primarily from social psychology); and the Research-Development-Diffusion-Adoption models (focusing on the steps in the process and deriving largely from experience with agricultural innovations).

Into the second category would fall the output-oriented model proposed by Gideonse, the set of models developed by the Far West Laboratory for Educational Research and Development, and the configurational model devised by Guba and Clark.³⁷ (A third type of model--the Linkage model proposed by Havelock³⁸ was developed analytically as an intended synthesis of the Social-Interaction, Problem-Solving, and Research-Development-Diffusion-Adoption models.)

The concern with models of the KPU process in civilian education is mirrored by a similar concern in military R&D circles. The funding categories and procedures prescribed by the Department of Defense define an essentially linear RDDA model. Models which elaborate on this DoD version have been posed by Bryan and by Mackie and Christensen.³⁹ However, Bryan's colleague at the Naval Personnel

³⁷Gideonse, "Research, Development, and the Improvement of Education"; Guba and Clark, The Configurational Perspective.

³⁸Havelock, Planning for Innovation.

³⁹Glenn L. Bryan, "Psychology and the Military: An Uneasy Symbiosis," paper for presentation at National Symposium of the Military Services on Utilization of People-Related Research, Development, Test, and Evaluation, Naval Personnel Research and Development Center, San Diego, Calif., 13 June 1977; Robert R. Mackie and Paul R. Christensen, Translation and Application of Psychological

Research and Development Center, suggests using a problem-solving model while McClelland argues for a systems model.⁴⁰ There is some degree of descriptive truth in all these models, and some value to be derived from examining each of them. However, in this study, the guiding model was the one proposed by McClelland.

Research, Technical Report 716-1 (Goleta, Calif.: Human Factors Research, Inc., January 1967).

⁴⁰Franklin F. Sands, "The Pragmatic Aspects of Institutionalizing Change," paper for presentation at National Symposium of the Military Services on Utilization of People-Related Research, Development, Test, and Evaluation, Naval Personnel Research and Development Center, San Diego, Calif., 13 June 1977; McClelland, The Process of Effecting Change.

CHAPTER II

ARMY TRAINING RESEARCH IN TWO WORLD WARS:

1917-1918 AND 1941-1945

Introduction

Although the roots of Army training research reach only thirty-five years deep into the soil of American history, the seeds were first planted nearly sixty years ago, in 1917-18. This chapter provides a review of the historical setting in which the Army first turned to scientific psychology for help with its personnel problems, and describes the profession's response. It also describes the relationships between the researchers and the operators (those who were to apply the results of this research).

As will be seen, no research on training per se was undertaken during World War I, but two precursors appeared. The Army, with a practical job to be done, did not hesitate to call upon the research community for assistance. For its part, the research community abandoned its presumed aloofness from the world of everyday affairs to translate its knowledge and techniques into a practical technology the Army could use to improve its personnel operations.

When World War II began, the relationship between psychological research and Army personnel operations--which had been allowed to wither--was freshened. New mechanisms were developed for bringing the two domains together. New organizations, civilian and military,

were created to bridge the gap between research and practice. The Army entered the training research field for the first time. The major portion of this chapter will be devoted to a delineation of those new organizations and their relationships as the two communities (psychology and personnel operations) struggled to achieve a common goal.

World War I

When the United States entered World War I on April 6, 1917, the Army had personnel machinery adequate to the requirements of its then-current force of 190,000 officers and enlisted men. However, the system was clearly not adequate to the personnel management demands of an Army that would grow to nearly 20 times that size in less than two years--to 3,665,000 persons by November 1918.¹ More than 80-percent of the new soldiers entered the Army via Selective Service (i.e., the "draft") with an average monthly input of some 180,000 recruits.² Each of these men had to be received, examined, classified, recorded, assigned, and reported to Army Headquarters. It was a monumental task by any standard. The psychological profession was a small one at that time (the American Psychological Association had only 336 members in 1917),³ but its members had a contribution to make.

¹U.S., War Department, Annual Report, Secretary of War, 1918 (Washington, D.C.: Government Printing Office, 1918), p. 8.

²Ibid., pp. 11-12.

³Archives of the American Psychological Association. The American Educational Research Association, organized in 1915 as the National Association of Directors of Educational Research, had

President Lincoln had created a mechanism for mobilizing the Nation's scientific resources in support of the military when, in 1863, he established the National Academy of Sciences to bolster the Union cause during the Civil War. In 1916, the Academy created the National Research Council (NRC) as its functioning arm, and gave it responsibility for coordinating and guiding U.S. scientific support for national defense in World War I. One of several major NRC committees was its Committee on Psychology, chaired by Robert M. Yerkes of Harvard. Even before the U.S. entered the war, members of that Committee were conducting research in their university laboratories to help solve military personnel problems. Much of their work for the Army during World War I is now noted only in specialized histories, yet a list of those psychologists includes "giants" of the profession: R. S. Woodworth (who developed tests to predict courage under stress); Edward L. Thorndike (who devised tests to identify potentially successful aviators); Walter Dill Scott (who produced a scale for judging and rating candidates for officer training); and J. R. Angell, Louis M. Terman, and John B. Watson (who initiated development of classification procedures). Also included in the group were Walter S. Hunter, Louis L. Thurstone, Raymond Dodge, G. M. Whipple, Truman L. Kelly, Edwin C. Boring, Horace B. English, and Arthur S. Otis.⁴

24 members in 1916 and 36 members in 1918, but figures for 1917 were not available in the AERA Archives.

⁴Julius E. Uhlaner, The Research Psychologist in the Army--1917 to 1973 (Arlington, Va.: U.S. Army Research Institute for the Behavioral and Social Sciences, January 1974).

The best-known product of psychological research during World War I was the adaptation of some exploratory group intelligence tests into the Army Alpha group test for classifying literates, and the Army Beta test for illiterates and the non-English-speaking. It is generally acknowledged that these tests were landmarks in the mental-measurement movement--landmarks paralleling the individual intelligence tests devised by Binet in 1905.⁵

Committee on Classification of
Personnel in the Army

The success of the early psychological contributions led both the scientists and the Army to seek even closer ties than were possible through the NRC Committee on Psychology. Following a series of high-level discussions in August 1917, Secretary of War Newton D. Baker directed establishment of a Committee on Classification of Personnel in the Army (CCP), and set aside \$25,000 to cover its first six months of operation. He placed the Committee under the jurisdiction of the Adjutant General (Major General H. P. McCain), who was the Army's senior officer for personnel matters. The Committee

⁵Development of these tests is described in Walter V. D. Bingham, "Army Personnel Work," Journal of Applied Psychology 3 (Jan-Feb 1919): 1-12; and Robert M. Yerkes, ed., Psychological Examining in the United States Army, vol. 15, Memoirs of the National Academy of Sciences (Washington: National Academy of Sciences, 1921). As Boring has pointed out: "The big event of the decade was the use of intelligence tests in the First World War. . . . The Armistice of 1918 came too soon to get much use out of the results, but the advertising that this testing gave psychology in America reached into the remotest corner of the laboratory and swelled college classes, creating a great demand for Ph.D. instructors." Edwin G. Boring, A History of Experimental Psychology, 2d ed. (New York: Appleton-Century-Crofts, 1950), p. 575.

chose Thorndike as its Chairman, and Scott as its Executive Secretary. The Committee was given the following mission:

. . . (1) to secure a contented and efficient Army by placing each enlisted man where he has the opportunity to make the most of his talent and skill; (2) to commission, assign, and promote officers on merit, and (3) to simplify the procedure of discovering talent and assigning it where most needed.⁶

It was, undoubtedly, an impossible assignment, but the Committee did help move the Army in the desired direction. First, its members developed standardized qualification cards for enlisted men and officers, to be used for recording important information about each individual and to make this information readily available to personnel managers who needed it. Next, they developed a series of "trade tests" for establishing just how skilled a new recruit with civilian experience really was--apprentice, journeyman, or expert. They developed job-analysis techniques and a standardized terminology for describing both civilian and military occupations. They helped the Army establish and staff centralized personnel offices for each camp and cantonment, and persuaded the Army to establish a special school for Personnel Adjutants and military psychologists at Camp Greenleaf, Georgia. They proposed methods for improving the placement of enlisted men into military assignments. They recommended statistical techniques whereby Army headquarters could better manage its burgeoning force of specialists by projecting both needs and resources. In addition, they provided technical advice to Army staff officers on numerous other problems: how best to treat limited-ability

⁶U.S., War Department, General Orders No. 56, 5 August 1917.

soldiers; how to reduce the Army's personnel paperwork load; and how to improve the workings of the Selective Service system.⁷

It is interesting to note that, more by accident than by design, the Army's intelligence-testing program was conducted apart from its other personnel work, with the former under the auspices of the Surgeon General and the latter under the Adjutant General. In his efforts to persuade the Army of the potential value of group intelligence tests (on which he and several of his colleagues had been working), Yerkes had made his approach through the Office of the Surgeon General. He was making such progress in getting his ideas accepted through that route that he was offered a direct commission as a major, and asked to head a new Division of Psychology in the Surgeon General's Office. At that same time, he was asked to join the civilian Committee on Classification of Personnel in the Army (CCP) then being created. Obviously reluctant to "switch horses in the middle of the stream," he accepted the Army commission and took the nascent intelligence program with him into medical channels.⁸ Nevertheless, his colleagues selected him for membership in the CCP.

⁷The work of the Committee, and its various organizational alignments and relationships, are reported in extensive detail in Committee on Classification of Personnel in the Army, The Personnel System of the United States Army, Vol. 1, History of the Personnel System (Washington, D.C.: Government Printing Office, 1919). Volume II is the actual Personnel Manual developed by the Committee. Both are official War Department reports. A detailed description of the development of Army trade tests is available in J. C. Chapman and D. R. Chapman, Trade Tests (New York: Henry Holt & Company, Inc., 1921). For an overview of the entire Army psychological research program during World War I, see Yerkes, Psychological Examining in the United States Army; and Robert M. Yerkes, "The Role of Psychology in the War," in New World of Science (New York: Century Company, 1920), pp. 351-389.

⁸Yerkes, Psychological Examining in the United States Army.

There was apparently little concern by the psychologists or the Army about possible conflicts of interest. Yerkes, for example, was at the same time an officer in the Army, member of the civilian CCP, Chairman of the NRC Committee on Psychology, and member of a special, militarily-oriented committee of the American Psychological Association. There was continuous and considerable cooperation among all these separate entities. Terman spent his early CCP days working with Yerkes of the Surgeon General's Office on problems related to the intelligence-testing program. Thorndike, the CCP Chairman, also devoted considerable time to this project.⁹

Committee on Education
and Special Training

The CCP had been operational for seven months when the Army established a correlative Committee on Education and Special Training (EST). This military body, working under the Army General Staff, had a civilian advisory board, and was given the following mission:

. . . to study the needs of the various branches of the Service for skilled men and technicians; to determine how such needs shall be met, whether by selective draft, special training in educational institutions, or otherwise; to secure the cooperation of the educational institutions of this country, and to represent the War Department in its relations with such institutions; to administer such plans of special training to colleges and schools as may be adopted.¹⁰

By the end of World War I, the Army had contracts with 142 educational and technical training institutions to establish and operate training detachments for temporarily-detailed soldiers.

⁹Committee on Classification of Personnel in the Army, History of the Personnel System, pp. 57-62.

¹⁰U.S., War Department, General Orders No. 15, 10 February 1918.

However, the Committee neither conducted nor supervised this instructional program, nor did it conduct or sponsor even informal research in relation to it. The Committee was, exclusively, an administrative, coordinating body.¹¹

The War Ends

It should be understood that not all Army officials were enthusiastic about receiving advice and assistance from psychologists, nor about adopting their recommendations. There was at least some question as to the scientific base from which the psychologists worked. In a 1918 speech, Secretary of War Baker said:

When Dr. Scott presented to the War Department the question of calling in psychology in this work, we all realized that that science had a particularly unfortunate name; it sounds very high-falutin' and cloud-stepping, as it were. It is the skyscraper, so far as its name is concerned, of modern science, and there is a certain revulsion in the ordinary man's mind when you speak to him about a thing that sounds as pretentious as that. I commend to my good friend, Dr. Scott, that he try to see whether they can't change that term to the study of human action or something with popular appeal. . . . But when you come down to it, the psychology which Dr. Scott has applied in the methods of the Committee on Classification of Personnel in the Army is simply applied common sense. . . . (but) we all realize that we have in this scientific procedure an unrivaled and effective substitute for the irrational and impulsive personal judgment which up to recent times had obtained.¹²

With the war drawing to a close, the Army decided to "militarize" the CCP and to make it part of the permanent establishment. Senior members of the Committee were commissioned as field-grade

¹¹Committee on Classification of Personnel in the Army, History of the Personnel System, pp. 528-39.

¹²Newton D. Baker, untitled address to the Eighth School for Personnel Adjutants, Camp Greenleaf Ga., 12 August 1918. Newton D. Baker papers, Archives of the Center for Military History, Carlisle Barracks, Pa.

officers (major and above) in October 1918, and company-grade commissions (captain and below) were in process for its junior members when the Armistice was signed on November 11. Practically all of the newly military members of the CCP promptly resigned their commissions and joined their still-civilian juniors in a race back to the campuses. Some of the more routine CCP functions were absorbed by the rapidly-shrinking Army, but the research emphasis (modest as it may have been) disappeared completely.¹³

Although the CCP work had touched on many aspects of the Army personnel system, there was nothing directly related to the manner in which the Army conducted its training--nothing that could even remotely be considered training research. What the Committee did establish was that scientific psychology could "roll up its sleeves and get its hands dirty" when there was a job to be done--that psychology was a science that could be applied. The Army did not forget this lesson; neither did the public ignore it. Applied psychology, particularly the use of intelligence and other types of mental tests, received an enormous boost from the Army experience.¹⁴ However after the war, the relationship between the Army and the psychological profession cooled, and there is little evidence in the record that either psychologists as scientists or psychology as a scientific discipline played much of a role in Army affairs between 1918 and the 1940s.

¹³Committee on Classification of Personnel in the Army, History of the Personnel System, pp. 101-3; 110-2; 665-70.

¹⁴Boring, History of Experimental Psychology, pp. 575-6.

World War II

Shortly before daybreak on the morning of September 1, 1939, German troops crossed the border into Poland; Great Britain and France responded by declaring war on Germany; World War II began. On that same date, George C. Marshall was promoted to four-star rank as the U.S. Army's Chief of Staff (its senior officer), a position he held throughout the war. The Army, which had been allowed to deteriorate along a number of dimensions since the end of World War I, was less than a year into a major rebuilding and rearming program. Although the possibility of war in both Europe and the Far East had been foreseen for some time by military officials, neither the number of men under arms, the weaponry and equipment available to them, nor the training they received were substantially different from what had been the case a decade or two earlier.

The National Defense Act of 1920 had authorized an officer strength of 17,717 and an enlisted strength of 280,000. However, by 1922, Congress was authorizing, and providing monies for, only 12,000 officers and 125,000 enlisted men, at which level the Army was held until 1936. Funding for all War Department (i.e., Army) purposes over this same 15-year period was only about \$300 million per year. In 1935, at the forceful urging of General Douglas MacArthur, who was then Chief of Staff, Congress increased Army funding slightly, making possible a modest increase in strength the following year. However, when General Marshall entered into his new position of overall responsibility, he found himself commanding an Army with

only 13,039 officers, 775 warrant officers, 672 nurses, and 174,079 enlisted men.¹⁵

General Marshall had served in France during World War I, and had been distressed by the inadequate training that members of the American Expeditionary Force had received before being thrust into battle. He was determined not to repeat the mistakes of World War I, and pressed vigorously for an extensive, sequential, and cumulative training program--one that would begin with the individual soldier and would proceed to small units, to larger units, and finally, to the division level. Although he achieved an early partial success in this endeavor, he was forced to divert most of his time and energies from his appointment as Chief of Staff to the Japanese attack on Pearl Harbor (December 7, 1941) to enlarging the Army, and housing and equipping it. His role in the passage of the Selective Service Act of 1940, in its extension less than a year later, and in the call-up and retention in Federal service of the National Guard is recounted in one volume of the Army's series of histories of World War II.¹⁶

Army Training

Before World War II, Army training had been decentralized, highly personalized, and extremely unstandardized. This kind of training system was possible because of the relatively small number

¹⁵U.S., War Department, Annual Report, Secretary of War, 1939 (Washington, D.C.: Government Printing Office, 1939), p. 11.

¹⁶For an authoritative and well-documented account of General Marshall's role in these events, see Mark S. Watson, The War Department, Chief of Staff: Prewar Plans and Operations (Washington, D.C.: Historical Division, Department of the Army, 1950).

of new enlistees each year. Each recruit learned basic soldiering skills as well as the rudiments of his military job within the regiment in which he would serve, an Army version of apprentice on-the-job training.

With World War II already under way in Europe, and with an Army build-up beginning in the United States, it was necessary for the Army to revise its approach to training to accommodate the masses of soldiers it had to train hastily for both mobilization and casualty-replacement phases of the war. Training became centralized in Replacement Training Centers (one or more for each branch of the Army), depersonalized (because of the large number of recruits involved, and a constant turnover in training centers), and standardized (on paper, if not in fact).¹⁷

Between 1939 and 1941, the Army's ground combat forces grew from three incomplete Infantry divisions to 30 Infantry divisions and six Armored divisions, complete in numbers and improving in quality. By the time the build-up was complete, the Army had grown from 188,569 officers and men in 1939 to a peak force of 8,300,000 in 1944.¹⁸

It should be remembered that, at this point in American military history, there was no separate Air Force. The Army had soldiers

¹⁷Capt. William H. Willis, The Replacement and School Command, Study No. 33 of the Historical Section, Army Ground Forces (Washington, D.C.: Department of the Army, 1946). This study report, originally classified SECRET, was regarded unclassified in 1950. Also, War Department G-3 Memorandum (G-3/6457-433) for the Chief of Staff of the Army, subject "Mobilization and Training Plan, Revised," dated 27 December 1941.

¹⁸Army Ground Forces memorandum for the Chief of Staff, subject "Procurement of Enlisted Personnel for the Army Forces," with attached charts, dated 15 June 1945. (327.3/104(ss)(S). Regraded unclassified, June 1955.

in the Army Ground Forces (combat) and Army Service Forces (support), and airmen in the Army Air Forces.¹⁹ All were under the command of a single Chief of Staff, General Marshall. The growth of the fledgling Army Air Forces was even more explosive than that of the Ground and Service Forces. Overall, it grew from a strength of 20,196 in June 1938 to 2,372,293 in June 1944, and from 11 percent of total Army strength to some 31 percent.²⁰ Between June 1939 and June 1941, alone, the number of flying training establishments increased from 2 to 45, the number of training aircraft from 400 to 2,700, and the number of personnel in flight training from 3,300 to 37,000.²¹

Although the Army Ground Forces, the major command responsible for training ground troops, did not sponsor or fund any formal research to improve its instructional programs, it did attempt to use the best available technology. Some of these attempts (as in the

¹⁹The history of the Army's air arm is one of struggle, first for recognition as to importance and, second, for a separate identity, either inside or outside the Army. The Army Air Corps Act of 1926 established the Air Corps as a separate arm of the Army. In 1935, the Army created GHQ, Air Force, to assume control over air tactical units, but to exist alongside the Air Corps. In 1941, the Army created the Army Air Forces, headed by a Chief who commanded both GHQ, Air Force (by then called the Air Force Combat Command), and the Army Air Corps. In a major reorganization of the Army on 9 March 1942, the Army established three autonomous and co-equal commands: the Army Ground Forces, the Army Service Forces, and the Army Air Forces. All elements of the air arm were incorporated into the Army Air Forces under a single Commanding General and a single Air Staff.

²⁰Wesley Frank Craven and James Lea Cate, eds., The Army Air Forces in World War II. Vol. VI, Men and Planes (Chicago: University of Chicago Press, 1955), p. xxv. This work is one volume in the official Air Force history of World War II. The figures cited here also appear in other volumes in the series, prepared by other authors.

²¹Ibid., p. 476.

heavy use of audio-visual devices)²² were successful; others were considerably less so, at least initially.

The Armored School at Fort Knox, Ky., representing one of the Army's newest branches, developed a special indoctrination and training program for its incoming instructors. In developing this program, the Commandant turned first for assistance to several professors of industrial education, whom he hired as expert consultants. The program they designed required new instructors to meet for an hour of lectures each day for three months. But the subject-matter was too arcane for the student body: psychology, statistics, job-analysis, learning theory. Only infrequent reference was made to Army Field Manual 21-5 on "Methods of Instruction," in which the Army had reduced its understanding of instructional science into how-to-do-it form, and with which most new instructors were at least modestly acquainted. In less than a year, the Commandant fired his "experts" and brought in a Reserve officer who had been a highly successful school teacher in civilian life. He combined what he had learned from his own schooling and experience with advice from his military colleagues, and revamped the curriculum for Armored School instructors. He discarded all references to learning theory and made supervised practice teaching the backbone of his course. He required each new instructor to plan and present at least one short and one long lesson of the kind he would be presenting to his students. Each instructor would evaluate and suggest improvements in lessons prepared by his

²²M. M. Chambers, Opinions on Gains for American Education from Wartime Armed Services Training (Washington: American Council on Education, 1946).

classmates, and each would develop a test on the practice lessons he had prepared. The new program ran four hours a day for two weeks and, when that phase ended, the program included irregularly-scheduled monitoring of the new instructors in their classrooms, with counseling provided if necessary. Other schools followed this example with such success that the Armored School became the Army's proponent agency for "methods of instruction."²³

The Army Ground Forces had other education and training specialists in various locations, as did the Army Service Forces, but there was no centrally-directed program of training research in the ground army. It was the Army Air Forces that made Army training research a reality during World War II. It did so through the Army Air Forces Aviation Psychology Program, which began its 4 1/2 year research program by taking a cue from the military psychology efforts of World War I.

Psychology Mobilizes

Early in 1939, threat of an impending war led military men and Federal officials to step up the tempo of their plans and preparations to defend the Nation. It also caused America's men of science to contemplate how they might lend their special talents to the effort. In the spring of 1939, W. S. Hunter of Brown University, representing the National Research Council, approached the Army's Adjutant General to see what help psychologists might offer. He was

²³Robert I. Palmer, Bell I. Wiley, and William R. Keast, The Army Ground Forces, The Procurement and Training of Ground Combat Troops (Washington, D.C.: Historical Division, Department of the Army, 1948), pp. 304-5.

shown Army personnel plans calling for the same personnel tests and procedures that had been used since 1918, was thanked for his interest, but was assured that "the situation is well in hand."²⁴

In September, Germany attacked Poland and World War II began. President Roosevelt authorized a 17,000-man increase in the Regular Army, a 35,000-man increase in the National Guard, and ordered 1,306 Reserve officers onto active duty for six months.²⁵ Determined not to be ignored, Professor Hunter and his colleagues established an Emergency Committee in Psychology under the auspices of NRC's Division of Anthropology and Psychology. Some of its members had been active in research support of the Army in World War I, and picked up where they had left off two decades earlier. They offered recommendations to the Army on selecting and training combat leaders, on recognizing "mentally defective" personnel, on handling illiterate soldiers and, later in the war, on teaching Morse code to radio operators. They also prepared a tailored textbook on psychology for use in the Army Specialized Training Program (ASTP).²⁶

The importance of aviation in the fast-approaching war must have been on the minds of officials in the Civil Aeronautics Authority

²⁴Walter S. Hunter, "Introduction to the Conference," Proceedings of Part I of the Joint Army-Navy-OSRD Conference on Psychological Problems in Military Training, August 15 and 16, 1945 (Washington, D.C.: Office of Scientific Research and Development, 11 October 1945), p. 2. This set of proceedings appears as OSRD Report No. 6069.

²⁵U.S., President, Executive Order No. 8244, 8 September 1939.

²⁶Charles W. Bray, Psychology and Military Proficiency: A History of the Applied Psychology Panel of the National Defense Research Committee (Princeton: Princeton University Press, 1948).

(CAA) in 1939 when they launched a Civilian Pilot Training Program calling for instruction of 50,000 new pilots. Under this program, funds were set aside for research on selecting and training these pilots. The CAA turned to the NRC for help in determining how best to allocate these research funds. The NRC responded by establishing a Committee on Selection and Training of Civilian Aircraft Pilots in October 1939. Morris S. Viteles of the University of Pennsylvania was named to chair this Committee. Its membership included psychologists, physicians, physiologists, engineers, pilots, and representatives of the military Services. Later, when the United States entered the war, the word "civilian" was dropped from the Committee's title, and primary emphasis of the research shifted to military needs.²⁷

By May 1940, Norway and Denmark had fallen to Germany; Holland and Belgium had surrendered; and the proud French Army was only weeks away from a completely unanticipated defeat. The U.S. Army began "crash" planning for a large military expansion to protect the entire Western Hemisphere, including a build-up of its own strength to some 1-million men.²⁸ The Adjutant General, recognizing the potential impact of this five-fold increase in Army manpower on personnel operations, accepted the earlier NRC offer of assistance, and requested creation of a Committee on Classification of Military

²⁷Morris S. Viteles, "The Aircraft Pilot: Five Years of Research. A Summary of Outcomes," Psychological Bulletin 42 (November 1945):489-526.

²⁸Memorandum, Assistant Chief of Staff, G-4, for the Chief of Staff of the Army, subject: "Program for National Defense," 7 May 1940.

Personnel, Advisory to the Adjutant General.²⁹ Walter Van Dyke Bingham, who had played an important role in development of the Army's World War I personnel system was named Committee Chairman. During the war, Committee members provided scientific and technical assistance to the Adjutant General in developing a screening test for officer candidates, in working out other induction-station tests and procedures, and in making recommendations as to how best to measure the job proficiency of officers and enlisted men. However, the Committee's initial contribution to the war effort, and possibly its most important one, was to work with the newly-established TAGO Personnel Testing Section in developing a new classification test to be administered to all incoming Army recruits.³⁰

This Section had been organized in March-April 1940, staffed primarily with Reserve officers on temporary-duty status, and given the assignment of developing a test to replace Army Alpha. The new test was to be capable of reliably sorting new recruits on the basis of their trainability, that is, on their ability to learn soldierly duties and jobs quickly. By August 1940, the first form of the Army General Classification Test (ACCT-1a) was ready for standardization. It was not quite ready for operational use when the National Guard was called into Federal service (August 27, 1940), nor when Congress

²⁹A. Irving Hallowell, Chairman of the Division of Anthropology and Psychology, to Detlev W. Bronk, Chairman of the National Research Council, 29 June 1940.

³⁰Staff, Personnel Research Section, Classification and Replacement Branch, The Adjutant General's Office, War Department, "The Army General Classification Test," Psychological Bulletin 42 (October 1945):760-8; also, "Personnel Research in the Army: The Classification System and the Place of Testing," Psychological Bulletin 40 (March 1943):205-11.

enacted the Selective Service and Training Act (September 16, 1940), but it was in use by November 1940 when the first Selective Service inductees began arriving at Army induction stations. During the course of the war, the AGCT was administered to more than 9-million men and women.³¹

The existence of two other NRC "psychology" committees during World War II should be noted at this point. The NRC established an Office of Psychological Personnel in 1942 to provide information to the Services on the availability of psychologists for particular projects, and to help psychologists in the Services find useful assignments.³² There was also an NRC Committee on the History of Psychology and the War, which was to assemble information and documents for a report on psychology and psychologists to be published at the end of the war. The first-mentioned Office accomplished some of the tasks for which it was designed, but the latter committee was unsuccessful in carrying out its assignment.³³

The early focus of psychological attention in support of the Army was, understandably, on problems of selection and classification

³¹Ibid.; also, "The Army General Classification Test, With Special Reference to the Construction and Standardization of Forms 1a and 1b," Journal of Educational Psychology, November 1947.

³²Donald G. Marquis, "The Mobilization of Psychologists for War Service," Psychological Bulletin 41 (1944):469-73.

³³"The Plan to write a history has been abandoned, first by Dr. Yerkes, the former chairman of this committee, and later by Dr. Bray. This project was abandoned with great reluctance, but was thought to be impossible since many important documents either have been lost or destroyed." Letter from A. Irving Hallowell to Detlev W. Bronk, 30 June 1949.

of personnel.³⁴ First, it followed in the tradition of psychological support in World War I. Second, it took advantage of what psychology had learned about psychometrics and selection-testing for industry in the 1920s and 1930s. And third, the major problems facing the Army in the early months of the war were problems related to mobilization, in which selection, classification, and assignment of personnel were all-important.

The Applied Psychology Panel. To understand how psychology moved from its initial interests in selection and classification to a concern for improving Army training, one needs a brief overview of the major instrumentality created by the Federal Government to provide scientific support for the Nation's war effort--the Office of Scientific Research and Development, and its major arm, the National Defense Research Committee.

In this case, the egg came before the chicken. At the urging of Vannevar Bush, President of the Carnegie Institution of Washington, D.C., and James B. Conant, President of Harvard University, the Council of National Defense (composed of the Secretaries of War, Navy, Interior, Agriculture, Commerce, and Labor) established a National Defense Research Committee on June 27, 1940.³⁵ The Committee (NDRC)

³⁴The term "selection" generally refers to the process of determining an individual's qualifications for military service; the term "classification" refers to the process of determining his qualifications for particular types of training and/or assignments.

³⁵The Council of National Defense exercised authority vested in it by Section 2 of the Act of 29 August 1916 (39 Stat. 649), which had not been rescinded following the end of World War I, to create the Committee. The order was signed by the Departmental Secretaries who made up the Council, and was approved by President Roosevelt on 27 June 1940.

was chaired by Bush, and was expected to "correlate and support scientific research on the mechanisms and devices of warfare, except those relating to the problems of flight included in the field of activities of the National Advisory Committee for Aeronautics. It shall aid and supplement the experimental and research activities of the War and Navy Departments; and may conduct research for the creation and improvement of the instrumentalities, methods, and materials of warfare."³⁶ The Committee was not expected to conduct research itself, but to support appropriate research projects on university campuses and elsewhere through Government contracts.

By mid-1941, the number of new official and quasi-official agencies being created by the Federal Government in anticipation of the fast-approaching war had multiplied into almost unmanageable confusion. As one step toward orderliness, President Roosevelt issued Executive Order 8807 on June 28, 1941, establishing an Office of Scientific Research and Development (OSRD) in the Executive Office of the President, and defining its functions and duties. The "old" NDRC died one day and was resurrected the next as part of OSRD, with the same title and with essentially the same personnel. Bush became Director of OSRD and Conant became Chairman of NDRC. (The other

³⁶U.S., President, Order Establishing the National Defense Research Committee, 27 June 1947, in James P. Baxter, Scientists Against Time (Boston: Little, Brown & Company, 1946), p. 451. Dr. Baxter was the official historian in the Office of Scientific Research and Development. Two other volumes of official OSRD history are New Weapons for Air Warfare and Applied Physics: Metallurgy; Electronics; Optics, both published by Little, Brown & Company as part of a series on "Science in World War II."

"arm" of OSRD was its Committee on Medical Research, chaired by A. N. Richards.)³⁷

Neither OSRD nor NDRC gave special attention to psychology until 1942. There were already two Committees within the National Research Council composed of psychologists and, presumably, meeting the military's needs in this disciplinary area. However, by 1942 the Navy wanted some of the same kinds of help the Army had been getting from its advisory committee on the classification of personnel, and both the Army and Navy wanted help with training problems. In response to this expressed need, the OSRD formed yet a third committee of psychologists within NRC: the Committee on Service Personnel-- Selection and Training.³⁸ J. M. Stalnaker, Associate Secretary of the College Entrance Examination Board, was named Chairman and Charles W. Bray, on leave from Princeton University, was named Executive Secretary.

To a large extent, this Committee operated independently of the NDRC, which was predominantly concerned with research on the hardware of war. As recorded in the NDRC Minutes of June 20, 1942, the new Committee was to be "informal, quick, and direct, of as much use to the Navy and Army as possible, and would work always with the understanding that it would do only those things it was asked to do by the Navy and Army." In late 1943, the NDRC reorganized, splitting

³⁷U.S., President, Executive Order No. 8807, 28 June 1941, "Establishing the Office of Scientific Research and Development in the Executive Office of the President and Defining Its Functions and Duties."

³⁸Charles W. Bray, Summary of Activities on Project N-100, OSRD Report No. 6573 (Washington: National Academy of Sciences, 31 October 1945).

its original five subcommittees into 19 numbered subject-matter Divisions (e.g., ballistic research; new missiles; sub-surface warfare; chemistry; and radar). In this reorganization, NDRC paid tribute to the fundamental importance of mathematics and psychology to all its research. It created a special Applied Mathematics Panel to assist all its Divisions, as well as the Army and Navy, with problems in the field of mathematics. It also created an Applied Psychology Panel to provide the same broad range of services in that disciplinary area. The Committee on Service Personnel was disestablished, and its personnel and projects were transferred, en masse, to the Applied Psychology Panel. W. S. Hunter became Panel Chairman; Bray became a Technical Aide, as did John L. Kennedy. Later, Bray became Panel Chairman, and Dael Wolfle became Technical Aide, in his stead.³⁹

The Applied Psychology Panel (and its predecessor Committee) conducted and sponsored 21 major and a host of minor projects during the war. Most of these projects were conducted by small teams of researchers "in the field" with the military--working on problems where they existed, and with the people most intimately concerned. Altogether, the Panel utilized the services of about 200 civilian psychologists for war research.⁴⁰ Early emphasis was on problems of selection and classification, primarily in the Navy. As the war continued and the Services approached their peak strength levels, the Panel's scientists were able to shift their attention to training

³⁹Bray, Psychology and Military Proficiency, pp. 24-25.

⁴⁰Ibid., p. 124.

problems and to problems of equipment design (human factors engineering). Toward the end of the war, there developed a general understanding of the interrelationship of these three areas of psychological research: selection and classification of personnel for particular jobs; training personnel to perform those jobs; and design of equipment and environments with which, and in which, the jobs were to be performed.⁴¹

Not only were the problems of aptitude, training, and equipment seen to be interrelated, but the same research method was found to be useful in each of the three problems. In all three cases, objective measures of human performance were necessary as criteria to use in evaluating alternative procedures. Such criteria were needed to measure the knowledge and skill of men who were selected by alternative aptitude tests, of men who were trained on different synthetic devices, or men who were following opposed doctrines of use of equipment, or of men who were serving as human guinea pigs in the comparison of alternative designs of equipment.⁴²

Psychological research during World War II, whether conducted by civilians or by military personnel, was primarily applied research (and development). There was relatively little concern for advancing psychology as a science; the goal was to use such psychological principles as existed to improve the performance of men in uniform. In other words, the idea was not primarily to seek new basic principles of human behavior, but to apply those which psychology had already discovered or fashioned; research was generally restricted to evaluating the efficacy of particular principles in particular situations.

⁴¹National Defense Research Committee, Summary Technical Report of the Applied Psychology Panel, NDRC. Volume 2. Human Factors in Military Efficiency: Training and Equipment (Washington: National Defense Research Committee, 1946), p. vii.

⁴²Ibid., p. 124.

After the war, Wolfle (who later became Executive Officer of the American Psychological Association) pointed out that "A striking fact about the successful application of psychological principles to the training of military specialists in World War II was that very substantial help was given by systematically applying only a very few principles of learning."⁴³ He enumerated these principles as: "1. Improve the distribution of practice; 2. Secure active participation of the trainee; 3. Vary the practice material; 4. Develop accurate performance records; 5. Give the men an immediate knowledge of the results of their practice; 6. Write clear detailed plans for the instructor."⁴⁴

Psychological Research in the Army

In 1945, the NRC Office of Psychological Personnel reported that there were 4,533 psychologists in the United States, of whom 1,006 were in military service. The Office provided the following breakdown: Army Enlisted, 159; Army Commissioned, 278; Army Air Force Enlisted, 119; Army Air Force Commissioned, 119. (The remaining 311 Service psychologists were in the Navy, Marine Corps, Coast Guard, and Maritime Service.)⁴⁵ A number of Army psychologists were clinicians, working in mental health settings and providing a service

⁴³Ibid., p. 124.

⁴⁴Ibid., p. 124.

⁴⁵Marquis, "Mobilization of Psychologists for War Service." To be eligible for inclusion in this count, the psychologist had to be a member of either the American Psychological Association or the American Association of Applied Psychology, or if neither, to hold a Ph.D. degree in psychology or some cognate field and be working in the field of psychology.

rather than conducting research. Mention has already been made of the Personnel Research Section in the Adjutant General's Office, but since this was one of the Army's two major personnel research activities, an expanded description will be provided here. It should be remembered that many activities that the Army labels as "personnel research" would be categorized as "educational research" in civilian circles.

Personnel Research Section, TAGO. The Adjutant General established a Personnel Research Section in his office in the summer of 1940. He called to temporary active duty three psychologists who held Reserve commissions, and obtained five civilian personnel technicians through Civil Service. By 1944, the Section had grown to a staff of 21 officers and 45 civilian professional members, with 51 clerical assistants and about 50 expert consultants who served part-time.⁴⁶

The Section's mission was to conduct research in support of the Adjutant General's personnel management responsibilities for selection, classification, assignment, utilization, and evaluation of military and civilian personnel in and with the Army. The Section was responsible for developing, constructing, validating, and standardizing all personnel screening tests and interview techniques for the Army. The only exception was development of techniques for selecting flight crews for the Army Air Forces.⁴⁷

⁴⁶Walter V. D. Bingham, "Personnel Classification Testing in the Army," Science 100 (20 September 1944):276.

⁴⁷U.S., War Department Circular 312, "Army Psychological Tests," November 1943.

Until 1943, the Section concentrated primarily on problems of initial selection and classification of recruits, and selection of personnel for specialist training. In 1943, the Army inaugurated the Army Specialized Training Program (ASTP), in which some 150,000 soldiers were sent to college for a compressed "college education" in such badly-needed specialties as engineering, medicine, foreign languages, and personnel psychology. The Personnel Research Section was directed to develop selection tests for choosing soldiers to enter this program, and achievement tests in the various college subjects offered. In 1943-44, the Section developed more than 140 subject-matter achievement tests which were administered more than 1-million times in an 18-month period. This was one of the largest national objective-testing programs at the college level in the Nation's history.⁴⁸ Lt. Col. Marion W. Richardson was Chief of the Personnel Research Section and Walter Van Dyke Bingham was the Chief Psychologist.

Throughout World War II, the Personnel Research Section devoted itself exclusively to personnel research. It did not venture into any aspect of training research until two years after the war ended (an activity that will be covered in the next chapter.)

The AAF Aviation Psychology Program. Research on Army training (as distinguished from research on other aspects of military personnel management) began mid-way through the war in the Army Air

⁴⁸Staff, Personnel Research Section, Classification and Replacement Branch, The Adjutant General's Office, War Department, "Personnel Research Section, The Adjutant General's Office: Development and Current Status," Psychological Bulletin 42 (October 1945): 445-52.

Forces Aviation Psychology Program. This program is a landmark in the history of applied psychology, and its accomplishments bear testimony to the scientific and organizational acumen of its initiator and director, John C. Flanagan; to the talents and ingenuity of the 200 officers, 1,290 enlisted personnel, and 500 civilians who served in it; and to the wise leadership of the Army Air Forces, which sponsored and supported it, and utilized the fruits of its endeavors.

On July 15, 1941, Flanagan, who was then Associate Director of the Cooperative Test Service, was commissioned a major in the U.S. Army. He was called to immediate active duty to establish a psychological research agency in the U.S. Army Air Corps (later to become the U.S. Army Air Forces). He reported for duty in Washington, D.C., the very next day to set up plans for developing and validating a battery of printed and apparatus tests for use in selecting pilots. Within a month, he had sketched the outlines of a program and had obtained commitments of cooperation from the Air Corps Training Division. He established a Psychological Research Unit at Maxwell Field, Ala., to develop tests of personality, temperament, and interest. This unit was headed by Maj. Laurance F. Shaffer (commissioned directly from his position as professor of psychology at the Carnegie Institute of Technology). He established a second Psychological Research Unit at Kelly Field, Texas, to develop tests of coordination and visual-motor skills. This unit was headed by Maj. Robert T. Rock (commissioned directly from his post as Head of the Psychology Department at Fordham University). And he established a third Psychological Research Unit at Santa Ana, Calif.,

to develop tests of intelligence, judgment, and proficiency. This unit was headed by Maj. J. P. Guilford (commissioned directly from his position as professor of psychology at the University of Southern California).⁴⁹

Also part of the program was the Research Section of the Department of Psychology, School of Aviation Medicine, Randolph Field, Texas, which was responsible for research on the design, construction, and procurement of psychological apparatus. This Section was headed by Maj. Arthur W. Melton, who had been Chairman of the Department of Psychology at the University of Missouri. Another element was the Psychological Section in the Office of the Surgeon, Army Air Forces Training Command, Fort Worth, Texas, was concerned with tests of alertness, observation, and perceptual speed. It was headed by Maj. Frank A. Geldard, who had been professor of psychology at the University of Virginia. From his post as Chief of the Psychological Branch, Office of the Air Surgeon, Army Air Force headquarters, Major Flanagan not only directed, supervised, and coordinated this entire program, he also led a research group that developed an Aviation Cadet Qualifying Examination.⁵⁰

The program included operational as well as research aspects, seven Psychological Examining Units at Army Air Force basic training centers which conducted classification testing (administering and scoring tests, and maintaining records). Flanagan also established

⁴⁹John C. Flanagan, ed., The Aviation Psychology Program in the Army Air Forces, Army Air Forces Aviation Psychology Program Research Reports, Report No. 1 (Washington, D.C.: Government Printing Office, 1948).

⁵⁰Ibid.

a Psychological Test Film Unit to conduct motion picture testing and research. He placed detachments of psychologists at four AAF gunnery schools, supervised creation of six psychological branches to study problems of reclassification and redistribution of personnel returning from combat overseas. He also coordinated the work of the Psychological Branch of the Continental Air Forces headquarters, and of the four branches in four numbered continental Air Forces.

When established, the Aviation Psychology Program was primarily sold as a two-stage screening and classification function. Each of the units was a Psychological Classification Unit first and a procedure improvement unit, on the basis of research in a particular area, second. As classification procedures were improved, personnel were able to assist with training and other personnel problems. By that time, they had established their credentials as a "can do," "no theoretical nonsense" group.⁵¹

When the Aviation Psychology Program began, the focus was entirely upon the selection of pilots. However, it quickly broadened to include selection of bombardiers, navigators, gunners, flight engineers, and radar operators--in sum, entire air crews. A basic activity for each research group was the attempt to develop adequate criteria of proficiency against which to check the selection tests that were being developed. This was a critical step, too, in training research since, to compare alternative instructional methods and programs, researchers needed good, objective measures of the performance of course graduates. Program researchers recognized the many shortcomings of school grades as criteria, but were unable to obtain satisfactory measures of combat performance for their

⁵¹Personal communication from Dr. John C. Flanagan, 17 August 1976.

purposes. An enormous amount of effort and ingenuity was invested in the search for "intermediate" criteria.⁵²

The Commanding General of the Army Air Forces, General Henry "Hap" Arnold, may have appreciated the difficulties his researchers were encountering in this regard, but he had no doubts as to the value of the research program. In his 1945 report to the Secretary of War, he said, in part:

The battery of psychological tests used for classifying all candidates for pilot, navigator, bombardier, and aerial gunnery training have proved valid in predicting not only an aviation cadet's chance for winning his wings, but also the flier's chance for combat success. In a follow-up study of both bomber and fighter pilots in the European Theater, it was determined that pilots who had scored highest in the psychological tests administered before they learned to fly tended to be rated by the squadron commanders as most successful in combat. Likewise, those who had the minimum acceptable scores appeared to be most frequently "missing in action." . . . The Aviation Psychology Program has paid off in time, lives, and money saved, and through its selection of the raw material has aided in the establishment of an effective combat air force. This has been done at a total cost of less than \$5.00 per candidate tested.⁵³

By 1943, with selection and classification work making good progress, the Program expanded its research into the complex field of training. Lt. Col. Flanagan (he had been promoted by then) established five Psychological Research Projects to conduct training research. The Project on Bombardier Training at Midland Army Air Field, Texas, was headed by Maj. Edward H. Kemp (Professor of Psychology, University of Rochester). The Project on Navigator Training

⁵²The term "criterion" refers to that performance measure which is used as a standard in evaluating other measures--in assessing effective test items and tests, in evaluating classification procedures, and in evaluating training programs and procedures.

⁵³U.S., War Department, Second Report of the Commanding General of the Army Air Forces to the Secretary of War, 27 February 1945.

at Selman Field, La., was headed by Maj. Launor Carter (Professor of Psychology, University of Rochester). The Project on Pilot Training at Randolph Field, Texas, was headed by Maj. Neal E. Miller (Professor of Psychology, Yale University). The Project on Radar Observer Training at Langley Field, Va., was headed by Capt. Stuart W. Cook (Research Director, Commission on Community Interrelations, American Jewish Congress). The Project on Flight Engineer Training at Hondo Army Air Field, Texas, was headed by Maj. Neil D. Warren (Professor of Psychology, University of Southern California).

The general pattern of research on training procedures in the Air Force followed the traditional pattern of civilian research on teaching; i.e., a comparison of alternative instructional procedures with the performance of graduates from alternative programs being compared on a standard criterion test. There was one additional requirement for Army Air Force training research. It not only had to produce results that were experimentally clear, but results that were practically meaningful. A statistically significant difference was not sufficient unless it was accompanied by a practically significant difference.

Problems of conducting training experiments in the Army Air Force were of two major types--scientific (which the researchers overcame with the benefit of their training as psychologists), and practical (which they overcame, when they did, by dint of ingenuity and perseverance). It took considerable tact for researchers to interrupt an ongoing training program which was producing airmen to fight a war across two oceans, to create conditions for an "ideal" training experiment. However:

As the war moved toward its successful conclusion, with a consequent lessening of pressure on training personnel, as aviation psychologists became better established in training research, and as training research projects were backed up by stronger directives from higher headquarters, it became possible to do more and more in the way of setting up special conditions for research projects.⁵⁴

In testimony before a Senate subcommittee in 1965, Arthur H. Brayfield, then Executive Officer of the American Psychological Association, recalled the degree of cooperation the researchers received from the Army Air Forces in "testing the tests."

A sample of more than 1,000 men was selected by representative Army Air Force Examining Boards throughout the country without reference to their test scores (the test battery included tests of coordination and speed of decision, intellectual aptitudes and abilities, perception and visualization, and temperament and motivation, which were combined into a single score). All men who met the physical standards of the medical examination were accepted and sent into pilot training. Their test records were sent to Headquarters and were not made available to the training schools.⁵⁵

Brayfield went on to describe the results of the 1943-45 experiment and its demonstration of the efficacy of the tests then in use. The point to be noted here was the willingness of the Air Force to allow into its pilot-training program men it did not expect to succeed, simply to enable the psychologists to "test their tests."

The third area into which the Aviation Psychology Program ventured was that of engineering psychology or human factors engineering. This aspect of the program was carried out by psychologists in the

⁵⁴Robert L. Thorndike, Research Problems and Techniques, Army Air Forces Aviation Psychology Program Research Reports, Report No. 3 (Washington, D.C.: Government Printing Office, 1947), p. 143.

⁵⁵Arthur H. Brayfield, testimony before the Senate Subcommittee on Constitutional Rights of the Committee on the Judiciary, United States Senate, 8 June 1965.

Engineering Division, Aero Medical Laboratory, Wright Field, Ohio, under the leadership of Paul M. Fitts, Chief of the Psychology Branch there. Researchers working in this area were concerned with collecting data on the psychophysiological capabilities and limitations of human beings as components in various Army Air Force man-machine systems. The purpose was to develop equipment which took these capabilities and limitations into account.

By the end of the war, the AAF Aviation Psychology Program was a completely integrated one, including research on selection and classification, training, manpower utilization, and human factors aspects of equipment and environmental design. The research that was accomplished was reported at war's end in 19 volumes of research reports.⁵⁶ Over the 4 1/2 years of its existence, the AAF Aviation Psychology Program was the largest assemblage of psychologists ever to work on a common problem--improving the personnel and training systems of the Army Air Forces. It is an obvious injustice to single out only a few names of program participants. However, the following sample should give the reader a "feel" for the caliber of personnel involved in the program. Among them were: Judson Brown, Urie Bronfenbrenner, Launor F. Carter, Meredith P. Crawford, John T. Dailey, Philip H. DuBois, Stanford C. Erickson, I. E. Farber, Glen Finch, Nathaniel L. Gage, Robert M. Gagne, Robert Glaser, Frank A. Geldard, Edwin E. Ghiselli, Walter F. Grether, John K. Hemphill, Roger W. Heyns, Nicholas R. Hobbs, Paul Horst, Lloyd G. Humphries, Edward H. Kemp, Joseph T. Klapper, William A. McClelland, Arthur W. Melton,

⁵⁶The nineteen volumes of reports of the Aviation Psychology Program are listed in appendix E.

Neal E. Miller, Gabriel D. Ofeish, Henry W. Riecken, Roger W. Russell, Benjamin Shimberg, Lawrence M. Stolurow, Robert L. Thorndike, J. E. Uhlaner, Theodore R. Vallance, and S. Raines Wallace.⁵⁷

In summarizing the program, Dr. Flanagan recently wrote:

. . . our psychologists worked on recognized problems with field units. When they demonstrated that they had an effective solution, this was communicated to me and Headquarters, USAAF, in Washington, and a new regulation or directive was prepared, coordinated with other offices in the headquarters, and communicated down the chain of command as new standing operating procedure.

This general procedure explains my answer to a recent question concerning what phase of my career had given me the most satisfaction. After reflecting a few minutes, I indicated that it was my work heading up the Aviation Psychology Program in the U.S. Army Air Forces. The reason this was so satisfying was that I was able to recruit a large team including some of the best psychologists in the country. We identified problems in selection, training, and other aspects of personnel management. A group of psychologists researched the problem and verified a proposed solution. This was communicated to me at headquarters, and we immediately prepared a regulation or directive that resulted in the comprehensive application of the proposed solution.

Unfortunately, in other phases of my career, identifying and verifying a solution frequently led to either no application at all or partial and inept efforts to use the results.⁵⁸

Summary

The Army first utilized scientific psychology to improve its personnel management practices during World War I, but undertook no training research during that war. However, in World War II, it launched a training research program that took two approaches: one in which civilian scientists worked on training problems under

⁵⁷Philip H. DuBois, The Classification Program, Army Air Forces Aviation Psychology Program Research Reports, Report No. 3 (Washington, D.C.: Government Printing Office, 1947).

⁵⁸Personal communication from Dr. John C. Flanagan, 17 August 1976.

individual, project-type contracts; and the other in which the Army established its own in-Service psychological research program for both personnel research and training research in its air arm.

In both cases, research was seen, predominantly, as producing solutions to immediately important practical problems rather than as producing a knowledge base upon which to build a psychotechnology of training or personnel management. The knowledge production and utilization (KPU) system was a short, tightly-knit one. The user subsystem asked for help with particular problems, and the research subsystem generated prototype solutions from a mixture of off-the-shelf science, quick research to fill gaps, and technological development to fit the Army Air Force training system. Promising developments were packaged into regulations, directives, and other official instructions which mandated their use by operational Army elements.

Because, in the case of the AAF Aviation Psychology Program, the field laboratories had operational as well as research missions, there was a confounding of subsystem roles, and the functional differentiations required for a neat modeling of the KPU system did not exist. However, several aspects of the situation during World War II should be noted.

(1) The starting point for most research studies was a recognized problem in an operating element of a client system.

(2) The research requirement was validated by the client system's headquarters. (The Applied Psychology Panel worked only on problems offered to it by the Services' headquarters representatives. Research projects undertaken by the Personnel Research Section were approved by the Adjutant General. Projects undertaken in the

AAF Aviation Psychology Program were approved in the Office of the Chief of the Air Corps.)

(3) Research and development activities were performed by organizations which, and by personnel who, were intimately familiar with the client system. (In the case of the Applied Psychology Panel, researchers worked in the field with operating Service elements. In the case of the AAF Aviation Psychology Program, researchers were part of the client system.)

(4) In most cases, despite being engaged in an ongoing war, the client system provided the resources--including research subjects--to make the research possible and, when the research effort produced useful results, saw to it that these results were actually used.

Thus, the four "necessary and sufficient conditions" for successful applied research in an ongoing operation, cited in Chapter I, were available to the Army during World War II.

CHAPTER III

THE IMMEDIATE POST-WAR YEARS

Introduction

The period between the end of World War II and the beginning of the Korean Conflict, 1945-50, was one of readjustment and reorganization for the American military. The Air Force became a separate Service alongside the Army and Navy, but all three were subordinated to the newly-created Department of Defense. In addition to losing its air arm, and its status as an Executive Department, the Army also went through a major reorganization which substantially realigned its headquarters responsibilities.¹ Human resources research programs--including programs of training research--flourished in the Air Force and Navy, but barely survived in the Army.²

¹The Army began reorganizing its headquarters in 1946, restoring powers to its General Staff which was realigned into five major groupings. Impetus was added to the reorganization by establishment of the National Military Establishment in 1947 and the Department of Defense in 1949. The changes were officially recognized by Congress in the Army Reorganization Act of 1950, Statutes at Large 64, sec. 263 (28 June 1950).

²The Air Force Personnel and Training Research Center (AFPTRC) was created to continue and to expand upon the work begun in the Army Air Forces Aviation Psychology Program. The Navy increased its support of training research in both its Special Devices Center and in its newly-created Office of Naval Research. However, with the disestablishment of the AAF Aviation Psychology Program, the Army was left without any organization for which training research was a primary, or even very important, mission.

To appreciate the situation of Army training research during this period requires an understanding of the overall situation of Army research and development at that time, and an understanding of what a small portion of the whole Army human resources research represented. This chapter offers a basis for such understanding by providing a description of the civilian and military organizations concerned with Army human resources research during 1945-50, the context in which they operated, and their relationship to one another.

It must be recognized that this was also a period of readjustment and reorganization for the American scientific establishment. The war-induced alliance between science and the military was reverting to a more traditional arms-length relationship. The Services wanted to continue enjoying the benefits of science without relinquishing direction of scientific endeavors; the scientists wanted to be free of wartime constraints imposed upon them by the military without surrendering the abundant support available to them during World War II. New mechanisms had to be developed which could satisfy the basic requirements of both communities.

After the War

When World War II ended, there was immediate and vociferous clamoring to "bring the boys home." With pressure from the home-front, and from soldiers themselves, the Army launched a drastic, around-the-clock demobilization operation. Within a nine-month period (August 1945 through June 1946), the Army shrank in size from

8,020,000 members to only 1,889,690--a decrease in strength of more than 76 percent.³

However, it was the manner of demobilization, more than the fact of it, that debilitated one of the greatest military forces of all time. Following most previous wars, the Army had demobilized on a unit-by-unit basis. This time, on the recommendation of a group of social scientists in the Office of the Army's Chief of Information,⁴ demobilization was on an individual-soldier basis which, for all its fairness and responsiveness to soldier desires, played havoc with the Army's preparedness. The system the Army followed assigned priority for discharge on the basis of points awarded for combat (measured by length of time in a combat zone, and by the number of Purple Hearts received for battle wounds), number of months of overseas service, number of children, and length of time in the Army. As a result, the most experienced soldiers were the first to return to the United States from their units in Europe and the Far

³U.S., War Department, Statistical and Accounting Branch, Office of the Adjutant General, "Weekly Estimate of Army Command Strength as of 30 June 1946," 8 July 1946.

⁴The "point system" for separating soldiers from active duty was recommended to high Army officials by the social psychologists and sociologists in the Research Branch of the Army's Information and Education Division. These scientists, who conducted a four-year program of studies in social psychology during the war, had surveyed a sample of more than 20,000 soldiers in the U.S. and in six overseas areas. The preferences expressed by the soldiers themselves became the basis for the assignment of priority for discharge from service. The entire program of studies conducted by this group of scientists is described in a four-volume work: Samuel A. Stouffer and others, Studies in Social Psychology in World War II (Princeton, N.J.: Princeton University Press, 1949-50). Volume I is titled The American Soldier: Adjustment During Army Life. Volume II is The American Soldier: Combat and its Aftermath. Volume III is Experiments in Mass Communication. Volume IV is Measurement and Prediction.

East. In many instances, the soldiers left behind were inadequately trained to operate and maintain their unit's equipment, and these units were, in any event, so severely understrength that their combat readiness was, at best, questionable.

Selective Service continued to induct large numbers of men to enable the Army to staff units required for a two-front occupation, but the need for these men was so pressing that their initial training in the United States was minimal.⁵ If any consideration was given to conducting research to improve either basic or specialist training in the immediate post-war period, it is not apparent on the record. In fact, the Army and other Services had reason to believe that their training programs were not only adequate, but exceptional. When the war ended, many civilian educators, recognizing both the magnitude and effectiveness of military training and educational programs, were examining those programs to see what the Services had done that could be adapted for peacetime use in schools and colleges. The most extensive such review was conducted by the American Council on Education, which established a special Commission on Implications of Armed Services Educational Programs. Between 1946 and 1948, the Commission issued nine major reports ranging in size from the 78-page Opinions on Gains for American Education from Wartime Armed Services Training⁶ to the

⁵The speed with which the postwar Army took men through basic training is illustrated by Mobilization Training Program 21-6 (13 January 1946), which required only six weeks of Basic Training and no advanced individual training before a new recruit could be assigned to duty overseas.

⁶M. M. Chambers, Opinions on Gains for American Education from Wartime Armed Services Training (Washington: American Council on Education, 1946).

257-page The Armed Services and Adult Education.⁷ Among the topics addressed were: utilizing human resources; language and area studies; curriculum implications; adult education; production and use of audio-visual aids; and training programs for women.

Civilian Research Organizations

NAS-NRC

As World War II drew to an end, officials in both the Army and Navy realized that many of the civilian organizations which had provided them with support would soon be disestablished, including the Office of Scientific Research and Development, upon which they had come to depend for scientific and technological leadership. In an effort to make this wartime expedient a permanent postwar feature, the Secretaries of War and Navy called on the National Academy of Sciences (NAS) to establish a permanent Research Board for National Security (RBNS), to be modeled after OSRD and to provide the military with many of the same scientific services.⁸ The Academy responded, in early 1945, by creating such a Board with Karl T. Compton, President of the Massachusetts Institute of Technology, as Chairman, and with 20 prominent civilian scientists as members. The Army and Navy each named 10 high-ranking officers to serve on the Board.⁹

⁷C. O. Houle and others, The Armed Services and Adult Education (Washington: American Council on Education, 1947).

⁸Frank B. Jewett, President of the National Academy of Sciences, to Henry L. Stimson, Secretary of War, and James V. Forrestal, Secretary of the Navy, 9 November 1944. Archives, National Academy of Sciences, Washington, D.C.

⁹Karl T. Compton, "Research Board for National Security," Science 101 (2 March 1945) 226-228; also, Karl T. Compton,

Although it was obviously intended that the Research Board for National Security would continue to provide the Services with the kinds of scientific support they had received from the Office of Scientific Research and Development, this support never materialized. The RBNS encountered difficulties almost as soon as it was created and, although it received a number of research requests from the Army and Navy in March 1945,¹⁰ there is nothing in the record to indicate that these requests actually resulted in research projects.

There was an immediate concern as to whether the RBNS should be a permanent program operated for the Services by the National Academy of Sciences or only a temporary one pending establishment of a separate, independent Federal research agency.¹¹ However, the principal issue which impeded development of the Board was whether the Services should, in peacetime, entrust direction of their research and development programs to a "private corporation" such as the National Academy of Sciences.¹² This issue was resolved in June 1945 when President Truman instructed the Secretaries of War and Navy that

"Establishment of the Research Board for National Security," American Scientist 33 (April 1945):115.

¹⁰Minutes of the Meeting of the Research Board for National Security, 10 March 1945. Archives, National Academy of Sciences, Washington, D.C.

¹¹U.S., Congress, House, Hearings Before the Select Committee on Post-War Military Policy, "Statement by Frank B. Jewett, President of the National Academy of Sciences, January 29, 1945" (Washington: Government Printing Office, 1945), pp. 8-10.

¹²U.S., Congress, House, Research and Development. Hearings Before the Committee on Military Affairs on H.R. 2946. 79th Cong., 1st sess., May 1945. Testimony from Admiral A. H. Keuren, Director of the Naval Research Laboratory (Washington: Government Printing Office, 1945), pp. 74-76.

"every function of control of program developments with respect to military research must at all times be lodged solely within the framework of the government."¹³ A compromise in which the RBNS functioned only as an advisory body to the Services, suggested by Vannevar Bush,¹⁴ survived for only a few months before the Board was finally disestablished on March 25, 1946.¹⁵ It is interesting to note that the Research Board for National Security actually predeceased the Office of Scientific Research and Development, which it was conceived to replace. Although OSRD began its termination phase when Germany surrendered and, effectively, went out of operation after V-J Day (September 2, 1945), it was not officially disestablished until 31 December 1945. In the meantime, many of the Nation's leading scientists, including most of those involved in OSRD and RBNS, were devoting their non-scientific time and energies to the five-year

¹³President Harry S. Truman to Secretary of War Henry L. Stimson and Secretary of the Navy James V. Forrestal, 8 June 1945. Archives of the National Academy of Sciences, Washington, D.C.

¹⁴Dr. Vannevar Bush to President Harry S. Truman, 12 June 1945. Archives of the National Academy of Sciences, Washington, D.C.

¹⁵Dr. Frank B. Jewett to Dr. Karl T. Compton, 25 March 1946. Archives, National Academy of Sciences, Washington, D.C. The entire history of the creation, life, and death of the Research Board for National Security is recorded in considerable detail in Rexmond C. Cochrane, The National Academy of Sciences: The First Hundred Years (Washington: National Academy of Sciences, in press, and scheduled for publication in July 1977). An even more detailed, though possibly less authentic, history of the Board is Daniel J. Kevles, "Scientists, the Military, and the Control of Postwar Defense Research: The Case of the Research Board for National Security, 1944-1946," Technology and Culture 16 (January 1975):28-29.

struggle which finally brought the National Science Foundation into existence in 1950.¹⁶

The Psychological Profession

The psychologists who had conducted research on personnel selection and classification, on training, and on human engineering for the military during the war established a new mechanism for continuing contact with one another at war's end. When the American Association for Applied Psychology merged into the American Psychological Association (APA) in 1946, in a reorganization that featured special-interest divisions, a Division of Military Psychology (Division 19) was created. This group had two principal purposes: "a. To encourage professional relationships among psychologists interested in the application of psychological knowledge and techniques to military problems; b. To provide for the continued availability to the Armed Services of technical advances in psychology following the war period."¹⁷ In 1948, the Division had about 150 members, representing approximately 3-percent of the total APA membership.¹⁸ These scientists and practitioners gathered at annual APA conventions,

¹⁶For a review of this struggle, see Milton Lomask, A Minor Miracle: An Informal History of the National Science Foundation (Washington: National Science Foundation, 1976), NSF Publication 76-18.

¹⁷By-Laws, Division of Military Psychology, American Psychological Association, 1 September 1947.

¹⁸Meredith P. Crawford, "Military Psychology and General Psychology," American Psychologist 25 (April 1970):328-336. Dr. Crawford, a former President of the Division of Military Psychology, also reported that by 1968, the Division's membership had grown to 350, but that this number then represented only 1.5 percent of APA's membership.

and between times, for panels, symposia, and paper-presenting sessions at which information was exchanged both formally and informally in the fraternal atmosphere of an "invisible college." The Division membership included both military and civilian psychologists. Some of the latter were Civil Service employees in military research laboratories; others were members of college and university faculties or on the staffs of private and Government-supported R&D organizations conducting projects for the military under grants and/or contracts.

Early Division 19 programs tended to emphasize reports on personnel research (i.e., on aptitude and achievement testing), the best-established area of human resources research, and human engineering, the newest one. Training research was represented primarily by reports of work with training devices. Not until the mid-1950s did the primary focus shift to discussion of the design, development, delivery, management, and evaluation of military instructions.¹⁹

Another APA contribution in the area of military psychology began in 1948 when, at the request of the Army, the Association's Board of Directors appointed an Army Advisory Committee on Psychological Problems. Members of the Committee were: Jerome Bruner, Mitchell Dreese, John W. Gardner, Carl I. Hovland, William E. Kappauf, Rensis Likert, Neal E. Miller, Marion W. Richardson, Carroll L. Shartle, and Dael Wolfle.²⁰ The activities of this Committee consisted primarily of on-call consultation on Army psychological

¹⁹Personal communication from Meredith P. Crawford, June 1975.

²⁰Report of the APA Executive Secretary, American Psychologist 3 (November 1948):486.

problems, and this responsibility was eventually transferred to the newly-formed APA Division of Military Psychology.

Military Research Organizations

The Joint Research and Development Board

By 1946, the Secretaries of War and Navy had apparently decided that the kind of scientific guidance they had received during the war from the Office of Scientific Research and Development, and had hoped to receive after the war from the Research Board for National Security, could now best be obtained by an internal-to-the-military organization. On June 6, 1946, they entered into an agreement to establish a Joint Research and Development Board with the following objective:

The Joint Research and Development Board shall coordinate all research and development activities of joint interest to the War and Navy Departments so that the War and Navy Departments will establish and carry out a strong, unified, integrated, and complete research and development program in the field of national defense. The Board shall not, however, attempt to control the administration of research and development activities of joint interest to the War and Navy Departments, but shall leave such administration to the agencies within the War and Navy Departments now or hereafter charged with such responsibilities by law or intra-departmental directive.²¹

They also directed that all joint boards, committees, and similar organizations already existing or to be formed to coordinate research and development activities of interest to both Services would be reconstituted as committees of the new Board. One of these was the Committee on Human Resources, established on February 1, 1947,

²¹U.S., Department of Defense, "Charter, Joint Research and Development Board," 6 June 1946, p. 1. This original document was superseded on 5 May 1952 by DoD Directive 5128-7, "Charter of the Research and Development Board."

to "merge into a joint effort programs related to the supply and utilization of scientific, technical, and specialized professional personnel, and to conduct research and development relating to broad problems of human resources."²²

To accomplish this purpose, the Committee was directed to "coordinate programs for achieving more efficient and effective education, selection, employment, training, assignment, utilization, administration, and environment . . ."²³ Donald G. Marquis, then of the University of Michigan, was named Chairman of the Committee, whose other three civilian members were William Menninger of the Menninger Foundation, Carroll L. Shartle of Ohio State University, and Samuel A. Stouffer of Harvard University. Three field-grade military assistants and a small staff of civilian aides were available on a full-time basis to support the Committee.

The Committee was concerned with four principal areas: psychophysiology; personnel and training; manpower; and human relations and morale. It created four panels corresponding to these general areas: a Panel on Human Engineering and Psychophysiology, chaired by Lyle H. Lanier; a Panel on Personnel and Training, chaired by Robert L. Thorndike; a Panel on Manpower, chaired by Philip Hauser; and a Panel on Human Relations and Morale, chaired by Charles Dollard.²⁴

²²U.S., Department of Defense, Joint Research and Development Board, "Committee on Human Resources," Directive HR 1/1, 1 February 1947, p.]. This directive was signed by L. V. Berkner, Executive Secretary of the Board.

²³Ibid., p. 3.

²⁴Lyle H. Lanier, "Psychological and Social Sciences in the National Military Establishment," American Psychologist 4 (May 1949) 127-147.

The Panel on Personnel and Training had nine major technical areas under its cognizance: basic psychological traits; assessment of characteristics of individuals with respect to their potential utilization; job analysis; development of criteria of performance; training and education; personal adjustment and rehabilitation; work simplification and modification of working conditions; administrative procedures in personnel and training; and research-supporting functions and facilities.

Each Panel, too, was further broken down into sub-panels and sub-committees. Thus, there was an unbroken chain that ran down from the Joint Research and Development Board, through its Committees, to their Panels, and to the sub-panels and sub-committees. Perhaps the major product of this nested group of bodies was an annual integrated plan for research and development, including a portion devoted to R&D on "human resources" for military purposes. But the Committee on Human Resources had little authority to enforce its recommendations or to allocate or reallocate responsibility between the Army and Navy. On any issue where challenged (or ignored), it could only go to the Joint Research and Development Board, which had greater authority but not always enough to achieve the desired action. The Board was, after all, a creature of two equally powerful bodies--the Department of War and the Department of the Navy.

Unification of the Services. During World War II, the Army and Navy had established an ad hoc Joint Chiefs of Staff mechanism for achieving unity of command. When the war ended, the Army Air Force resumed its pre-war efforts to become the Nation's third major

military arm, and the war-induced cooperation between Army and Navy disappeared rapidly as each jockeyed for exclusive roles and missions.

Congress attempted to solve these and several related problems when it passed the National Security Act of 1947. That Act gave the U.S. Air Force separate status, but it placed all three Services under a new National Military Establishment (NME) headed by a single Secretary of Defense. The three major elements within the NME (aside from the three Services) were all pre-existing, but each was given new status under the Act: the Joint Chiefs of Staff, the Munitions Board, and the Joint Research and Development Board.

The National Military Establishment was not initially the superordinate power over the Services that might have been expected. In 1947-49, the Services maintained considerable autonomy. The Navy so resisted unification that one Chief of Naval Operations was forced out of office in an argument over roles for the Navy's air arm vis-a-vis the new U.S. Air Force. The cooperation and coordination implied by the term "establishment" did not exist in the early war days.

Because unification had been achieved by political compromise rather than by fiat, its success was limited rather than absolute. The shortcomings were so obvious that the Act had to be amended extensively in 1949²⁵ to increase the powers of the Secretary of

²⁵The 1949 Amendments to the National Security Act of 1947 (5 U.S.C. 101) stressed that the Secretary of Defense was to be the President's principal advisor on all matters relating to the entire military establishment, and that the Secretaries of Army, Navy, and Air Force were subordinate to him. It also created positions for a Deputy Secretary of Defense and for three Assistant Secretaries, and doubled the number of officers on the Joint Staff.

Defense, to create the additional post of Chairman of the Joint Chiefs of Staff, and to downgrade the three Services from their status as Executive Departments, making them clearly subordinate to the Department of Defense (which is the title Congress gave the NME in the 1949 amendments). With this additional authority, beginning in 1949, the Department of Defense, and its Research and Development Board, were able to have a greater impact on the R&D plans and programs of all the Services, including those in the area of human resources.

Army Human Resources Research

The period immediately following the end of World War II was one of reorganization for all the Services. As an institution, the military had enjoyed first call on the Nation's manpower, resources, and energies for five long years. Now came a period "in the back seat." Budgets were cut. Attention was diverted to other pressing national problems. With fewer dollars with which to work, the military became more conscious of effectiveness--in both hardware and manpower. It was, however, also a period in which, in some quarters, the importance of the uniformed man was downplayed. After all, didn't the United States now have the atomic bomb, and the planes to deliver it against any possible enemy, anywhere in the world? If it came, wouldn't the next war be a push-button affair, over in minutes or, at most, in a few days?

The World War II experience had generated a new respect on the part of the Army for the potential fruits to be harvested from the tree of science. However, if one judged by the investment each Service made in research and development, it would appear that the

Army developed this respect more slowly, or less forcefully, than its sister Services. One possible reason was that wartime R&D had been more productive in the area of hardware than in manpower, and both the Air Force and Navy were machine-ascendant forces, in contrast to the Army, which was man-ascendant. Until the Korean Conflict began, the separate R&D budgets for both Air Force and Navy were a substantially greater percentage of their overall budgets than was the Army's. As late as Fiscal Year 1950, the Army's R&D budget was only 2.6 percent of its total budget, while the Navy's was 5.1 percent and the Air Force's was 4.8 percent. At that, only 1.04 percent of the Army R&D budget for Fiscal Year 1950 was available for human resources research.²⁶

In the five years following the war's end, the Department of War became the Department of the Army and reorganized its headquarters twice. The Assistant Chief of Staff/G-4 (who had been assigned General Staff responsibility for research and development) became the Director of Logistics and was given a Deputy Director for Research and Development. As had been the case during the war, the Army's R&D emphasis was on hardware--on the tools of war. The Deputy Director of Logistics (R&D) did supervise a portion of the Army's human resources research, but only a portion. In the reorganization and immediately afterward, the Army had issued conflicting regulations. One assigned responsibility for all Army research and development to the Director of Logistics. But a second regulation assigned

²⁶U.S., Department of the Army, "Human Resources Research Program Within the Department of the Army (A Staff Study)," 22 June 1950. This study, originally classified SECRET, was declassified on 4 April 1963.

responsibility for personnel research (including training research), manpower investigations, and limited aspects of research on personnel management to the Director of Personnel and Administration. When the Army expanded its interest in the human resources research area, it established a Human Resources Research Section in its Research and Development Division, Office of the Director of Logistics. The civilian psychologists employed to head that section (T. G. Andrews, 1948-49; Paul D. Gard, 1949-50; Harry Harlow, 1950-52) were distressed by this division of responsibility and fired off a series of "staff studies"²⁷ recommending that responsibility for personnel research be returned to their aegis: "Human Resources Research Program Within the Department of the Army," June 22, 1950; "An Army Program in Human Resources Research," November 28, 1950; "Responsibility for General Staff Supervision of Human Resources Research," January 12, 1951; "A Program to Improve the Effectiveness of the Infantry Soldier," February 28, 1951; and "Study of the Utilization of Negro Manpower," March 5, 1951. In the next chapter, Army actions taken in partial response to this flood of staff studies will be examined.

Personnel Research and Procedures Branch, TAGO. The human resources research being conducted under the control of the Director of Personnel and Administration was taking place in the Personnel Research and Procedures Branch in the Office of The Adjutant General. There, a group of psychologists who had been working on problems of classification and assignment since before World War II began

²⁷A staff study is a standardized military form of problem-solving commonly used by staff officers to help their commanders make decisions.

(involving, for the most part, tests of aptitude and achievement) were continuing their programs in two sections: a Manpower Analysis Section and a Personnel Research Section. The former was primarily concerned with occupational analysis and classification. During the immediate post-war years, it consolidated several hundred different Army jobs into only 50-plus career fields; however, little research was actually performed to validate this accomplishment.

The Personnel Research Section continued to develop and refine selection and classification tests, and extended its efforts into more basic areas relating to the identification, definition, and assessment of individual psychological characteristics. The Section ventured into "training research" between 1947 and 1952 on the evaluation end of the process--by measuring the results of training. Section members developed paper-and-pencil and performance tests to assess recruit achievement in basic training and also conducted several "psycho-educational" surveys of several Army Service Schools to evaluate the effectiveness of training there. But training research was always secondary to the traditional work of the Section--predictive psychological tests to select men for military service, and to classify them for particular schooling and assignments.

The Operations Research Office. The end of World War II presented the Services with a dilemma. The Office of Scientific Research and Development was about to disappear and a National Science Foundation with a major program of military R&D was still on a distant horizon. The Services moved to create their own in-house and contractual capabilities to replace those they would be losing. The Army

Air Forces contracted with Douglas Aircraft Company to establish the RAND organization to perform its policy research. The Navy continued its wartime Operations Analysis Group to do post-war operations research, and created an Office of Naval Research to enable it to continue supporting scientific research in the Nation's university laboratories. The Army contracted with The Johns Hopkins University to establish an Operations Research Office (ORO) in September 1948 for "the definition and exploration of military problems of the future."²⁸

. . . the implications for warfare of known and foreseeable science and technology were great and revolutionary. . . . First-rate scientific talent was necessary. Yet it seemed likely that few scientists who had been willing to serve in government positions during the war would continue to do so in peace. . . . They wanted to escape from the real or apparent constraints on their freedom and conditions of work posed by conditions of government service. They wanted to be as free as possible to determine the subjects of their research. They wanted to pursue it in their own way. They wanted full freedom of communication and publication. . . . to many, the conditions posed by government, including relatively low pay, frictions and rigidities of government personnel policies, constraints as to choice of research topics, and evaluation of the quality and results of research by administrators, not scientists, made continued service to government look less attractive. Some new kind of organization was called for . . .²⁹

The Operations Research Office was the Army's answer to this problem. The Office was run by The Johns Hopkins University which, since 1942, had operated an Applied Physics Laboratory for the Navy. University officials were already familiar with conducting important

²⁸Charles A. H. Thomson, The Research Analysis Corporation: A History of a Federal Contract Research Center (McLean, Va.: Research Analysis Corporation, June 1975). From June until September 1948, this organization was known as the General Research Office, and from September 1948 until mid-1961, it was the Operations Research Office. In 1961, it was separated from The Johns Hopkins University and established as a private, nonprofit entity, the Research Analysis Corporation.

²⁹Ibid., pp. 5-6.

research for the military in a university setting, and the field of operations research was an important one to both the military and academia. Although the field was not a clearly delineated one, it was understood that ORO would be a problem-solving operation, and that the problems it would tackle were those facing the Army in some indeterminate future. These included, but did not emphasize, the problem of Army training. (As the next chapter shows, ORO surrendered its responsibility for research on Army training to another, newer, university-affiliated research organization in 1951.) ORO focused on such subjects as force structure analysis and planning, logistics, military manpower, resource analysis and cost studies, military systems, and military gaming and simulations. ORO concern with Army training was at a gross level subsumed under its concern for manpower planning studies. It was never concerned with the more molecular issues of improving particular training programs or choosing among alternative instructional techniques.

Navy Special Devices Center. Although the Army developed and used large numbers of training devices³⁰ during World War II, it did not begin conducting research in this area until after the war. To put this effort into perspective, and to round out the story of Army training research in the immediate post-war years, it is

³⁰In Army terminology, a "training device" is a three-dimensional aid, such as a model, miniature, or cutaway. The term is used to describe both extremely simple and extremely complex items. A training device is one type of "training aid," which the Army defines as any item developed or procured with the primary intent that it should help in training/learning.

necessary for the reader to know something about the Navy's Special Devices Center (SDC).³¹

This Center had begun in 1941 as the Special Devices Desk in the Engineering Division of the Navy's Bureau of Aeronautics. Its purpose was to develop training aids and devices to help improve naval aviation training. How well it accomplished this assignment is indicated, in part, by its successive upgrading from Desk to Section (in 1941), to Division (in 1943), to Center (in 1946); and the promotion of its director from Commander to Captain to Rear Admiral, over this same period. With each upgrading the Center's mission expanded so that, by war's end, it was not only developing devices related to Navy flight training, but also to training in navigation, communication, aircraft recognition, gunnery, radio, radar, seamanship, electronics, battle tactics, and the maintenance of armament and equipment. Willis reports that, between 1941 and 1946, the Center conducted nearly 1,500 separate projects, of which some 40-percent produced practical results. He also reported that the Center was responsible for the manufacture and distribution of more than 2,800,000 training devices during the war.³² In 1946, the Center moved from Washington, D.C., to Port Washington, L.I., New York, where it came

³¹The Navy's Special Devices Center, originally located at Port Washington, L.I., N.Y., is now the Naval Training Equipment Center, Orlando, Fla. The Army's special relationship with this Center is described in a later chapter.

³²Wesley W. Willis, "The Utilization of Armed Forces Training Research in Army Training Activities," (Ed.D. dissertation, Duke University, 1953), p. 23.

under the control of the newly-created Office of Naval Research.³³

During World War II, the Center's emphasis had been on the development of training devices, with little attention paid to establishing their instructional value empirically. "Face validity" was sufficient; if it appeared reasonable that a device would be helpful, it was produced. In the latter stages of the war, when it became apparent that psychological aspects of training device development and utilization were at least as important as engineering aspects, the Center began using psychologists to advise device development teams. The psychologists attempted to insure that the devices, as instructional instruments, included such features as objective scoring, adjustable task difficulty, and psychological validity and reliability.³⁴ After the war ended, and pressure for production of new devices eased, the Center's program expanded to include studies of rapid mass learning media and techniques (i.e., motion-picture films, radio, and television), and research to help solve particular Navy training problems.

When, in 1948-49, the Research and Development Board put pressure on the Army to invest some of its R&D resources in training device research, the Army's response was to "join the Navy." On March 20, 1950, the two Services entered into the "Joint Army and Navy Agreements for Army Participation in the Navy Special Devices

³³For a description of research activities at the Special Devices Center in the immediate post-war years, see Leonard C. Mead, "Psychology at the Special Devices Center, Office of Naval Research," American Psychologist 4 (April 1949):97-103.

³⁴Ibid., p. 97.

Center." Under these agreements, the Army provided, for the first year's participation (Fiscal Year 1952), the following sums: \$600,000 for research and development on training devices; \$1,400,000 for procurement of training aids and devices; and \$149,000 for the salaries of 28 civilians who were to devote themselves to meeting Army training device requirements. It was also agreed that the Army would station 16 officers at the Center, and that the senior among them would serve as Associate Director (Army).³⁵ These individuals formed an Army Participation Group, Navy Special Devices Center under the operational (management) control of the Chief of Army Field Forces, who was responsible for all training of individuals and units within the continental United States. Although both the Center and Army Field Forces have been reorganized several times since that 1950 agreement, the relationship and participation has continued down to the present.

The Buel Report. One of the major landmarks in military human resources research is reflected in the Report of Working Group on Human Behavior Under Conditions of Military Service, a joint project of the Research and Development Board and Personnel Policy Board in the Office of the Secretary of Defense.³⁶ Although Air Force Colonel Jack Buel was neither the Chairman of the Working Group, nor senior author of its report, the product of this group effort has come to be identified as "The Buel Report."

³⁵See appendix H for a copy of the text of the complete agreement.

³⁶Sidney Adams and others, Report of Working Group on Human Behavior Under Conditions of Military Service (Washington, D.C.: Department of Defense, June 1951).

This project began in November 1949 when the Secretary of Defense asked his R&D and Personnel Policy Boards to examine the problem of human behavior in the military, and to translate what was already known on the subject into recommendations for relatively immediate use by the Services. The time allotted for the task was one year. It was a mammoth undertaking and some 150 individuals contributed significantly to the effort. One of its accomplishments was development of a "Career-Wise Master Plan" in the form of a matrix. Thirteen areas of human resources study form the ordinate; eleven stages in the Serviceman's career form the abscissa.³⁷ Those who contributed information filled in the "cells" by describing what was known about, for example, proficiency measurement relating to the individual undergoing indoctrination/basic training. Some 129 of the 143 cells in the matrix had been filled by the time the report was printed and delivered to the Secretary of Defense in 1950. It is impossible, in retrospect, to identify how many of the Group's recommendations for action were adopted. It is an even greater impossibility to be certain that, for any related action taken, the Group's recommendation was the sole or major reason it was taken. However, the widespread circulation the report received within the Pentagon, and the numerous references to the report in human resources planning documents of the early 1950s, contribute to the impression that the document had a potent effect on both personnel policies and human resources research in the years following its appearance.

³⁷The matrix comprised of areas of human resources study and stages in the Serviceman's career is described in appendix I.

Other Research Reports. The traditional medium for publication of reports on scientific research was, before World War II, the scholarly journals of the separate disciplines. During the war, security considerations precluded this normal, open dissemination of military research results, and the technical report became the primary vehicle of scientific publication in the United States. As long as the war lasted, reports of research and development for the military, including reports on training research, were circulated to limited audiences composed primarily of military decision-makers and scientists working for the military.

After the war, two major clearinghouses were created to make these technical reports generally available: the Armed Services Technical Information Agency (ASTIA), and the Office of Technical Services (OTS) of the U.S. Department of Commerce.³⁸ ASTIA was begun with a base of 400,000 technical documents captured from the German and Japanese. To these were added a majority of the scientific reports generated by and for the military during World War II.³⁹ ASTIA

³⁸Like many other Government agencies over the years, these two clearinghouses, which both exist today, have gone through several reorganizations. ASTIA became the Defense Documentation Center (DDC) in March 1963, when responsibility for its management was transferred from the Department of the Air Force to the Department of Defense. OTS became, first, the Clearinghouse for Federal Scientific and Technical Information (CFSTI), and then, the National Technical Information Service (NTIS). Control of NTIS has remained with the U.S. Department of Commerce. DDC accessions, almost exclusively, reports of research, development, test, and evaluation (RDT&E) generated through Department of Defense funding. NTIS accessions reports from most Federal Government agencies.

³⁹The World War II system of security classification had four levels ranging, in order of increasing sensitivity, from RESTRICTED to CONFIDENTIAL to SECRET to TOP SECRET. The RESTRICTED category was discontinued in 1953 by Executive Order. ASTIA (and now DDC) accessions unclassified reports and classified reports up through the SECRET level.

received, stored, announced, and retrieved reports for the military and its contractors. It made copies of its unclassified reports available to OTS, in effect releasing them to the general public since OTS, unlike ASTIA, did not restrict its services to any particular clientele. Anyone could subscribe to the OTS semi-monthly announcement bulletin and could obtain copies of reports among its holdings. In this manner, the corpus of wartime research-generated information passed into the open literature, including the results of training research conducted by and for the military. Although both ASTIA and OTS have been reorganized, both are still operating, still collecting and making available the growing body of reports on Government-funded research, development, test, and evaluation.

Summary

When the Army lost its air arm after World War II, it also lost its only organized training research program. There had been no wartime program for ground troops as there had been for airmen, and none was established in this post-war period. These were years of diminished size and resources for the Army. Training problems were not a major concern for the Army's leaders.

These were also years in which the Army and other Services were building their own R&D capabilities. While human resources research, including training research, was recognized as a problem area at the Department of Defense level, and by the Air Force and Navy, it did not enjoy especially high priority in the Army's research plans and activities.

Because so little training research was actually accomplished by the Army between 1945 and 1950, this period is best considered a hiatus in the evolutionary development of the Army's training research program. From the historical point of view, it was a period of relative inactivity. It is only when one looks at a broad enough sweep of history that any development looks continuous; there are almost always periods of discontinuity if one looks at small enough segments of time.

CHAPTER IV

ARMY TRAINING RESEARCH IN A FEDERAL CONTRACT RESEARCH CENTER, 1951-1973

Introduction

Although military training research had its beginnings during World War II in the Army Air Forces Aviation Psychology Program, this work focused exclusively on airmen rather than on ground troops. Because the Air Forces separated from the rest of the Army at war's end, this World War II research is best conceived as part of Air Force, rather than Army, history. Organized research on the training of ground soldiers did not really begin until 1950-51. At that time, a number of influences combined to pressure the Army leadership into establishing a comprehensive, integrated program of human resources research, including research on training objectives, training methods, training content, training devices, and the evaluation of training programs.

Between 1951 and 1973, the Army moved, through the services of a unique contract training-research agency, from a position of deficiency to one of leadership in the field, not only among the Services but in the industrial training and vocational education communities as well. This chapter describes the steps the Army took to enter the training research field and the organization it created to conduct that research. It also describes the relationships that

were forged between the research organization and those Army elements concerned with training and education in building a productive research-into-practice system.

The Situation in 1951

On June 25, 1950, the North Korean Army crossed the 38th parallel in an attack on South Korea. Two days later, the United States committed air power and ground troops to help stem the aggression, but things went badly for the under-strength, ill-equipped, and poorly trained U.S. Army units. For three months, our Army was forced to retreat down the Korean peninsula. Following a dramatic, flanking invasion at Inchon, the U.S. Army took the offensive in September and was pursuing the North Korean Army inside its own territory when Chinese troops entered the war in December. As 1951 began, the U.S. Army was once again retreating down the peninsula and sustaining heavy casualties.

On the home front, many questions were raised as to why our Army was so poorly prepared to fight this new war so soon after having been the largest and most successful military force in American history. It was recognized that the Army had eased its training program after World War II ended. One reason was the difficulty of recruiting a volunteer Army, given the general distaste among American youth for the rigors of traditional Army life. Also, the Army had adopted many recommendations of the Doolittle Board, which the War Department had appointed in 1946 to examine complaints of lack of democracy in the Army, and to make suggestions for improving the

morale of enlisted soldiers.¹ Many of the Board's recommendations were directed toward improving leadership and esprit de corps; others were aimed at reducing the disparity between officers and enlisted personnel. Some, however resulted in the Army's substituting comfortable classroom lectures for less comfortable, hands-on, learning-by-doing instruction.² When the inadequacies of the "New Army" approach to training were revealed by events in Korea, there was pressure on the Army leadership to return to the more rigorous methods of training used during World War II.

The DoD Research and Development Board was pressuring the Army to improve its human resources research program, especially in the areas of training; motivation, morale, and leadership; and psychological warfare, pointing to gaps in the Army's research program and urging immediate remedial action.³ As the Board pointed out in its 1950 guidance to the Services: "The Department of the Army has done very little to implement the program guidance provided by the Research and Development Board and its Committee on Human Resources."⁴

¹U.S., War Department, Board on Officer-Enlisted Man Relationships, Officer-Enlisted Man Relationships (Washington: Government Printing Office, 1946). This report was also issued under the title of The Complete Doolittle Report: The Report of the Secretary of War's Board on Officer-Enlisted Man Relationships as Senate Document 196, 79th Congress, 2d Session.

²For an illustration of the reaction of some career officers to the Doolittle Board recommendations, see John Alger, "The Objective Was a Volunteer Army," Naval Institute Proceedings 96 (February 1970):62-68.

³U.S., Department of the Army, Office of the Assistant Chief of Staff, G-4, "Human Resources Research Program Within the Department of the Army," Staff Study, 22 June 1950, p. A-5.

⁴Ibid., p. 2.

A third source of pressure came from within the Army staff itself. The Human Resources Research Section in the Office of the Assistant Chief of Staff, G-4, had initiated a series of staff studies detailing the need to improve the Army's human resources research program, calling for its centralization under a single General Staff office, and identifying problem areas particularly in need of such research (see Chapter III). How far up Army channels any of these studies travelled cannot now be determined. In any event, their primary importance was in setting the stage for one staff study which did produce demonstrable results, and which did get the Army solidly into the training research field.

Training Research, 1950-51

When the Army entered into its 1950 agreement to participate in the program of the Navy's Special Devices Center (SDC), the focus of attention was on three-dimensional training devices, which was SDC's special area of expertise. However, as SDC broadened its work program to include such new areas as research on the mass media of instruction (e.g., radio and television), and the solution of training problems which did not involve training devices, the Army did likewise. SDC was accomplishing a substantial proportion of its research through contracts with universities and other research agencies, including its research on training methods. The Army did the same, although its investment in this type of contract research was significantly smaller than the Navy's.⁵

⁵U.S., Department of the Army, Letter, Office, Chief of Army Field Forces, to the Assistant Chief of Staff, G-1, Department of the Army, 16 February 1954 (ATTNG-83/41-4 415).

Even before the Army's formal affiliation with the Navy in SDC, the two Services were collaborating to support an Instructional Film Research Program at Pennsylvania State College. In this respect, the "ground Army" was not significantly behind the Army Air Forces (AAF) in use of, and research on, that most ubiquitous tool of audiovisual instruction, the motion picture film. The AAF program is described in James J. Gibson, editor, Motion Picture Testing and Research (Washington, D.C.: U.S. Government Printing Office, 1947). Other Army-supported research on training films is described in Charles F. Hoban, Jr., Movies That Teach (New York: Dryden Press, 1946); and Carl I. Hovland and others, Experiments on Mass Communication (Princeton, N.J.: Princeton University Press, 1949).

One major product of that research, of as great an import to civilian education as to the military, was a technical report on Instructional Film Research, 1918-1950, by Charles F. Hoban, Jr. and Edward B. van Ormer.⁶ It summarized the important experimental studies "which report the observed effects of motion pictures on human behavior," and attempted--through analysis, interpretation, and synthesis--to answer the question, "What do we know with reasonable certainty about the influence of motion pictures on the behavior of people?"

In addition, The Army Participation Group at SDC was sponsoring research on procedures for evaluating training devices and for using television in Army training, and was surveying the Army's

⁶Charles F. Hoban, Jr., and Edward B. van Ormer, Instructional Film Research, 1918-1950 (Port Washington, L.I., N.Y.: Navy Special Devices Center, December 1950), Technical Report No. SDC-269-7-19. This report identified five major influences of motion picture instruction and offered ten principles of developing films intended to influence human behavior.

aviation training program and its programs in marksmanship and tank gunnery.⁷

The AGO Personnel Research Section continued into the 1950s the work in which it had been engaged for the preceding decade. Its personnel devised a system for differentially classifying recruits into militarily significant aptitude areas by combining selected tests from an overall test battery.⁸ The Section also served as executive agent for all three Services in developing an Armed Forces Qualification Test (AFQT) which all three would use for the next quarter-century to determine the mental fitness for duty of potential enlistees and draftees. The AFQT was first used in 1950; for the Army, it replaced the Army General Classification Test (AGCT), which had been used since 1940.⁹

Although it never constituted a significant proportion of the Section's activities, PRS scientists did conduct some research on

⁷Leonard C. Mead, "Psychology at the Special Devices Center, Office of Naval Research," American Psychologist 4 (April 1949) 97-103.

⁸An "aptitude area" is a combination of test scores which is intended to provide the best possible prediction of an individual's success in specific occupational areas. The PRS aptitude-area system involved seven occupational clusters: General Maintenance; Combat; Radio Operator; Motor Maintenance; Clerical; General Technical; and Electronics. Other accomplishments of the Personnel Research Section each year were recorded in an annual publication, Report of Accomplishments, issued by the AGO Personnel Research and Procedures Division.

⁹Saul Lavisky, "A Summary Review of the Armed Forces Qualification Test," Staff Paper, Human Resources Research Organization, Alexandria, Va., May 1973. See also, Personnel Research Section Technical Research Report 976, Development of Armed Forces Qualification Test and Predecessor Army Screening Tests, 1946-1950 (Washington: Department of the Army, November 1952).

Army training. For the most part, this work took the form of psycho-educational surveys of a few Army schools to ascertain the value of instruction given there.¹⁰ The Section also developed several pencil-and-paper tests to assess trainee achievement in basic combat training.¹¹

The Operations Research Office, as part of its overall interest in broad Army problems, performed some analyses of human factors problems in military operations, but conducted no research to improve Army training. In fact, its director, Ellis Johnson, advised the Army that his organization did not wish to engage in developmental research--that is, in the development of specific new techniques, skills, or equipment.¹²

The Army's technical services, particularly the Surgeon General's Office and the Quartermaster Corps, were engaged in human resources research, but not in training research. Their focus was,

¹⁰Scientists from the Personnel Research Section surveyed the education program at the Command and General Staff College (Research Memorandum 51-46, February 1947), the Quartermaster School at Camp Lee, Va. (RM 51-47, May 1947), the Adjutant General's School at Camp Lee, Va. (RM 51-48, May 1948), and the Military Police School at Camp Gordon, Ga. (RM 51-49, 1950). Although these reports are not part of the open literature, copies are available for inspection by qualified researchers at the U.S. Army Research Institute for the Behavioral Sciences, Rosslyn, Va.

¹¹U.S., Department of the Army, Basic Military Subjects Test, Part I: Paper-Pencil (Washington: Department of the Army, August 1951) Personnel Research Section Research Memorandum 51-14.

¹²Dr. Johnson's position on this matter was presented to the Army Chief of Staff by Dr. Harry F. Harlow of the Office of the Assistant Chief of Staff, G-4, in a briefing on June 21, 1951. A copy of that briefing is available in the HumRRO archives. In his position as Chief of the Army's Human Resources Research Section, Dr. Harlow performed liaison duties between Headquarters, Department of the Army, and the Operations Research Office.

respectively, on psychophysiological research to determine the limits and variability of human performance under different conditions and circumstances), and on human factors engineering.

In sum, then, the Army reached mid-century with only modest attention to, and modest resources invested in, research to improve its training programs.

Establishing a Training Research Agency

On April 11, 1951, the Chief of the Research Division at Army headquarters sent a memorandum to the Chief of his Human Resources Research Section acknowledging major shortcomings in the Army's program for research in that area and requesting, within ten days, a set of recommendations for correcting the situation. Whether the ten-day deadline was met or not is unclear, but on May 26, a staff study entitled "An Integrated Program in Human Resources Research" appeared and began collecting concurrences and endorsements as it progressed through channels to the highest echelons of Army decision-makers.

This study outlined a series of actions "to provide the Army with a coordinated and comprehensive program of human resources research . . . to develop methods of increasing the motivation and morale, skill, and combat effectiveness of our troops and to develop methods of adversely affecting these psychological factors in the enemy."¹³ The study included the following specific recommendations:

¹³U.S., Department of the Army, Office of the Assistant Chief of Staff, G-4, "An Integrated Program in Human Resources Research," Staff Study, 26 May 1951. Although the authors of the study are not identified in the document, it is probable that it was co-authored by Dr. Harry Harlow, Chief of the Human Resources Research Section, and Major Jay Mowbray, his senior military assistant.

9. That a major contract be awarded to a recognized educational institution to provide for the information of a Human Resources Research Office, which would have primary responsibility for conducting research in the areas of training methods, motivation and morale, and psychological warfare techniques.

10. That the Human Resources Research Office carry out its responsibility by:

- a. Conducting research at an established central office.
- b. Granting and monitoring contracts to appropriate educational, business, and industrial organizations.
- c. Providing the civilian staff for in-service research units and furnishing technical supervision of research conducted at military installations.

11. That appropriate research units be established at selected military installations to give primary research emphasis to the following areas:

- a. Training methods
- b. Motivation and morale
- c. Psychological warfare.¹⁴

The paperwork moved rapidly through the Pentagon, reaching both the Chief of Staff and the Under Secretary of the Army on June 7. These two individuals gave their approvals on June 21, authorizing the Assistant Chief of Staff, G-4, to begin negotiating the contract he had recommended. On July 30, the Army entered into an administrative-type contract with The George Washington University in Washington, D.C., for establishment of a Human Resources Research Office. For the next 22 years, this new organization (best-known by its acronym, HumRRO) was to serve as the Army's principal research and development agency in the field of training methods, training content, and training evaluation.

¹⁴Ibid., p. 3.

The speed with which necessary Army approvals were obtained and agreement reached with The George Washington University gives evidence of skillful groundwork by the plan's proponents. The original contract covered the period from July 30, 1951, through January 30, 1953, and allocated \$500,000 for the first year of "research and scientific studies for the Department of the Army requiring the services of qualified scientific and administrative personnel and the subcontracting of various phases of such research and scientific studies."

HumRRO Personnel

Three days after the contract was signed, Meredith P. Crawford, who had headed one of the wartime laboratories of the AAF Aviation Psychology Program and who was then Dean of the College of Arts and Sciences at Vanderbilt University, arrived in Washington to become Director of HumRRO. His first six months were spent primarily in developing plans, recruiting a staff, and working out procedures with the Army for conducting a mutually-acceptable training research program; however, a few research projects were begun almost immediately. The selectivity Dr. Crawford exercised in staffing the new organization is reflected in the fact that, during this initial six-month period, he interviewed some 275 professional personnel for possible positions in HumRRO, but employed only 15 of them.¹⁵

¹⁵[Meredith P. Crawford], "Semi-Annual Report of the Human Resources Research Office: Covering Period 2 August 1951 - 31 January 1952 (Washington: Human Resources Research Office, 1952).

In general, the HumRRO staff was recruited from university ranks: senior researchers came from faculty posts and junior researchers fresh from graduate schools. The predominant discipline recruited was psychology, with subspecialties in experimental, measurement, social, and educational fields. HumRRO also recruited sociologists, anthropologists, and statisticians, but these individuals were clearly in the minority. By 1953, HumRRO had 198 staff members; the next year it had 224. Thereafter, over the ensuing 20 years, the staff averaged 255 members, of whom approximately 50-percent were categorized as professional or technical, and 50-percent as clerical or administrative (i.e., supporting staff).

Unique Features

Although the concept of a contract research and development agency working intimately with and for a single Federal Government sponsor was no longer new in 1951, there were some aspects of the HumRRO organization and its relationships with the Army that were relatively unique.

In the first place, HumRRO carried out its research under three plans. (1) Staff members from the central office on the University campus traveled, in task-force teams, to Army installations in the U.S. and abroad, where they conducted research and collected data to be processed when they returned to home base. (2) Permanent-type field laboratories (called Human Research Units) were established on selected Army posts under the control of the Army's major training command but with HumRRO scientists making up the professional staff for conducting training research in situ. (3) Through

subcontracts issued by HumRRO, special research projects were accomplished by other R&D organizations and institutions.

This organizational alignment created a unique three-way management structure for the HumRRO research program. By terms of the contract, the Director of HumRRO was responsible for the program's scientific and technical aspects. Overall Government responsibility was vested with Headquarters, Department of the Army, which had awarded the contract and which, by regulation, was responsible for monitoring the entire Army human resources research program. However, HumRRO's field laboratories were under the command of the Chief of Army Field Forces, who assigned a field-grade military officer to command each Human Research Unit. In fact, each unit had two "top men," the military Chief appointed by OCAFF and the Director of Research appointed by HumRRO. It is no small tribute to the officers and scientists who occupied these posts over the years that, through the exercise of good judgment and a spirit of common purpose, this gross deviation from accepted management practice worked satisfactorily, as it apparently did.

The integration of military and civilian personnel in the Human Research Units (HRUs) did not exist solely at the managerial level. Almost from the time each field laboratory was established, the Army augmented the HumRRO research staff with officer and enlisted research assistants, primarily personnel with scientific and technical backgrounds at either the bachelor's or master's degree levels. Over the years, this augmentation averaged 75 to 80 individuals, effectively increasing the strength of the overall research staff by about 30-percent.

In the second place, unlike some other contract research and development organizations working for military sponsors, HumRRO did not attempt to maintain an arms-length relationship with its Army sponsors in a gesture of scientific independence. Given the joint military-civilian staffing of the field laboratories and the three-way management structure, this insulation would have been difficult to achieve even if HumRRO had desired it. Both the initial structure and that which evolved over the years fostered a pattern of two-way communication which was recognized as having contributed to HumRRO's success, not only as an R&D agency but also as a "change agent" in the area of Army training.

. . . much of the success of the Army-HumRRO relationship must be attributed to a willingness to develop intimate communication channels in order to maximize understanding between the two groups.¹⁶

The Committee notes with approval the use by the HumRRO Central Office of experienced military personnel . . . The Committee believes that human research of maximum benefit to the Army can be achieved only by the full utilization of the knowledge and experience of the military officer in conjunction with the skill and techniques of the scientist.¹⁷

HumRRO had close relationships with the Army at three levels. It had staffs of researchers at a number of important Army posts, where the interaction was at the school and training center (i.e.,

¹⁶CONSAD Research Corporation, Institutional Funding for Applied Research: The Case of HumRRO and the U.S. Army (Pittsburgh: CONSAD Research Corporation, 24 May 1973), p. 14. This was one of a series of reports the CONSAD Research Corporation prepared under contract to the U.S. Department of Health, Education, and Welfare on different kinds of research-sponsorship arrangements.

¹⁷U.S., Department of the Army, Army Scientific Advisory Panel, "Report of the Committee for the Evaluation of the Army's Human Resources Research Program," 16 March 1955, p. 6.

operating) level. It had representatives stationed full time at the headquarters of the Army's major training command, where many key decisions were made and where training policy and directives implementing that policy originated. It had liaison officers from Army headquarters stationed in its Central Office which was located only a 10-minute drive from the Pentagon and top Army officialdom.

This parallel structure, particularly in the case of the clear hierarchy of the Army, is probably important for the intimate, informal relationship which obtained between the two and must be understood as supplying much of the background for the conduct of the annual review (of the HumRRO research program). . . . Communications moved up and down the two structures, as well as between them at numerous levels.

The association which developed over the years became so close and intimate that many Army personnel assumed HumRRO was in-house. Moreover, the impression gained is that many officers who would have been wary of "outsiders" seemed to define HumRRO in a role analogous to that of the family physician. . . . A base commander might have a problem which had not been well articulated and he would be willing to discuss it with HumRRO personnel when he would not be so open with people from an outside "independent" contractor.¹⁸

In the third place, HumRRO and its Army monitors devoted considerable effort to the development of procedures for insuring "mutuality" in their joint enterprise. The Army was asked to approve key personnel selected in the initial staffing of HumRRO. Proposals for research projects could be initiated anywhere in the Army, but had to be approved by the Army program manager and acceptable to the Director of HumRRO before they could be added to the research agenda. HumRRO managers were given access to Army advance planning documents to enable them to develop a forward-looking work program each year. The Army established high-level committees in both its training

¹⁸CONSAD, Institutional Funding, pp. 26-27.

command and its headquarters to approve or reject proposed research projects, to review ongoing ones, and to provide advice and counsel to HumRRO. Draft reports of research were reviewed in appropriate Army agencies to insure the authenticity of any military information before the reports could be prepared in final form and released. First informally and later formally, HumRRO allocated a small percentage of its resources each year to provide Army commanders at all echelons with unprogrammed, short-term assistance, sometimes providing help in implementing a HumRRO recommendation and at other times simply providing advice based on available information to help the commander respond to immediate problems.

HumRRO Organization

To carry out the research program called for in the contract which brought it into existence, HumRRO promptly created three Divisions at its central location on The George Washington University campus--one for each of its major areas of concern: a Training Methods Division; a Motivation, Morale, and Leadership Division; and a Psychological Warfare Division. In 1952, it provided research staffs when the Army established Army Field Forces Human Research Unit #1 (HRU #1) at Fort Knox, Ky., and Army Field Forces Human Research Unit #2 at Ford Ord, Calif. The former began as a field laboratory for training methods research and the latter as a field laboratory for research on motivation, morale, and leadership.

Plans were under way in 1954 for a third HRU, at Fort Benning, Ga., when research programs in the field were shifted from subject-matter to problem orientation. Fort Knox was the home of the Army's

Armored forces, and the HRU on that post began concentrating on Armor training problems. Fort Ord was a major Army Training Center and the HRU there focused on training problems of major interest to basic training centers. Fort Benning was the home of the Army's Infantry forces and when, in 1954, the third HRU was established there, its research problem area was Infantry training.

By 1954, HumRRO was also reorganizing its program of centrally-conducted research. The Motivation, Morale, and Leadership Division was disestablished and work in these areas was thereafter conducted throughout the organization, but in a training context (i.e., How do you conduct training so as to improve motivation, morale, and leadership? How do motivation, morale, and leadership influence the effectiveness of training?)

The following year, the Army Scientific Advisory Panel appointed an ad hoc Committee on Human Resources Research in the Army. That committee, which reported on March 16, 1955, recommended that research on psychological warfare be split away from the rest of the program and given increased emphasis. HumRRO responded by disestablishing its Psychological Warfare Division and surrendering its work in this area to a new Army contract research agency, the Special Operations Research Office (SORO), established at The American University. (Two of the first three Directors of SORO had been Assistant Directors at HumRRO, and the new organization not only employed a number of former HumRRO personnel, but also adopted many of the procedures HumRRO had pioneered for conducting research for the Army.)

Over the 22 years it served as the Army's principal training research agency, both HumRRO and the Army underwent several

reorganizations and realignments as they continued their symbiotic relationship. At its maximum staff size of 280 members, beginning in 1963, HumRRO consisted--in addition to its headquarters--of two central research elements (a Training Methods Division and a Language and Area Training Division) and five numbered field research Divisions (No. 2 at Fort Knox, Ky.; No. 3 at the Presidio of Monterey, Calif.; No. 4 at Fort Benning, Ga.; No. 5 at Fort Bliss, Tex.; and No. 6 at Fort Rucker, Ala.). The HumRRO field Divisions had been separated (on paper) from their collocated Army Human Research Units because of a growing recognition that legally HumRRO was a contractor and that contractor and Army elements should be formally separate. But the extraordinarily close relationship between civilians and military personnel in these Divisions and Units continued as before.

Monitorship of the HumRRO research effort from Army Headquarters level shifted over the years from the Assistant Chief of Staff, G-4 (logistics), to the Assistant Chief of Staff, G-1 (personnel), to the Chief of Research and Development in the Office of the Army's Chief of Staff, to a separate Office of the Chief of Research and Development, to the U.S. Army Research Institute for the Behavioral and Social Sciences.¹⁹

At the level of the Army's principal training command, the Army Field Forces became the U.S. Continental Army Command, and then the U.S. Army Training and Doctrine Command, but the close coordination

¹⁹The U.S. Army Research Institute for the Behavioral and Social Sciences was established in 1972. It is a lineal descendant of the Personnel Research Branch first created in the Office of The Adjutant General before World War II. Its organization and growth will be described in the next chapter.

which had existed from the very beginning of HumRRO continued--that of a training research agency producing information and innovations for use by the Army's major training organization.

The HumRRO Research Program

Between 1951 and 1972, HumRRO conducted some 630 separately identifiable research projects for the Army, in addition to providing approximately 100 less-well-recorded short-term consulting services each year. At the time they were being performed, these research projects were described and categorized in several different ways. In retrospect, practically all of them fell into one of six general research areas.

(1) Individual Training and Performance. This category includes projects which sought improvement in the training of individual soldiers and determination of the performance requirements imposed upon him by the particular Army subsystem into which he was expected to fit. It covers all levels of training and includes research on training aids, job-performance aids, and training literature as well as the study of individual abilities and skills.

(2) Unit Training and Performance. In this category fall those projects concerned with the training of groups, as distinguished from individuals. Such groups could be as small as a four-man tank crew or a twelve-man rifle squad up to battalion size, or larger. It includes research conducted on group organization and interpersonal relations and the manner in which these elements contribute to group effectiveness.

(3) Training for Leadership, Command, and Control. A considerable number of HumRRO research projects were directed to the study of leadership, at all levels from the junior noncommissioned officer up to the senior officer commanding a Division. The focus of this research was on the human factors involved in exercise of leadership, and on the command-and-control function in man-man and man-machine systems.

(4) Language and Area Training. In this category fall those HumRRO projects that attempted to identify the skills required for successful interaction by Americans with non-Americans, that is, with cross-cultural and inter-cultural encounters. Once having identified these skills, the projects were designed to produce prototype programs of instruction to help Army officers and enlisted personnel master them.

(5) Training Technology. Simulation, miniaturization, programmed instruction, and computer-assisted instruction are some of the areas encompassed within this category. While it was true that many HumRRO research projects advanced the technology of training while solving specific training problems, some were focused primarily on the technology itself. A conscious effort was made to codify the new knowledge as it was developed.

(6) Training Management. Army training takes place within the context of a training establishment. In addition to research conducted on training objectives, training content, and training methods, HumRRO also studied the training establishment, itself.

This research focused on administrative and organizational problems, and the role of training within overall Army organization and operations.

Another way in which HumRRO divided up its annual program of work for the Army was in terms of administrative categories: Exploratory Studies, Tasks, Technical Advisory Services, Basic Research, and Institutional Research. In 1967, Dr. Crawford described the evolution of these three categories as follows:

In the early years, only one kind of project was listed: the Task. The statement for such a project included some appraisal of the military problem and a necessarily nonspecific section on probable research approach and expected military benefits. Gradually, more comprehensive planning measures were inaugurated, but still a large number of Tasks proved wasteful of effort and disappointing to the Army and HumRRO because the military problem had not been sufficiently analyzed, in advance, to determine the feasibility of a research approach.

To provide a vehicle for assessing the research potential of suggested projects, the category of Exploratory Study was introduced into the Work Program for FY62. Under this category, in relatively small efforts (one or two men) a military problem is studied through discussion and field observation to determine whether a research approach might lead to a solution. . . . As a result, research resources have been conserved for application to Work Units (a latter-day label for Tasks) where the possibility of useful results could be forecast with more confidence.

As HumRRO scientists became familiar with the Army and the results of our previous work became known, we began to receive an increasing number of requests for information relevant to Army decisions. Some of the needed information was available in scientific and technical literature; some could be obtained by a "crash" data-gathering effort. The Army also began to request assistance in the implementation of results of previous HumRRO research. We felt that it was highly desirable to meet many of these requests, but this entailed using resources from the programmed work, with consequent delays in schedules. Therefore, for FY62, the category of Technical Advisory Service (TAS) was added to the Work Program to make budgetary provision for this kind of work. . . . A larger number of HumRRO results have found application than might otherwise have occurred, and HumRRO scientists have been introduced to new Army problems to be attacked in later programmed work.

The combination of Exploratory Study, Work Unit, and Technical Advisory Service have proven to be an effective and economical way of surveying an Army problem, conducting work toward its solution, and helping the Army utilize the results from it and related research efforts. Taken together, these administrative categories are useful management devices for applying behavioral science research skills to operating problems.²⁰

The category of "basic research," as used by HumRRO, differs somewhat from the way this term is frequently understood. In conventional usage, it connotes a free, unfettered following of one's scientific curiosity. No such freedom was implied by the Army's or HumRRO's use of this administrative category. It meant, simply, research for whose results there was no immediate Army application, but which were expected to contribute in the long-run to the more applied work HumRRO undertook for the Army. Thus, basic research was only one short step removed from the majority of HumRRO work from which immediately useful information, innovations, and prototypes were expected to flow.

Similarly, the category of "Institutional Research" paralleled that of the "Lab Director's Fund," i.e., monies made available to the Director for research for which no sponsor could be found but which he felt would be useful in the long run. This category was added to the HumRRO Work Program in FY66, and some modest funding made available. HumRRO management chose to use this money to support research that had been requested by Army agencies but which had not mustered sufficient priority in high-level review to be included as "sponsored research."

²⁰Meredith P. Crawford, A Perspective on the Development of HumRRO (Alexandria, Va.: Human Resources Research Organization, August 1967), pp. 15-16.

Orientation Toward Usefulness

Most HumRRO scientists came from university posts or from advanced degree programs where the important final step in the research process was having one's results published in a respected disciplinary journal, monograph, or book. At HumRRO, too, considerable emphasis was placed on reporting. The organization's bibliography²¹ indicates that, between 1951 and 1971, it produced some 1,200 reports, professional papers, and presentations at professional meetings. It should be noted that, despite the presumed constraints of conducting research for the military, less than 3-percent of these reports and papers were classified and unavailable to the general public. An internal bibliography for that same period²² lists a smaller, but still impressive, number of documents which, for one reason or another, were never actually published or widely distributed.

Responsibility for reporting was vested with an Assistant Director, and a full-time staff of editors and production specialists was employed to help the researcher-writer communicate with his various audiences. The problem they faced was how to combine, in a single document, attainment of the following objectives:

- (1) To communicate effectively with the potential operational user and yet contain sufficient technical detail to supply hard evidence for the conclusions reached.

²¹Human Resources Research Organization, Bibliography of Publications as of 30 June 1971 (Alexandria, Va.: Human Resources Research Organization, September 1971).

²²Human Resources Research Organization, Internal-Use Only Supplement to Human Resources Research Organization Bibliography of Publications (Alexandria, Va.: Human Resources Research Organization, December 1974).

(2) To include such information as might add to the general store of scientific knowledge.

(3) To achieve perspective on a piece of work, so that a report not only provides specific information to a specialized Army user, but also makes explicit the lines along which results might be generalized to other military or to civilian problems.²³

HumRRO was not only a mission-oriented R&D agency, it was also action-oriented. The mechanics of producing formal, printed reports was relatively time-consuming, so the oral briefing of commanders and staffs became the usual manner in which HumRRO initially transmitted its research results and recommendations to the Army. Some briefings merely provided progress reports, but others recommended Army actions. It was not unusual to find the Army taking a recommended action before the technical report describing the research upon which it was based became available.

Although the principal product of HumRRO R&D efforts was information to aid the Army decision-maker, the desired results of these efforts was improvement in Army training practices and procedures. Thus, it was by the utilization of HumRRO research products and the implementation of HumRRO recommendations that the effectiveness of the training research program came to be judged.

An accurate list of HumRRO accomplishments on behalf of the Army would be difficult, if not impossible, to compile.

In some instances, it is relatively easy to point to complete HumRRO-developed "packages" which are now in daily Army use--the TRAINFIRE program of basic rifle marksmanship instruction, the Leader Preparation Schools for potential noncommissioned officers, and a set of programmed self-instructional materials for teaching junior officers the missile checks they need to evaluate the operational readiness of their units.

²³Crawford, Development of HumRRO, p. 16.

In many other instances, however, HumRRO has not been the "prime mover," but has played the role of catalyst by providing scientific evidence which influenced the Army to undertake a particular course of action. A principal objective of training research and development is to present the decision-maker with information on ways of achieving certain levels of individual and unit proficiency at given costs of time, money, equipment, and personnel. From various options, each with a cost and effectiveness determined by research methods, the decision-maker can choose the one which most appropriately meets his requirements.²⁴

Dr. Crawford came to the HumRRO directorship from a background in which the action implications of research and development were stressed--the Army Air Forces Aviation Psychology Program (see Chapter II). This experience was reinforced early in his new career in a manner which he frequently cited when explaining his concern over Army implementation and utilization of his organization's research products.

. . . I have already illustrated our practical concerns in HumRRO about utilization and implementation. A good reason for that concern was made clear to me in the early years of HumRRO. On one occasion, after I had presented the research plans and support requirements for the next fiscal year to a board of general officers, the chairman said, very simply and directly: "Well, Doc, we will give you money for one more year. If you don't produce, you're out." He meant for us to produce something the Army could use. We did produce and have continued to do so over the years. A gratifyingly large portion of our products have been put to use in the Army, in the other services, and in civilian settings.²⁵

No completely satisfactory manner of recording Army use of HumRRO research products was ever developed. In 1960, the U.S. Continental Army Command circulated a letter²⁶ describing the use

²⁴[Saul Lavisky], What Is HumRRO? Fact Sheet, February 1968.

²⁵Meredith P. Crawford, "Military Psychology and General Psychology," American Psychologist 25 (April 1970):334.

²⁶Letter, Headquarters, U.S. Continental Army Command, subject: "Army Utilization of HumRRO Research Products," 6 July 1960, ATTNG-TNG 300.6/12.

that its schools and training installations had made of training research products during the preceding fiscal year. In 1961, that letter was institutionalized as an annual CONARC Pamphlet on "Army Utilization of HumRRO Research Products."²⁷ These pamphlets, published each year through 1971, usually listed 50 to 75 illustrations of new uses of research products--information, innovations, or prototypes.

In 1969, in an effort to provide an even better picture of the benefits the Army had derived from its training research program, HumRRO issued a Professional Paper which traced several hypothetical soldiers through different Army training programs, identifying ways in which these programs had been improved through the application of HumRRO research results. The paper cited improvement in programs for both enlisted and officer personnel, in several branches of the Army, and at all levels from raw recruits to division staff officers and commanders. Altogether, some 93 reports were cited as having been used by the Army to improve its training curricula, training methods, or training evaluation.²⁸

However, it was recognized that, since there was no requirement for anyone using a training-research product or recommendation to report it to any Army headquarters or to HumRRO, these efforts at recording and accounting were, at best, only partially indicative of

²⁷U.S. Continental Army Command Pamphlet 70-4, Army Utilization of HumRRO Research Products (FY 61) (Fort Monroe, Va.: U.S. Continental Army Command, 1 September 1961).

²⁸Saul Lavisky, HumRRO Research and the Army's Training Program (Alexandria, Va.: Human Resources Research Organization, December 1969), Professional Paper 36-39.

the actual utilization and implementation taking place.

Diversification of Support

Between 1951 and 1967, HumRRO conducted its research and development work exclusively for the Army. The organization had made a conscious and sustained effort to disseminate its reports and other research products widely in the Army and other Services. Beyond that, HumRRO employed a Research Information Coordinator on its central staff whose principal duties included making its new-found knowledge available, in appropriate form, to a wide variety of interested publics--especially other branches of the Federal Government, civilian educators and educational researchers, and the industrial training community.

This kind of publicity about the organization's accomplishments for the Army produced two kinds of effects. In some cases, HumRRO research products were adopted or adapted for use by organizations other than the Army. In other cases, organizations with training problems (especially the Navy and Air Force) sought to contract with HumRRO for training research on their problems and in their organizational settings. Because of its special relationship with the Army, and certain Congressional limitations on the size to which organizations like HumRRO could grow, HumRRO was able to accept very few of these contracts.

In 1965, the Navy persuaded the Army to allow HumRRO to conduct an electronics maintenance training project for it and the funds required were transferred between the Services. In 1966, the Post Office Department approached the Army with a similar request,

but for an extensive and extended program of research and development rather than a single project. By this time, both HumRRO and the Army were convinced that some modification in the Army's exclusive call upon HumRRO services was in order, and that the continuing transfer of funds from other Government agencies to the Army was not the most satisfactory solution to the problem.

In May 1967, the Army and The George Washington University agreed to a proposed "Concept of Diversification of HumRRO Support." The essence of this concept and agreement was that, beginning in July 1967, HumRRO would be allowed to work in its by-then-traditional areas for other Government and non-Government agencies, so long as Army requirements received HumRRO's best efforts. A modification of the Army-University contract delineated these areas as: "development of the technology of training and education, research and development on specific problems in training and education, research in leadership and management and training for these, studies of techniques for the motivation of training and performance, studies of human performance in military and educational systems, and the teaching of the technology of training and education."

On July 1, 1967, the Post Office Department entered into a contract with The George Washington University calling for a program of research and development projects to be conducted by HumRRO. This contract brought to an end HumRRO's 16-year status as an exclusively Army-supported R&D agency.

As the Director wrote to his staff: "Broadening the scope of HumRRO's research program should, I believe, benefit not only the Army and the Government, but also the civilian educational community

as a whole and other sponsors we hope to serve. In addition, our professional capabilities will be enhanced through our broader contacts and experiences."²⁹

An Independent Corporation

Although HumRRO had been established by The George Washington University as an Office of that institution, in point of fact it was always closer to the Army than to its "parent." Its staff members enjoyed neither faculty rank nor the possibility of tenure, and more than half of them served on Army posts away from the campus. Yet they served on Army committees and, on occasion, represented the Army in tri-Service and even international scientific meetings and activities. When members living in the Washington, D.C. area taught University classes, as they sometimes did, it was on their own time; they were treated as any other part-time faculty member. However, when these same staff members engaged in Army business, they enjoyed the simulated grade and privileges of high-ranking Army officers or Government employees, though they were neither.

Furthermore, HumRRO required its own data processing facilities, library, print-shop, and business office, and was relatively independent of the University in day-to-day affairs. For some years, HumRRO's mid-campus building was off-limits to casual visitors (faculty and students alike) because of military security concerns. Then, in 1963, HumRRO moved its staff a dozen miles off campus into a new

²⁹Memorandum, Meredith P. Crawford to the HumRRO staff, subject: "Diversification of HumRRO Support," 10 May 1967.

building in Alexandria, Va., thereby adding physical to psychological distance between itself and the University proper.

After lengthy and friendly discussions in which all parties participated over many months, the University's president, Lloyd H. Elliott, advised the Army in April 1969, that he would not seek renewal of the contract for support of HumRRO work beyond its expiration date of June 30, 1970. As he explained, this decision followed extended examination of HumRRO's relationship to the rest of the University.

Both Dr. Crawford and I have sought ways in which there might be a more meaningful, substantive relationship between HumRRO and the academic departments of the University. This has proven to be difficult because of the geographical separation of HumRRO and because of the difference in mission-oriented objectives and research interests between HumRRO staff and our academic departments. Furthermore, since HumRRO began its program of multi-sponsorships on July 1, 1967, it has felt a need for a degree of autonomy and administrative flexibility that is not compatible with the University structure. Therefore, in late March, I accepted Dr. Crawford's recommendation to me that we take steps to separate HumRRO from the University. In view of both faculty and student unrest over Defense sponsored research in the University, we agreed that an early announcement of the intention to separate was in the best interest of both the University and HumRRO.³⁰

The "unrest" to which Dr. Elliott referred was that which swept the Nation's campuses in 1968-69 in reaction to the war in Vietnam. Although no college or university was immune to these student and faculty protests, those which, like The George Washington University, held large DoD research contracts were particularly susceptible. HumRRO, because of its work for the Army, was anathema to the Students for a Democratic Society (SDS) and other action

³⁰Lloyd H. Elliott, President of The George Washington University, to Frederick S. Jones, Contracting Officer, U.S. Army Research Office, April 1969.

groups. Perhaps because of its location away from the main campus, HumRRO was never physically attacked by such groups. However, SDS did seize a University building housing another Government-sponsored research agency and did considerable damage before being evicted. While not a primary factor in the decision to separate HumRRO from the University, campus protest undoubtedly contributed to bringing the matter up for speedy resolution.

HumRRO's parting from the University was entirely amicable. It was discussed thoroughly beforehand with Lt. Gen. Austin W. Betts, the Army's Chief of Research and Development, and a number of options for protecting the Army's interests were explored. The one finally selected was formation of an independent, nonprofit corporation to carry on the training research the Army needed and wanted.

On April 11, 1969, Articles of Incorporation were filed in the District of Columbia to establish a Human Resources Research Organization to continue as the Army's principal resource for conducting studies and research and development on training, needs for training devices, motivation, and leadership. On April 18, Dr. Crawford advised the Army that "It is my firm intention to continue the HumRRO organization in essentially its current form. The change in corporate status should not materially affect the HumRRO resource as it has been developed over the 18 years of association with the Army."³¹

Officers of the initial Board of Trustees of HumRRO, Inc., were: Meredith P. Crawford, Chairman; Stephen Ailes, Vice Chairman; and William A. McClelland, Secretary. Mr. Ailes was a former Secretary

³¹Meredith P. Crawford, President of HumRRO, Inc., to Frederick S. Jones, 18 April 1969.

of the Army, and Dr. McClelland was Deputy Director of HumRRO. The initial officers of the new corporation were: Dr. Crawford, President; Dr. McClelland, Executive Vice President and Secretary; and Mr. C. W. Smith, Vice President and Treasurer.

The new HumRRO was legally designated by both the Army and the University as the successor organization to the original HumRRO. On August 30, 1969, the University's Human Resources Research Office ceased to exist; on September 1, 1969, the new Human Resources Research Organization came into operation--with the same staff, same facilities, same contracts, and same field laboratories.

The Relationship Changes

While many aspects of HumRRO's special relationship to the Army were relatively unique, the existence of a "special relationship" between the Government and an independent R&D organization was not. HumRRO was categorized by the National Science Foundation as a Federal Contract Research Center (FCRC), a type of organization defined by NSF as "exclusively or substantially financed by the Federal Government either to meet a particular research and development need or, in some instances, to provide major facilities at universities for research and associated training purposes. They are administered by extramural organizations . . ." ³² The advantages, disadvantages, and special nature of 40 of the Nation's major FCRCs (including HumRRO) were examined by the Denver Research Institute

³²National Science Foundation, Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1966, 1967, and 1968, Volume XVI (Washington: National Science Foundation, 1967), p. 82. NSF Publication 67-19.

in 1968-69 in a study for the National Science Foundation. The study report concluded that FCRCs should be considered "contract R&D adjuncts" of their sponsoring Government agencies and that: "The concept of a Federal agency having a contract R&D adjunct to serve selected, important national needs appears viable" even though "the mechanism is not widely understood nor is it easy to understand . . . There appears to be no inherent weaknesses in the mechanism which cannot be surmounted. If this be the case, the organizational form should continue to be a valuable option to Government for the performance of Federally sponsored R&D."³³

The relationship between an FCRC and its Government sponsor includes special commitments on each side. In return for the FCRC's exclusive or near exclusive dedication to its sponsor's concerns, the Government agency tacitly agrees to provide a relatively stable level of funding over a period of years.³⁴

A variety of concerns, including the continuing growth and potentially unhealthy influence on Federal policy-making of some few FCRCs, and the high salaries and fringe benefits provided executives in another few, led Congress in 1962 to place a ceiling on the amount of money the Services could spend with any of their FCRCs. HumRRO, as an FCRC, found itself trapped by this ceiling, despite its innocence in areas of Congressional concern. There had been no

³³Denver Research Institute, Contract Research and Development Adjuncts of Federal Agencies: An Exploratory Study of Forty Organizations (Denver: University of Denver, March 1969), pp. 186-187.

³⁴Norman Waks, Problems in the Management of Federal Contract Research Centers (Bedford, Mass.: The MITRE Corporation, September 1970). Report MTP-119.

significant growth in HumRRO since the late 1950s, and approximately the same amount of work had been performed for the Army each year for a number of years. It was not a "think tank" offering broad policy advice to its sponsor. Its salaries were well among the lowest for all DoD-supported FCRCs. For example, in 1967, when the president of the largest FCRC, Aerospace Corporation, was being paid \$97,000 per year, and when the median salary paid FCRC presidents was \$42,000, the President of HumRRO was receiving \$30,000.³⁵ Still, the Congressionally-imposed ceilings limited the amount of money the Army could spend with HumRRO. Further, the ceiling was interpreted as being DoD-wide. This meant that once the Army had contracted with HumRRO for the maximum allowable (ceiling) amount, neither the Navy nor the Air Force, nor even the Department of Defense could obtain HumRRO services--even when they had problems in HumRRO's area of expertise, wanted HumRRO to conduct the necessary research and development, and had the money in their budgets to pay for the R&D they wanted.

Thus, the funding ceiling effectively prevented HumRRO from conducting training research for the Navy and Air Force, which was one of the main purposes it had expected to achieve by its 1967 transition from an exclusively Army-supported organization to one empowered to accept contracts from diverse sponsors. Although some non-military agencies did contract with HumRRO following the transition, it had been the Navy and Air Force upon which HumRRO had counted

³⁵Harold Orlans, The Nonprofit Research Institute (New York: McGraw-Hill, 1972), p. 69.

to maintain, and even to increase, the size of its research program and staff.

The effect of the ceiling on HumRRO was further exacerbated by the organization's readiness to be accommodating in helping the Army meet emergency, high-priority problems. As Dr. Crawford pointed out to a special DoD study Group on Federal Contract Research

Centers:

. . . it is clear that there is much more Army work that HumRRO could do, and the Army would like us to do, than the ceiling will allow. Second, because of this limitation, high priority activities must be forced into the program through suspension or cancellation of work for which high priorities have already been established by the Department of the Army. This causes waste of time and effort and has an adverse effect on the morale and productivity of the staff. . . . Finally, when a new program is undertaken with the expectation of continued special funding, as was the case when HumRRO began its extensive and long-range attack on computer administered instruction (Project IMPACT), and then be required to absorb that program under a fixed ceiling, marked curtailment of other Army activities must take place. . . . during the current fiscal year we are continuing to absorb a \$700,000 program in CAI, undertaking a new \$270,000 program in support of the Modern Volunteer Army, and meeting rising research costs within this fixed limit (\$3,420,000). This has resulted in a massive sacrifice of programmed research efforts for field commands, and especially for Army Schools and Training Centers.³⁶

On December 8, 1971, the HumRRO Board of Trustees, formally asked the Army to initiate the necessary actions to declassify it as a Federal Contract Research Center and, in effect, to terminate the special relationship which had existed between the Army and HumRRO for the preceding 20 years. HumRRO management hoped that this request, if approved by the necessary authorities, would actually

³⁶Meredith P. Crawford, presentation to a special Department of Defense Study Group on Federal Contract Research Centers, 1 April 1971, pp. 39-40.

mean that the organization could perform more, rather than less, work for the Army.

Because HumRRO had enjoyed a steady increase in its non-Defense sponsorships, and because such sponsorships amounted to approximately 27-percent of the total HumRRO budget at that time, the declassification request was approved, effective July 1, 1972.

The Research Management Mechanism

Although the Army's training research program was conducted by a contract civilian organization between 1951 and 1972, it was always clear to all concerned that the program was under complete Army control. The basic management framework was detailed in Army Regulation 70-8, which appeared in several revisions during the 22-year period.³⁷ This regulation provided a basic policy reference to which all Army elements (and contractors) could refer for fundamental guidance.

The regulation spelled out the scope, objectives, manner of execution, application, and coordination of Army human resources research and development. It made the Chief of Research and Development responsible for planning, programming, coordinating, supervising, and evaluating Army research in the behavioral and social sciences (including the promulgation of detailed policies, establishment

³⁷Army Regulation 70-8 has appeared in seven versions since it was first issued in 1955. Among its various titles have been: "Personnel and Training Research" in 1955; "Human Factors Research" in 1961; "Human Factors and Non-materiel Special Operations Research" in 1963; and "Behavioral and Social Science Research and Development" in 1969. The current (1976) version is titled "Personnel Performance and Training Program."

of priorities for research projects, and allocation of funds for conducting the work).

The regulation also created a special review committee³⁸ at Army headquarters, composed of representatives of key headquarters staff agencies and major Army commands. This Committee reviewed both current and contemplated research plans and, in the light of Army requirements, made recommendations to the Chief of Research and Development as to the appropriate priority for each project. This Committee also recommended the coordination that should be effected before and during conduct of the research. Once projects were under way, the Committee was expected to insure that each project's sponsor monitored the manner in which the research was proceeding.

The regulation made clear that, no matter how a research requirement had arisen, there should be an Army sponsor for each project. The sponsor (which was usually the Army element most likely to be able to use the research result) was required to provide the research agency with advice and guidance, background data, and other information and support needed in the research effort.

It is interesting to note that, while the regulation required a variety of research reports (progress reports, consulting reports,

³⁸Like the regulation which gave it birth, the Committee experienced several name changes over the years. It was originally the Army Advisory Committee for the Human Resources Research Office. It was later named the Army Personnel and Training Research Advisory Committee and, finally, the Army Human Factors Research Advisory Committee. When AR 70-8 appeared in 1975, with the title "Human Resources Research Program," all reference to the Committee was dropped. It appears that the Committee was disestablished by a conscious act of omission when the U.S. Army Research Institute for the Behavioral and Social Sciences was established (see Chapter V).

reports on ancillary products of the research effort, and final technical reports) it also made provision for both formal and informal, periodic and aperiodic briefings and visits between research agencies and project sponsors. Many members of the research community and of the Army felt that these face-to-face contacts were among the most important ways in which progress was reported and feedback obtained.

While AR 70-8 provided fundamental policy guidance for training research (as part of "behavioral and social science" research), even more detailed guidance was provided in the form of a policy letter prepared by Office of the Chief of Research and Development with input from HumRRO and issued by the Office of The Adjutant General.

In fact, AR 70-8 created a management framework within a management framework. Although research and development was a diversified Army activity before World War II, it became a much more tightly controlled and regulated one after the war. Increasingly, after the Chief of Research and Development was positioned at Deputy Chief of Staff level in 1955, Army R&D management became much more highly proceduralized than it had been before. An entire series of regulations was issued to define Army policy for various aspects of R&D management.³⁹ AR 70-8 fit within, and meshed with, the framework created by these regulations.

³⁹The system of Army Regulations establishes numbered series for particular topics. Regulations relating to research and development appear in the "70-series," which now includes some 41 separate regulations. Subjects range from the management of R&D projects, laboratories, centers, and appropriations to the use of volunteers as research subjects, to standards for technical reporting, to the assignment of popular names to major items of new equipment.

Summary

In the early 1950s, the Army began to sponsor training research on a sustained, systematic basis, not only to solve immediate, important problems (as had been the case with the AAF Aviation Psychology Program during World War II), but also to build a psychotechnology of training that could be expected to generalize to a wide range of training problems. The mechanism the Army chose was that of a Federal Contract Research Center, an independent, nongovernmental research-and-development organization tied to the Army through a series of long-term, "exclusive service" contracts.

The Army and this research organization established and maintained a web of fruitful relationships over the 22-year period, 1951-72. Between the end of the Korean War and the increasingly deepening Army involvement in the Vietnam War, the Army and its research organization developed, tested, and revised a set of procedures for productively integrating a research-and-development activity into the operation of a mission-oriented agency. Several features of these relationships and procedures appear worthy of special note.

In the first place, during most of this period, responsibility for supervising and directing the training research program was vested with the Chief of Research and Development rather than with the training command itself. In this manner, research was kept separate from operations, and was protected from both interruptions and any siphoning of resources to meet immediate, short-term operational demands. At the same time, the procedures which evolved insured that the training command's requirements would be thoroughly considered in development of the annual training research program.

In terms of the list of "necessary and sufficient" conditions for the effective conduct of research within an operational agency (see Chapter I), the following conditions obtained between 1951 and 1972:

1. An Army Regulation specified the manner in which research requirements from any point in the Army could be raised for consideration. A high-level headquarters committee evaluated all such suggestions for training research in terms of overall Army needs, and assigned each one a priority ranking in recommendations to the Chief of Research and Development. The CRD would then authenticate appropriate requirements for research in the research agency.

2. This research agency was created, staffed, organized, and its laboratories geographically dispersed specifically to be responsive to the Army's training research needs. It is clear from self-report, from Army reports, and from the reports of outside observers that this organization established and maintained an orientation of usefulness toward its client--the United States Army.

3. Regardless of the element of the Army in which a research requirement arose, the research itself was funded from a single source, the Office of the Chief of Research and Development. In addition, the research agency could also turn to a designated sponsor who was obliged, under Army Regulation, to be helpful in a variety of ways--providing advice and guidance, information, research subjects, and logistic support.

4. This Army policy of requiring that each research project have a sponsor constituted a twofold benefit. It not only insured that the research project would be supported in the field, where it

was being conducted, but it also insured that research results would be seriously considered for implementation if that appeared warranted. In this manner, the potential user of research results was drawn closer than would otherwise be the case to the producer of those results.

CHAPTER V

THE CURRENT SITUATION

Introduction

As the Army entered the 1970s, it was an institution changing under stress. The war in Vietnam was winding down, but the United States was not winning it. There was increasingly open dissent within the Army's ranks, and new problems of racial conflict, drug abuse, and anti-military social values with which it had to cope. The Army enjoyed less popular support than it had known since the end of World War I, but the draft (upon which the Army had depended for 30 years) was on its way out, and an all-volunteer force was going to have to be recruited. There were questions as to the wisdom, and even the possibility, of raising an all-volunteer Army in a period of youthful antagonism toward the military, considerable opportunity for employment, and relatively accessible funds for college or other postsecondary education.¹ Army leaders faced the almost-certain prospect of filling their ranks with lower-ability personnel than in immediately preceding years, and doing so at a time when Army equipment was increasing in number, sophistication, and complexity.

It seemed obvious that the "new" Army would be smaller, would have limited resources, and would have to depend upon Reserve

¹Gus C. Lee and Geoffrey Y. Parker, Ending the Draft--The Story of the All Volunteer Force (Alexandria, Va.: Human Resources Research Organization, April 1977), HumRRO Final Report FR-PO-77-1.

Component forces of questionable capability and readiness. There was also a new Army philosophy which stressed the importance of winning the first battle of any new war. This philosophy grew from a recognition that American dependence upon the strength of the Nation's industrial resources and civilian population to come back from initial defeat (as in the cases of World War II and the Korean War) would no longer suffice in a world in which potential enemies had massive nuclear power, and in which mobilization and training for combat require increasingly longer periods of time.²

This combination of factors put considerable pressure on Army training officials at the highest levels to devise and implement a training system, nested with a complex personnel management system, that would enable the Army to make the best possible use of the human resources available to it. In other words, there was a new stress on selection, classification, and assignment of personnel, and on training them for the Army jobs to be filled.

In response to these internal and external pressures, the Army reorganized its personnel and training research agencies and, capitalizing on the fruits of thirty years of effort in these areas, developed and installed new personnel and training systems.

Enlisted Personnel Management System

As one important aspect of its reversion to an all-volunteer force, the Army developed and is implementing a comprehensive Enlisted Personnel Management System (EPMS) that incorporates the results of

²U.S., Department of the Army, Operations (Washington: Department of the Army, 1 July 1976), Field Manual 100-5.

many years of personnel research, training research, and performance-assessment research. The new system is not so much based on findings from individual research projects as on an approach implied by, and derived from, numerous projects conducted by several behavioral-science research agencies, both in-house and contract.³

The new system provides a visible, easily-understood career ladder for each soldier, with specific training and on-the-job experience required for each rung to be climbed, from lowest to highest. Never before has evaluation so driven the overall system--including training, classification, assignment, and promotion.

In pre-EPMS days, a soldier was evaluated by means of an annual Military Occupational Specialty (MOS) test: a 125-question, multiple-choice, paper-and-pencil test. Under EPMS, the evaluation device is a Skill Qualification Test (SQT) consisting of three components: written test; hands-on (performance) test; and job-performance certification by the individual's immediate commander. All three test components are based on information gathered in job-and-task analyses in which the critical tasks a soldier must actually perform on the job are identified, as well as the conditions under which they are performed and the standards his performance must meet.⁴

³William L. Hauser, "EPMS--Career Management for Professional Soldiers," (Alexandria, Va.: U.S. Army Military Personnel Center, 1975). Standard briefing paper by Colonel Hauser, Chief of the Enlisted Personnel Management System Task Force at the U.S. Army Military Personnel Center. See also Department of the Army Regulation 611-201, Enlisted Military Occupational Specialties, 1974; and, Department of the Army Circular 351-48, Noncommissioned Officer Educational System, 1974.

⁴U.S., Department of the Army, SQT--A Guide for Leaders (Washington: Department of the Army, 1 April 1977), draft Department

These same analyses are crucial to the instruction given in a new, five-level Noncommissioned Officer Education System (NCOES) which has been instituted as part of EPMS. The five levels of enlisted schooling correspond to five recognized Skill Levels, each of which must be attained as a soldier climbs his career ladder. His initial training (Basic Combat Training and Advanced Individual Training) qualifies him for Skill Level 1 and for promotion up through the grade of corporal. A Primary NCO Course qualifies him for Skill Level 2 and for promotion to sergeant. A Basic NCO Course qualifies him for Skill Level 3 and for promotion to staff sergeant. An Advanced NCO Course qualifies him for Skill Level 4 and for promotion to sergeant first class. And finally, a Senior NCO Course qualifies him for Skill Level 5 and for promotion to master sergeant or sergeant major.⁵

Instruction in these courses, as well as the training conducted in operational units, is based on the identical lists of critical tasks (together with conditions and standards) used in developing SQTs. The lists are also used in Soldier's Manuals which the Army provides each enlisted person. There is a separate Soldier's Manual for each MOS at each Skill Level. Each manual has three major sections: (1) a list of critical tasks the soldier is expected to perform; (2) a list of reference materials to which he can turn for essential information about each task; and (3) a description of an

of the Army Pamphlet, unnumbered. See also U.S. Army Training Support Center Bulletin No. 77-4, SQT, April 1977.

⁵U.S. Department of the Army, Noncommissioned Officer Educational System (Washington: Department of the Army, 1974).

actual performance test that could be used to assess his ability to perform the critical tasks. (It should be noted that the statement of a critical task, together with the conditions of performance and standards to be met, provide the three essential ingredients for a "behaviorally-stated instructional objective." This concept has also received considerable attention from technologically-oriented civilian educators and curriculum developers.)⁶

The Army Training System

In 1973, the Army reorganized itself and, among other changes, created a Training and Doctrine Command (TRADOC) to which it assigned responsibility for developing, managing, and supervising the training of individual officers and enlisted personnel through the Army.⁷ The initial TRADOC focus was on institutional training, i.e., on training taking place in schools and centers under TRADOC's direct command. However, there was also recognition of the fact that most of what an enlisted soldier learns about his job, he learns in his unit of assignment rather than in a school or training center. Gradually, a decentralized individual training program evolved with major support from TRADOC. In this program, TRADOC concerns itself with developing "exportable" training: tools and techniques a unit commander anywhere in the world can use in training the personnel assigned to him.

⁶Robert F. Mager, Preparing Instructional Objectives (Belmont, Calif.: Fearon Publishers, 1962).

⁷U.S., Department of the Army, United States Army Training and Doctrine Command (Washington: Department of the Army, 27 June 1973).

The basis for this program is the job-and-task analysis process through which critical tasks for each duty position at each skill level are identified and cataloged. To help teach soldiers to perform these tasks, a newly-created TRADOC agency, the Training Support Center (TSC), develops and disseminates Training Extension Courses (TEC).⁸ These are programs of instruction in film-and-audio cassettes that can be used for individual self-study or for teaching groups of soldiers. TSC is also responsible for managing the Army's correspondence course program and for revising Army training literature to make it more understandable and useful. The materials themselves are performance oriented; that is, they are designed to teach the soldier to perform the tasks expected of someone in his grade and duty position. Further, in their development, TSC performs four of the six steps in the TRADOC instructional systems approach: (1) job-task analyses to produce validated task lists; (2) determination of whether instruction should be given in a training institution or in an operational unit; (3) preparation of tests of individual and unit performance; and (4) development of validated, exportable, performance-oriented training materials. The final two steps are: (5) conduct of the training; and (6) evaluation and analysis of training outcomes.

In summary, then, TRADOC interprets its mandate for individual training as extending beyond the arena of schools and centers into the operational units of the Army, providing support for individual training wherever it takes place. In doing so, it has introduced

⁸U.S., Department of the Army, U.S. Army Training Support Center Bulletin 76-1, September 1976.

training technology (resulting primarily from training research) into the entire Army training system.

Department of Defense

While it is true that each Service is responsible for its own training and its own training research, the Department of Defense has been increasingly active in both these fields, especially in recent years as DoD-wide budgetary constraints have become so pronounced. Because the Department of Defense is superordinate to the Department of the Army, some DoD actions in these areas impact upon the Army's own training and training research programs.

Interservice Training Review Board

In the area of training per se, DoD formed an Interservice Training Review Board in 1973 to stimulate joint training (i.e., to "persuade" the Services to consolidate common courses and courses teaching substantially the same things). The Board is composed of General Officers; in most cases, they represent the personnel directorates and training headquarters of their respective Services. During its first year of operation, the Board was able to obtain a consolidation of 37 separate Service courses into 18 interservice ones. While the primary mission of the Board is to effect economies through such consolidations, it has also been successful in "cross-fertilizing" new training ideas and methods among the Services. The preeminent example of this effect is represented by the development, under contract, of an extensively-documented set of Interservice

Procedures for Instructional Systems Development.⁹ While the procedures were proposed for use in interservice training development projects, they are also being used, to a considerable extent by the individual Services in developing and improving their respective training systems. "Instructional Systems Development" is the term the Services use to describe the general application of a systems approach to training. The Interservice Procedures prescribe a five-step process based upon the results of research in management sciences, communication sciences, and behavioral sciences (especially research on learning and on the measurement and evaluation of behavior).¹⁰

Defense Research & Engineering

The Director of Defense Research & Engineering (DDR&E) is responsible for coordinating and integrating the research programs and projects of the several Services (including training research). One of the management devices he uses in fulfilling this responsibility is the Technology Coordinating Paper (TCP):

. . . which provides both a concise summary and an analysis of a selected technical or scientific area within the technology base. The TCP is intended to define: (1) areas of scientific endeavor and specific engineering advances needed to meet future military requirements and to solve current problems; (2) the programs underway or planned by each Service to fill these needs; (3) the important gaps in the technology, if any, which exist at presently projected funding levels; and (4) the ways in which the

⁹Each of the Services has published these procedures in its own official literature series. In the Army, they appear as a five-volume TRADOC publication, Interservice Procedures for Instructional Systems Development (Fort Monroe, Va.: U.S. Army Training and Doctrine Command, 1 August 1975), TRADOC Pamphlet 350-30.

¹⁰Ibid., vol. 1: Executive Summary and Model, p. 8.

technology area can be strengthened--these are in the form of recommendations from the "field" for consideration by management.¹¹

In 1972, DDR&E directed the Services to contribute materials to the first TCP to be prepared in the general area of "human resources," to include research on personnel, training, human factors, manpower development, and overseas operations and planning. The document was completed in 1973 and accepted as the principal DoD planning document for the overall management of human resources research in the technology base.¹² While the TCP serves no directive function, it is in effect something of a road map, showing where the various human resources research efforts have been, where they are, and where they need to go. It is this map-like quality, with its comprehensive overview of the entire terrain, that makes the Human Resources TCP valuable not only as a management tool, but also as a pan-Service coordinating device.

¹¹U.S., Department of Defense, memorandum for DDR&E Action Officers for TCPs and Members of TCP Task Groups, subject: "Background and General Guidance on TCPs," from Gus D. Dorough, Deputy Director of Defense Research and Engineering (Research and Advanced Technology), 19 January 1972, p. 3.

¹²U.S., Department of Defense, Office of the Director of Defense Research and Engineering, Technology Coordinating Paper: Human Resources Research, (Washington: Department of Defense, 30 March 1973). The Army and other Services describe their R&D efforts in terms of categories. The R&D process involves four categories: research, exploratory development, advanced development, and engineering development. R&D effort (and funds) are also expended in two other categories: management and support, and operational systems development. The term "technology base" refers to efforts expended on research and exploratory development, neither of which are expected to produce a completed end-item; but both are expected to provide the fundamental knowledge upon which the Army can draw in improving its many materiel and nonmateriel systems.

Advanced Research Projects Agency

The Defense Advanced Research Projects Agency (DARPA) is an operating research-and-development agency under the direction and supervision of the DDR&E. It is, in a sense, DoD's "corporate" R&D facility. Unlike its Service counterparts, DARPA tends to concentrate its efforts in high-risk research areas, working at the very edges of scientific knowledge and technology. Its policy is to carry its programs only to the point of demonstrating feasibility, and then to transition them to one or another of the Services for further development.¹³

For example, DARPA has devoted considerable effort to studying the uses of computers in military education and training. When CAI proved feasible for military training, and all Services had begun research and operational use of this technology, DARPA shifted its attention to both (1) new technological developments for use in computer-based training (such as videodisc, holography, and three-dimensional color television), and (2) cost-effectiveness models for computerized training as an important evaluative technique. The DARPA findings and leads are being fed into, and influencing, work the Army is doing in connection with its own Computerized Training System.

¹³U.S., Department of Defense, "Program of Research, Development, Test and Evaluation, FY 1977," statement by the Director of Defense Research and Engineering to the 94th Congress, 2d Session, 1976, p. VII-30 and VII-31.

Army Training Research and Development

Between 1970 and 1975, both the headquarters-level supervision and operational-level control and conduct of the Army training research program changed.

At Headquarters, Department of the Army, the Chief of Research and Development surrendered staff supervision over the Human Resources R&D program (including training research) to the Deputy Chief of Staff for Personnel.¹⁴ At the operational level, the Army terminated its special Federal Contract Research Center relationship with the civilian contract R&D agency, HumRRO, and integrated the training research program into its own in-house laboratory work. In doing so, it created, first, a Manpower Resources Research and Development Center (MRRDC) and, then, an Army Research Institute for the Behavioral and Social Sciences (ARI). It also created, for the first time, in-house Army agencies responsible for translating the results of training research into readily-implementable materials, tools, procedures, and practices.

These changes occurred within the framework of a major reorganization of the Army which took place in 1973. They represented not merely a shifting of responsibilities, but a new approach to the conduct and use of research for improving human performance in the Army.

¹⁴U.S., Department of the Army, Department of the Army: Organization and Functions (Washington: Department of the Army, 1 April 1975), Army Regulation 10-5.

Army Headquarters

At Headquarters, Department of the Army, the Behavioral Sciences Division which had supervised the Human Resources R&D (HRRD) Program for the Chief of Research and Development, was transferred intact into the Office of the Deputy Chief of Staff for Personnel (ODCSPER) to continue this supervision. Reincarnated as the DCSPER Research Office, this group of military and civilian program managers focused less on substantive aspects of the HRRD program than in earlier years and more on its fiscal and administrative aspects. In effect, the Office delegated its substantive concerns to an operating field agency. Over the past five years, this field agency has existed in two forms--as the Manpower Resources Research and Development Center (MRRDC) and as the Army Research Institute for the Behavioral and Social Sciences (ARI).

Manpower Resources R&D Center

In January 1970, the Chief of Research and Development created the U.S. Army Manpower Resources Research and Development Center (MRRDC) to "supervise and conduct . . . R&D in personnel classification, selection, utilization, training methods and techniques, motivation, morale, leadership, and human performance in military systems."¹⁵ The Center, which had an authorized strength of some 125 military and civilian personnel, was organized into two laboratories: a Behavior and Systems Research Laboratory (to continue the personnel research program the Army had conducted for the

¹⁵U.S., Department of the Army, Office of the Chief of Research and Development, General Orders No. 3, 9 January 1970.

preceding thirty years), and a Motivation and Training Laboratory (to supervise and conduct training research and research in the social sciences).

The new Center was created for two primary reasons: to respond to Congressional criticism regarding lack of an in-house Social Science and Training Research capability, and to overcome problems caused by the Congressionally-imposed funding ceilings on Federal Contract Research Centers.¹⁶ Creation of the MRRDC also freed the Behavioral Sciences Division in OCRD to concentrate on its General Staff functions, especially that of insuring proper support of behavioral sciences research programs at the highest levels.¹⁷

The Behavior and Systems Research Laboratory, as a continuation of the Behavioral Sciences Research Laboratory, was increasingly active during the ensuing 2 1/2 years, but the new Motivation and Training Laboratory was still being staffed and was engaged primarily in program development activities when the next transmutation occurred.

Army Research Institute

On October 1, 1972, MRRDC was redesignated the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and was assigned the mission of conducting "the Army's research and

¹⁶U.S., Department of the Army, briefing by Lt. Col. Pen-
nel J. Hickey, Director, MRRDC, to the U.S. Army Human Factors Re-
search Advisory Committee, 16 February 1970.

¹⁷Brig. Gen. George M. Snead, Jr., Director of Army Research,
to the Director, MRRDC, and to the Chief of the Behavioral Sciences
Division, Army Research Office, subject: "Letter of Instruction,
U.S. Army Manpower Resources Research and Development Center,"
25 May 1970.

development program in human performance, military selection, behavioral evaluation, motivation, race relations, behavioral and social aspects of drug abuse, social change, soldier-community relations, career incentives, and training."¹⁸

Not only did the new Institute assume the resources and responsibilities of MRRDC and its two laboratories, it also assumed a number of high-level functions previously assigned to its superior headquarters and monitor, the Army Research Office. Further, ARI was designated a "developing agency."

The concept of a developing agency is an important one in the Army's R&D management structure. There are only seven developing agencies in the entire Army--headquarters or major commands (and ARI) which have prime responsibility for planning, supervising, and conducting research and development in specific fields, in response to Army guidance documents, requirements documents, and requests for research.¹⁹ In designating ARI as developing agency for the behavioral and social sciences, the Army clearly enhanced the status of both this subject area and the Institute in its overall R&D establishment.

ARI created two laboratories to conduct its research program: the Individual Training and Performance Research Laboratory

¹⁸U.S., Department of the Army, Letter from the Office of the Adjutant General, DAAG-PAP-A (M) (28 Aug 72) DARD-ARB, subject: "Redesignation of the U.S. Army Manpower Resources Research and Development Center," 12 September 1972.

¹⁹U.S., Department of the Army, Army Research, Development, and Acquisition (Washington: Department of the Army, March 1973). Army Regulation 70-1.

(ITPRL) and the Organizations and Systems Research Laboratory (OSRL). The ITPRL mission is "to conduct research concerned with training and increasing a soldier's capability to resolve personal and interpersonal problems, effectively dealing with social changes and social processes as they affect soldiers; with procuring, developing, training, and improving performance of enlisted men, noncommissioned, and commissioned officers; with improving distribution of manpower and retention."²⁰ The OSRL mission is "to conduct research to enhance the effectiveness of groups of individuals in support of command and control functions and in the integration of systems through measurement of total systems performance; to conduct research concerned with improving performance of groups in a variety of military systems through organizational development and enhancement of capability and unit leadership; and to conduct research concerned with increasing unit training skills through maintaining proficiency of units in the field and through development of human factors methodology in educational technology systems."²¹

In adopting this organizational alignment, ARI completed the merger of training research with personnel research into an overall program for improving human performance in the Army. While individual projects are still managed separately, primarily for administrative and fiscal reasons, the ARI program is a fully integrated one, concerned with the soldier's entire Army experience--from

²⁰U.S. Army Research Institute for the Behavioral and Social Sciences, Technical Standing Operating Procedures (Arlington, Va.: U.S. Army Research Institute for the Behavioral and Social Sciences, January 1974), p. 1-1.

²¹Ibid.

recruitment and enlistment, through training and assignment, job performance and promotion, to eventual discharge or retirement. The ARI commander is a military officer, Colonel William Maus, but it is through the Institute's Technical Director, Dr. Julius E. Uhlaner, and the predominantly civilian staff that organizational continuity is achieved. Dr. Uhlaner has been a key figure in the Army's personnel research program for more than 30 years and wears the second hat of Army Chief Psychologist. The Individual Training and Performance Research Laboratory is directed by Dr. E. Ralph Dusek, and the Organizations and Systems Research Laboratory by Dr. Joseph Zeidner.

ARI research is divided into two categories: a Technological Base Program and an Advanced Development Program. The former is made up of projects which fall in the Research and Exploratory Development areas; i.e., efforts which, although directed toward solution of specific military problems, are not expected to produce completed end-items so much as indications of the feasibility of proposed solutions. The expected result of Technological Base efforts is new knowledge, new facts, and/or new research techniques. Examples of such products include a systems measurement bed for surveillance-equipment operation; models of human behavior in combat that incorporate motivation variables; data bases on training methods that emphasize Army unit training; and gaming techniques for military instruction. In the Advanced Development Program, researchers conduct applied research; i.e., they use information from the Technological Base Program and elsewhere to help the Army solve specific behavioral and social-science problems. Examples of such research products include alternate forms of the Armed Forces Qualification

Test; improved techniques for individual training in specific Infantry specialties; data for determining the basis of issue for particular night vision devices; and a handbook for commanders to use in improving a unit's race relations.²²

The ARI research program is further divided into seven technical areas. Three of these fall within the province of the Individual Training and Performance Research Laboratory: Personnel Accession and Utilization; Individual Training and Skill Evaluation; and Career Development and Soldier Productivity. Four fall under the Organizations and Systems Research Laboratory: Unit Training and Evaluation Systems; Battlefield Information Systems; Educational Technology and Training Simulation; and Human Factors in Tactical Operations.

In addition to its two Washington-based laboratories, ARI has nine field units--seven in the United States, one in Europe, and one in Korea. These units enable ARI to continue a 35-year-old feature of Army training research, that of conducting problem-solving research in the field, where the problems are located, and in concert with the operational personnel who have those problems. Altogether, the ARI staff averaged between 280 and 300 persons in 1976-77.²³

ARI conducts approximately fifty percent of its work in-house (i.e., using its own personnel) and fifty percent through contracts and grants. A conscious effort is made to maintain this balance, and though it may fluctuate during the course of a year, it

²²Ibid., p. 2-8.

²³J. E. Uhlaner, Interview held in ARI headquarters, 11 March 1977.

has been fairly consistent for some time.²⁴ In addition to its Technology Base Program, which is devoted to advancing the state-of-the-art in military sciences, ARI also supports even more fundamental work in a Research Themes program. Research Themes are defined as "suggested areas for basic research required for the resolution of critical Army problems where progress has been inhibited by a lack of understanding of fundamentals or a scarcity of basic data."²⁵ A Research Themes booklet is distributed periodically to colleges and universities whose behavioral- and social-science faculty members are the major participants in this program. The entire ARI work program is detailed annually in a two-volume publication, ARI Science and Technology Program. Part I is devoted to "Basic Research and Exploratory Development," and Part II to "Advanced Development."

ARI reports the results of its research efforts to two major audiences: to the sponsors of those efforts and other members of Army "management," and to scientific and professional personnel in the behavioral and social sciences. Communication with the former is largely through such media as official ARI publications, less-formal written communications, and face-to-face briefings. Communication with the latter is accomplished primarily through journal articles, papers, and professional interactions.

²⁴Ibid.

²⁵U.S. Army Research Institute for the Behavioral and Social Sciences, Research Themes and Technological Base Program in Behavioral and Social Sciences for the U.S. Army, 1975 (Arlington, Va.: U.S. Army Research Institute for the Behavioral and Social Sciences, undated), p. ii.

Utilization of research results is an important concern for ARI management and staff. In this connection, ARI regularly allocates up to 15-percent of its resources for Technical Advisory Services (TAS).²⁶ The predominant TAS activity is helping a potential user implement a research-based recommendation or utilize some research product. Other TAS activities include formal briefings on technical topics, ARI representation on Army boards, and both short-term and long-term consultation in areas of ARI expertise. The Institute has also created a special category of document, the R&D Utilization Report, which presents background, procedures, results, and utilization (both immediate and potential) of selected research projects. These reports not only describe how particular research findings have already been incorporated into Army operations, but also show how additional implementation might be achieved. In this manner, ARI both documents what has been accomplished and also increases the likelihood that the Army will get additional payoff from a research undertaking.

Combat Arms Training Board

By 1970, the Army's institutional training was significantly different from what it had been 15 or 20 years earlier. The most pronounced change to have occurred was the Army's adoption and implementation of a systems-engineering approach to curriculum development.²⁷ However, unit training had not changed very much since World

²⁶J. E. Uhlener, interview, 11 March 1977.

²⁷This approach to course development had been mandated for the Army's schools and training centers by the U.S. Continental Army Command in CONARC Regulation 350-100-1, Systems Engineering of

War II. It was still governed by Army Training Programs and Army Subject Schedules imposed upon the units, regardless of their specific training needs, by higher headquarters following directives for mandatory training imposed by even higher headquarters.

In 1971, the Army Chief of Staff abolished the concept of mandatory training imposed by higher headquarters and decentralized responsibility for training management down to the commanders of battalions and even smaller units. He further ordered that these commanders not be given specific training directives, but be given mission-type instructions instead. This meant that commanders were told what level of readiness was expected of their units, but were given freedom to train their men toward that level in their own ways. It would be up to the commander to estimate his own unit's situation, to conduct the necessary training, and to periodically appraise his unit's readiness--both in terms of individual members and of the unit as a whole.

At the same time, the Chief of Staff appointed a Board for Dynamic Training to conduct a worldwide study of Army training and training management, and to make recommendations for improvements. The Board made its report in December 1971.²⁸ Its major recommendation was for the establishment of a Combat Arms Training Board to provide training assistance to units, to expedite development

Training (Course Content), 1968. The regulation was developed by a group of Army Service School educational advisors with the technical assistance of a senior staff scientist from the Human Resources Research Organization, Dr. John E. Taylor.

²⁸[Brig. Gen. Paul F. Gorman], Report of the Board for Dynamic Training (Fort Benning, Ga.: Board for Dynamic Training, 19 December 1971). The report is composed of six volumes.

and distribution of training literature and materials, and to better link units with Service Schools for the solution of training problems.²⁹

The Combat Arms Training Board was established in December 1971 as a development, rather than a research, agency. It was to "collect, publish, and disseminate to combat arms units in the form of informal training literature, or otherwise communicate descriptions of, those approaches to training which have worked well for some unit or units and should be made available to others--commendable training techniques, training devices, or training management." Also, to "monitor, and sponsor when appropriate, research, studies, and tests designed to promote improved training in combat arms units."³⁰

Among the activities in which the Combat Arms Training Board has engaged have been the following:

- a. Training Extension Courses (TEC) was one of the first initiatives generated by the CATB. After testing and validating the TEC program, it was established as a major effort of the entire TRADOC community and was transferred to the Training Support Center (TSC) for full implementation, distribution and control.
- b. Instructional Systems Design (ISD) was a civilian educational approach that was identified and initiated by the CATB as having application to Army training which has grown in magnitude and acceptance throughout the Army to such a degree that all TRADOC service schools are engaging in ISD training for doctrine and course developers.

²⁹Personal communication to the author from Lt. Col. Godwin Ordway, III, Chief of the Training Concepts and Operations Division, Combat Arms Training Board, Fort Benning, Ga., 14 March 1977.

³⁰U.S., Department of the Army, U.S. Army Combat Arms Training Board (Washington: Department of the Army, 11 May 1972), Army Regulation 10-2.

- c. The Army Training and Evaluation Program (ARTEP) was another effort of the CATB which results from the Army ISD approach to training. The concept testing and validating was a requirement for CATB, and was then passed to each proponent service school.
- d. Another area energized by the CATB was in the field of training devices. Our interest and involvement ranged from GTA's to television cameras. TRADER, another directorate of TSC was an outgrowth of the device team at CATB. They, too, are now assigned to TXC at Fort Eustis.
- e. A new approach to Army training literature was initiated at the CATB. It has evolved into almost a total revamping of the Army's training literature to include content, methodology, and approach--TC's, FM's, TM's, etc.
- f. In the area of Army training research, the CATB identified and contracted research requirements to support many areas of proposed training initiatives for both present and future needs of the Army.³¹

The current primary focus of the CATB is on training management, particularly as this responsibility is exercised at the unit level. The findings of training research and the wisdom and experience of military experts are being combined into a new manual on this subject, as well as into other CATB-developed training management tools.

Training Management Institute

Another new organization created by the Army that is parallel in many ways to the Combat Arms Training Board is the U.S. Army Training Management Institute (TMI). Whereas the CATB focus is on improving unit training, TMI is primarily concerned with improving the content, approach, and methodology of training conducted in the Army's service schools.

³¹Lt. Col. G. Ordway, personal communication, 14 March 1977.

The U.S. Army Training and Doctrine Command created TMI in July 1975 because its schools had not been aggressive enough in employing modern instructional approaches, that is, in using the products of training research the Army had been conducting and supporting for the preceding quarter-century. Like CATB, TMI was created to fulfill the role of "translator"; that is, to so package "instructional technology" that the service schools could use it without much difficulty.³²

TMI initially consisted of a small task force which launched several pilot instructional projects through contracts with civilian firms. However, its major task was to develop a complete individual-training plan to support the Enlisted Personnel Management System (EPMS). The key concept was that of a "life cycle MOS training plan."

Another major TMI effort was to bring about much greater use in the Army of self-paced courses, but to do so within the framework of systems-developed training (i.e., performance-based, criterion-referenced training). Initially, Army courses were prepared in self-pacing form by outside contractors. More recently, TMI has been attempting to develop in-house self-pacing capability in the service schools, and has developed and conducted workshops for course developers who are involved in this work.³³

³²U.S. Department of the Army, memorandum from Col. Frank Hart, Director of the Training Management Institute, to Maj. Gen. Paul F. Gorman, Deputy Chief of Staff for Training, Headquarters, U.S. Training and Doctrine Command, subject: "TMI Status Report," 2 November 1976.

³³Ibid.

TMI has also been developing staff-and-faculty improvement programs for the Army's service schools. This program involves conducting several different workshops, ranging in extent from two days (for managers) to three weeks (for practitioners).³⁴

Training Support Center

The newest, and most elaborate, instrumentality the Army has created for improving its training programs through the use of training research, is the U.S. Army Training Support Center (TSC), which came into being on July 1, 1976, to replace the U.S. Army Training Support Activity (TSA). Both are lineal descendants of the U.S. Army Training Aids Management Agency and the CONARC Training Aids Agency. However, each change of name represented a broadening of mission--from a simple concern with training aids to today's consolidation and institutionalization of training technology in an exportable training management structure.

Activities which have been integrated into TSC include the Training Extension Course (TEC) program from CATB; the TRADOC Training Devices Requirements Office; and Army correspondence course program; the Army training literature program; the engagement simulation program; the Individual Training Evaluation Group (which supervises development and implementation of Skill Qualification Tests); and the Training Aids Service Officer program (which places liaison officers at each major TRADOC post to encourage use of training aids in

³⁴In developing its instructor workshops, TMI contracted with Dr. Robert Mager, an industrial consultant from Los Altos Hills, Calif. With help from TMI and CATB officers, Dr. Mager converted his program to Army-unique modules which TMI then tested and used in its own program.

various instructional programs).

The Training Support Center is concerned primarily with exportable training, i.e., with the centrally-developed tools and techniques a commander in the field can use to meet his training requirements, whatever they may be. The official TSC mission is "to provide Army-wide centralized management of training support activities. This includes development, production, procurement, and delivery of training support products in support of individual and collective training for all Active Army and Reserve Component Forces."³⁵ It is anticipated that the Training Support Center will continue to grow and expand by absorbing still other training-development agencies and by sponsoring a greater proportion of the Army's training research projects.

Summary

The past six years have seen numerous changes in the Army, in Army training, and in Army training research. One key change has been adoption of an entirely new Enlisted Personnel Management System, along with training and testing systems to support it. All three are based upon the results of personnel and training research conducted during the preceding thirty-five years, and all three are continuing to depend upon this kind of research support. The cumulative impact of this research became readily apparent as the Army shifted to a criterion-referenced, performance-based personnel-and-training management system.

³⁵U.S., Department of the Army, U.S. Army Training Support Activity Bulletin No. 76-2, February 1976.

During this same period, there was implicit recognition that the Army's process for getting research results applied needed to be improved. Old organizations received new and explicit missions, and new organizations were created to accomplish functions that either had been performed inadequately in the past, or not at all. Responsibility for all behavioral- and social-science research was vested in a single Army organization, the U.S. Army Research Institute for the Behavioral and Social Sciences. Translation, technological development, and dissemination functions were vested with such newly-created organizations as the Combat Arms Training Board, Training Management Institute, and Training Support Center.

The Army's behavioral-science research-into-practice system became, through evolution, a more thoroughly rounded and carefully articulated one. While individual organizations in the system are not quite coterminus with the functions to be performed, there has been at least implicit recognition that responsibility for these functions is best assigned to specific agents--that what is everybody's business is, in effect, nobody's business.

Insofar as the field of training research is concerned, the Army model for research-into-practice is primarily a linear one, featuring research, development, and dissemination. However, unlike the civilian counterpart of this model (RDDA), the Army model both begins and ends with the organization experiencing the problem(s) that activated the process. This point will be elaborated in the final chapter.

CHAPTER VI

SUMMARY AND CONCLUSIONS WITH IMPLICATIONS FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

Summary

The United States Army initiated a formal training research program in its air arm during World War II as part of a scientific effort to man its aircraft with the best-qualified and best-trained crews possible. Ten years later, in 1951, the Army inaugurated a research program on the training of ground troops, a program that has continued and grown in size and importance to the present day. The purpose of this study has been to examine the 35-year history of Army training research efforts, to describe how the current configuration of research-related Army agencies evolved, and to try to derive from the Army's experience some implications for the planning, management, and conduct of civilian educational research and development.

The focus of this study has been upon the organizations which have been, and are, involved in Army training research, and upon their relationships with one another and with the Army's training establishment.

In searching out data for examination, a model of the Army's research-into-practice process was used as a guide and framework. This model postulated four types of organizations, or organizations

performing four types of functions, as being "necessary and sufficient" for conducting training research in an operating, mission-oriented supra-system, and for getting the results of that research used to improve training practice. These are: (1) an organization that has or can pose a problem whose solution would result in increased efficiency in training; (2) an organization that can perform the required research and development activities; (3) an organization that can support with funds, materiel, and non-research manpower, the research and development activities; and (4) an organization that can act to cause implementation of a successful solution to the problem(s) originally posed.

The research approach taken combined aspects of both historical and case study methodology. Primary sources of data were official and unofficial records in the Army's files and in the files of the organization that was the Army's principal training research agency for more than two decades. Other sources included the U.S. Army Library, the archives of the U.S. Army Center for Military History, and the personal recollections of several individuals who played key roles in the Army's training research program over the past thirty-five years.

When the Army training research began during World War II, it was as part of a broader personnel research effort in the Army Air Forces Aviation Psychology Program. Because of the war, the need was urgent for information and recommendations to improve both the selection and training of air crews. The path a research product traveled to utilization was usually short and direct: from the research

laboratory to the training command headquarters and thence to operational units in the form of directives and instructions.

This wartime program was devoted exclusively to personnel and training problems in the Army Air Forces; there was no comparable program focusing on ground forces personnel. When the war ended, research on the training of air crew members continued in the newly-formed U.S. Air Force. For the ensuing five years, the Army had no training research program of consequence.

The Army did not really begin research on the training of ground troops until 1951. In that year, the Army contracted for establishment of a university-based, independent research-and-development organization charged with improving training. This relationship proved sufficiently productive for the Army and sufficiently satisfying for the researchers that it continues substantially unchanged to this day, even though the bulk of the work is now done by in-Service laboratories.

As a mission-oriented Governmental department, the Army sponsors training research to accomplish the practical purpose of improving Army training. This orientation, which has held firm over the entire 35-year history of the training research effort, has given the program its primary thrust toward problem-solving. Only secondarily have the program's managers been concerned with contributing to man's store of research-based knowledge. Recognizing this, the contract research organization shaped its practices to insure that the problems it studied were of direct interest to the Army, that its research results were packaged and presented in a form that would enhance their acceptability and utility, and that it would undertake a variety

of "change agent" activities to help the Army use its research products.

During the period covered by this study, the Army fought three wars and underwent several major changes in its approach to training. Before World War II, the then-small, all-volunteer force was trained primarily through apprenticeship, a largely unstandardized procedure. During World War II, the draft-swollen Army shifted to standardized curricula taught in centralized training facilities, a policy followed until the 1970s.

The manner in which the Army conducted its training was largely unaffected by training research in World War II (with the exception of some Army Air Forces training toward the end of that war). Neither was training during the Korean War noticeably affected by the results of training research. (An exception was the increased use of training aids produced for the Army by the Navy's Special Devices Center.) By the mid-1950s, however, important differences could be observed. For example, a new program of instruction in basic rifle marksmanship, which is required of every new soldier, was developed by the Army's contract research scientists and implemented throughout the Service. Other research-based changes in individual curricula followed. Then, in the late 1960s, the Army adopted a "systems engineering" approach to curriculum development for all courses of instruction, an approach based on training research and development.

When the Vietnam War ended and the draft was discontinued, the Army reverted to an all-volunteer force for the first time since the end of World War II. This transition was accompanied by several important changes in the Army's approach to training, changes which

have affected the entire Army training establishment. These include: (1) holding centralized (i.e., institutional) training to a minimum; (2) development of a system for upgrading the individual soldier's proficiency through training conducted in his unit; (3) emphasis in both institutional and unit settings on performance-oriented, criterion-referenced (i.e., competency-based) training.

The Army's training research program changed, too. Beginning in 1972, the Army took steps to achieve an approximately even balance between in-house and contractor-performed research projects. Training research was integrated with a distinguished, long-time personnel research program under a newly-formed Army institute. Several new internal agencies were created with explicit responsibility for developmental and dissemination functions believed necessary to achieve maximum utilization of research results. In this manner, the Army elaborated its training research and development system and placed additional emphasis on moving usable research results expeditiously and effectively into actual practice.

There is no indication in the record that, in creating new agencies and redistributing responsibilities, the Army was consciously following any preconceived model of the research-into-practice process. However, the system that exists today is an essentially linear one, beginning with a problem situation and moving through stages of research, development, test and evaluation, dissemination, and implementation. Despite changes which have occurred in the Army's training research system in the past half-dozen years, the elaborated model used to guide this study's

data-collection activities appears to be as accurate a description of the process today as it was almost a decade ago.

Discussion

This study was begun with the hope that it would be possible to identify some particular organizational arrangement or set of functional relationships in the Army training research system that so obviously and reliably contributed to the system's productivity that, with due concern for differences between Army training and civilian education, they could be adopted by or adapted to the civilian educational research system. However, an unanticipated problem arose as soon as an attempt was made to compare the two research domains. There do not appear to be any conclusive assessments available of the productivity of either system.

The major problem has been noted by Bhola:

Evaluation requires measurement; measurement requires detection; and detection presupposes operational definitions and taxonomies. . . . Unfortunately, in the area of social change and innovation-adoption processes, we seem to have no lively tradition of research or action involving measurement, evaluation, and prediction.¹

The problem has been voiced even more explicitly by Clifford:

To establish the facts of the impact of educational research upon teaching itself, to advance quite certain proof, and to reconstruct a relationship of cause and effect is a near impossibility. If either the praise (including contracts, royalties, promotions) or the blame accorded educational research depended upon the existence of hard data on its impact upon schools, there would be little of either.²

¹Harbans S. Bhola, Innovation Research and Theory (Columbus, Ohio: School of Education, Ohio State University, 1965), p. 92.

²Geraldine J. Clifford, "A History of the Impact of Research on Teaching," in Second Handbook of Research on Teaching, ed. Robert

The productivity of Army training research, too, has been questioned, particularly in terms of its utility to, and utilization by, Army training managers. A recent report from the General Accounting Office³ traced the Services' use of some 374 reports on human resources research, predominantly in the training research field. GAO reported that 38-percent of these reports had not resulted in Service implementation actions and, on that ground, criticized Defense management of the program.

Attempting to assess the productivity of a research and development program by counting instances of use or non-use of research reports appears to be entirely inadequate. A report that did not get used might only have proposed a new program for annually training 100 mess-kit repairmen, while one that did might have led the Army to redesign its entire approach to training men of limited mental ability. The accountant's ledger would record one minus and one plus, but this would clearly be an inappropriate assessment of the impact of the program (i.e., its "productivity").

Similarly, many observers of the civilian educational research scene have commented that the importance of this research is not solely that it produces individually useful innovations, but that it influences educational practice by creating new concepts (of students, teachers, curricula, and instruction), and that it has

M. W. Travers (Chicago: Rand McNally College Publishing Co., 1973), p. 3.

³U.S., Comptroller General, Human Resources Research and Development Results Can Be Better Managed, Report to the Committee on Appropriations, U.S. House of Representatives (Washington, D.C.: Comptroller General, 22 April 1977).

this effect by virtue of its accumulated weight of evidence rather than through individual projects, one by one.

Given this situation, it would appear that attempts to evaluate both Army training research and civilian educational research would have to be in qualitative rather than quantitative measures. In these terms, it would appear that the Army's program has been the more productive of the two in affecting instructional practices in their respective parent systems. Army training today is substantially different from that of 25 or 35 years ago. The changes have been in directions recommended by its training researchers, toward: individualized instruction, performance-based training, job-related evaluation systems, and promotions based on demonstrated skills and knowledges. On the other hand, public schools today are not significantly different from those which existed twenty-five or thirty-five years ago. Classrooms are dotted with new equipment, and teachers and administrators appear to be aware of the latest innovations, but the basic approach to instruction and evaluation has changed relatively little.

A Training Research Model

The Army's system for conducting and sponsoring training research appears to have evolved without reference to any model of the research-into-practice process beyond that of trial and error, impelled both by DoD funding policies and the researchers' desires to do things which would make a difference. However, if one examines the procedures followed by both the Army's contract training research agency (1951-72) and its own in-house research institute (1972 to

date), a descriptive model can be developed. The criterion for including or excluding an activity from this research-into-practice model is its purpose. If its primary purpose is somehow to improve instructional practices in the Army, it is eligible for inclusion.

The Army's research-into-practice process begins with a problem. In Army jargon, the starting point is a military requirement, "an established need justifying the timely allocation of resources to achieve a capability to accomplish approved military objectives, missions, or tasks." The formal process of establishing a military requirement for training research is detailed in Army Regulation 70-8. Each problem is identified by (and with) a specific Army element (e.g., school, division, headquarters). Thus, there is an interested audience for the research the requirement generates, and a likely user of research products if positive results are obtained. A research requirement may arise anywhere in the Army, and therefore no single organization or type of organization is identified with the problem-posing function.

The second stage of the process is conduct of research. This effort might begin with "fundamental" research, but this would be relatively rare. Army-sponsored fundamental research in training is most often conducted as part of a "Themes" program, and not as part of the research-into-practice process. Sometimes, fundamental research is part of the process as, for example, when applied research has been started but has come up against some gap in the necessary knowledge base. However, in almost every case, the work begins as an "applied" activity. The Army defines this as Exploratory Development, directed toward producing and evaluating the "feasibility,

practicability, and parameters of proposed solutions to specific military problems--short of major development efforts." This stage of the process is presently identified with the U.S. Army Research Institute for the Behavioral and Social Sciences and its contractors.

The next stage of the process is "development," which involves the systematic use of research-based and other knowledge in production of, or improvements in, new instructional methods, systems, materials, or devices the Army can use. A problem arises in trying to fix a locus for this activity. While it is true, conceptually, that development is separate from and usually follows research, the border between these two activities is clearly permeable. In the course of establishing the feasibility of a particular solution to an Army training problem (a research activity), the research agency must frequently develop a prototype solution to test. Until quite recently, it has been these prototypical, experimental solutions that Army operating elements have tended to adopt, rather than any "product" engineered after research was completed. The process of applied research is intermingled with development, and most performers will freely admit that in such work they not only draw upon the results of basic research, but upon a variety of other sources of knowledge, including experience--their's, their colleagues', and that of competent military experts.

However, most development work is no longer done by the research agencies. In recent years, the Army has established several new organizations to accomplish the development function. Here, too, sources of knowledge other than research are commingled with research

results to produce both products and procedures for improving Army instruction. These agencies include the Combat Arms Training Board, the Training Management Institute, and the Training Support Center. As has been true for many years, Army Service Schools continue to play a key role as developers of instructional materials and methods.

The next stage in the research-into-practice process is that of adoption. This is both simpler and, at the same time, more complex than might be imagined. In the Army, a new research-based product or process can be adopted at the decision of a single individual, the commanding officer of the particular organization to which the innovation has been proposed. However, Army decision-making is not as simple as might be presumed from this fact. A commander almost always seeks the advice of his staff members. Further, he almost always obtains the concurrence and/or comments of the chiefs of those elements of his command most likely to be affected by any decision to institute a significant change. He may also have to seek support from a higher headquarters if adoption requires resources he does not control. Since Army training feeds graduates into Army operational systems, consideration will usually be given to any impact proposed changes might have on the Army's operating elements. Consequently, although one individual has the authority to say "yea" or "nay" to an innovation, his decision is invariably informed by the views of numerous subordinates and superiors.

The Army's research-into-practice process does not end with adoption. All of the research and development agencies which have a hand in the process have responsibilities for helping adopting organizations make the innovation (product or process) "work right."

This is done through a combination of consultation and technical advisory services, and may include a wide range of support activities. In this stage of the process, R&D agencies often learn of problems in the innovation that need to be ironed out. They may also learn of other problems that call for additional research and/or development. It is this "feedback" link that converts the linear RDDA model into a circular or, perhaps, spiral one insofar as Army training research is concerned.

To depict the Army's research-into-practice model graphically would almost require a three-dimensional paradigm or schema since the problem (or "military requirement") which energizes the system impacts upon and influences every stage of the process. Although the researcher may attempt to satisfy his personal curiosity or to work at theory-building, and although the developer may contemplate the potentially general applicability of his product, all activities are driven by, and eventually evaluated in terms of their contribution to solving the original problem.

The Army's training research system, like a work of architecture, is one in which "form follows function." That is, the research agency has been tailored, and special organizations have been created, to perform the necessary functions, as their necessity has become established. It should be noted, however, that the system is a dynamic, rapidly-evolving one. Several of the newly-created organizations are less than two years old and, at this writing, additional mergers and realignments are being considered.

On Deriving Implications

As stated earlier, one major purpose of this study has been to derive implications from the Army's experience with training research for the planning, management, and conduct of civilian educational research and development. A set of implications will be presented in the next section. However, several preliminary observations would appear warranted.

The process of deriving implications from this study's findings is not entirely straightforward. As Sieber has pointed out:

The translation of social research into recommendations for action is a process which is shrouded in mystery. The main reason for this state of affairs is that detailed accounts of how recommendations actually grow out of research findings have not been written.⁴

And, later:

In approaching this subject [the interplay between research and action], we should first recognize that facts do not speak for themselves anymore than they can be collected without the aid of a conceptual framework. Indeed, there is always an element of personal judgment involved in drawing up recommendations based on empirical research. Without the ability to size up a complex situation and to focus on those factors which have a high probability of effecting change, there can be no recommendations--there can be only summaries of results. In exercising the judgment required for drawing up recommendations, one's personal experience and values often come into play. In short, the vital step between facts and implementation cannot be taken without the help of personal judgment and perspective.⁵

This problem has concerned theoreticians as well as researchers. In a recent issue of Educational Theory, Tostberg has observed:

There appear to be at least two ways in which "implications" could be understood, as it enters into such talk about education. One, a lay or ordinary sense of "implications" might reasonably be taken to mean "suggestions." "Hints," "clues," and

⁴Sieber, Organization of Educational Research, p. 342.

⁵Ibid., p. 354.

"intimations" would be suitable substitutes. The point made by each of these terms is that guidance for the conduct of education, though in some way "contained" in the antecedent collections of knowledge and belief is not expressed directly, not made explicit. By a reasonable turn of mind, that guidance could be said to be implicit. It is usual and acceptable, then, to talk in this inexact way about "educational implications."

A second sense of "implication" is that employed in saying that, given certain knowledge or value beliefs, prescriptions for educational practice necessarily follow from them. In this technical sense, it means "entailment" or "logical implication." These two meanings--the ordinary and the technical--are easily mistaken for each other in the imprecise formulations that are typical of much that is said about education. . . . unless some other, satisfactory account of the relationship between descriptive and normative ["ought"] statements about education can be given, there is serious doubt about the contributions to be made by both philosophy and science to the direction of education.⁶

Tostberg goes on to present a philosophical/logical argument to reach the conclusion that ". . . it is possible to formulate and hold prescriptions for the conduct of education which are empirically informed and logically warranted . . . in cases of successful justification, where grounding concepts supply the necessary logical connection."⁷

Scientists conducting training research for the Army have had to face the same problem in terms of when and how to make recommendations for changes in Army training practices on the basis of their research findings. In HumRRO, nearly two decades ago, it was decided to distinguish three degrees of advocacy: recommendation, implication, and suggestion.⁸ "Recommendation" was reserved for

⁶Robert E. Tostberg, "Observations on the Logical Bases of Educational Policy," Educational Theory 25 (Winter 1975):74-75.

⁷Ibid., p. 82.

⁸John L. Finan, Advisor on Research, to Meredith P. Crawford, President of HumRRO, memorandum, 17 March 1960.

advocating action when two conditions had been met, (1) the conclusions on which the recommendation was based were reliable for the operational purposes which generated the study; and (2) HumRRO had evaluated the system environment and felt in a reasonable position to rule out factors which would interfere with or degrade the performance of the component (the "packaged" program) when it was articulated within the broader operational system.

"Implication" was used to denote a second, somewhat lower, order of advocacy, guaranteeing the reliability of the conclusions of a research effort, but falling short of providing a determinate basis for forecasting success of the component under the environmental conditions provided by the operational system.

The term "suggestion" was used to denote a still lower order of advocacy. HumRRO defined "suggestion" as referring to a possible course of action which, although logically related to the research results, was not rigorously derivable from the original observations.

In later years, HumRRO scientists eschewed inclusion of any statements of advocacy in their research reports. They came to believe that, as research scientists, they seldom had an appreciation for all of the complex factors facing the Army official who had to decide whether or not to implement a research-based innovation. They preferred to present their findings to the decision-maker as information on ways of achieving certain levels of soldier proficiency at given costs of time, money, equipment, and personnel. The official could combine this with other information available to him in reaching his decision. In this role as an information-provider, the scientist was more often a "catalyst" to action than a "prime mover."

Using the HumRRO three-level schema of advocacy, this study will offer recommendations only for "needed additional research." No higher level of advocacy than "implication" is warranted on the basis of this study. Applying the distinction Tostberg makes between ordinary and technical use of the term "implication," the implications offered in the next section would have to be categorized as "ordinary."

Implications

The major implications to be drawn for civilian educational research from this study of the Army's experience with training research would appear to apply primarily at the national level of concern.

1. The systemic qualities of the "national educational R&D system" should be strengthened. This would appear to be a responsibility that only the Federal Government could undertake. The National Institute of Education has already been charged by law (P.L. 92-318) to ". . . build an effective educational research and development system."

Rationale. One key characteristic of the Army's training research system has been that each new organizational element involved in the research-into-practice process has been fitted into that process (i.e., system) with a clearly defined relationship to other system elements. Responsiveness to a common set of goals and coordinated effort governed by a common set of regulations appear to have been factors contributing to the system's success in getting research results implemented. The system is a dynamic one that is

constantly being "fine tuned" on the basis of evaluations of its effectiveness, with agencies being created or disestablished as experience dictates.

This does not appear to be the case in the civilian educational R&D arena. As Guba and Clark observe:

It is certainly not the case that there is some common objective, goal, or output to which the many agencies involved with educational KPU are committed. Can one really believe that local school systems, state departments of education, universities, regional educational laboratories, research and development centers, and private R and D agencies, to name only the most obvious educational agencies, are or could be committed to the same KPU output; or that these agencies can be linked in the sense that what are outputs for one agency become the inputs for another; or that there exist a set of cooperative modes which these agencies can and will adopt that will make linkage possible; or that the sanctions (reinforcements and deprivations) to which these agencies respond can all be enlisted in support of a national KPU system; or that the needed resources are sufficiently flexible within these agencies, and sufficiently transferrable among them, so that they can be well utilized in support of the common objective? Surely not!⁹

One can accept this lengthy rhetorical question as an accurate description of the current state of affairs without affirming the immutability of the situation, particularly given a firm Federal policy to strive for "systematizing the system." In fact, the Guba and Clark litany provides policy-makers with a ready-made list of potentially high-priority areas for attention.

2. Before new policies are effected with regard to the "national educational R&D system," there should be developed a firm conceptualization of this "system" and its constituent elements and relationships. Such a conceptualization (model or models) should

⁹Guba and Clark, The Configurational Perspective, pp. 29-30.

take into account "what is" as the current stage in a march toward "what ought to be."

Rationale. Even though the Army's training research system has evolved without apparent reference to any formal model, it can be seen that an implicit model has been followed in the system's development. It is at least possible that the current, elaborated system would have come into being sooner had the model been made explicit.

Given the multijurisdictional nature of American education, it is unlikely that there can ever be a complete, formal, maximally effective and efficient national educational R&D system. However, Federal education policies inevitably impact upon agencies within the system, and such policies should be planned and promulgated within a consistent, coherent framework.

As Churchill commented:

A survey of the current literature on educational research and development in the United States reveals that almost all studies have been undertaken to serve purposes narrower than those laid down in the legislative mandate for NIE. None seemed to be comprehensive enough to serve as a long-term planning and research framework; . . .¹⁰

And as Sieber has observed:

Lurking behind the discussion of current problems of educational R&D, and indeed only partially apprehended by the field, are certain assumptions about what constitutes a "national R&D system" in education. To my knowledge, these assumptions have never been spelled out, . . . A national R&D system is something that NIE is mandated by Congress to nourish and bring to fruition, something which nearly all endorse--and yet no one seems inclined to define this system.¹¹

¹⁰Stacy Churchill, Modelling a National Educational R&D System: A Conceptual Framework (Ontario, Canada: Ontario Institute for Studies in Education, 1974), p. 2.

¹¹Sam D. Sieber, "The Requirements of a National Educational R&D System," Educational Researcher 4 (December 1975):3.

The NIE has taken steps to assemble information on those elements of the national educational R&D system that now exist. This information is presented in the 1976 DATABOOK, a companion volume to the 1975 Annual Report of the National Council on Educational Research. However, this work does not live up to its subtitle as a report on "The Status of Education Research and Development in the United States" because it overlooks educational research being accomplished in both the military and industrial sectors. An expanded, truly inclusive version of this type of status report could form a partial basis for modeling the current national educational R&D system.

3. The Federal Government should develop formal procedures for identifying special problem areas in education and for establishing priorities among them. This would appear to be a proper assignment for the National Institute of Education or the newly-created Federal Council on Educational Research and Development, which is chaired by the Director of the National Institute of Education.

Rationale. The Department of the Army encourages all field elements, and even individuals, to submit for high-level consideration any training problem for which training research and development would seem to be appropriate. Individual problem statements are grouped into problem areas which are then reviewed by a committee of senior officers at Army headquarters. Problems which survive this screening are ranked in order of importance, and are referred to research agencies to be undertaken insofar as funding for research is available. In assigning priorities, the Committee not only

considers the problems themselves, but also the likelihood that they can be solved within the current state-of-the-art and their relevance to Army plans for the future. This review takes place within a framework provided by a DoD-wide Technology Coordinating Paper which provides a summary and analysis of the entire training research area.

Similarly, in civilian education, there are more problems in need of solution than there are funds and other resources to undertake. The Federal Government is the major supporter of educational research in the Nation, and the NIE has the major responsibility for managing the Government's educational research program. To fulfill this assignment, NIE has formed six program groups to focus on particular problem areas. These groups conduct a contract and grant program within guidance provided them by the NIE Director. A recent study by the General Accounting Office found the guidance inadequate and the program group efforts diffuse.

We reviewed the planning activities of the program groups and found that their goals and subgoals were also broad. For example, one group's goals were to (1) improve the knowledge about the relationship between education and work . . . NIE officials agreed that the group goals lacked necessary quantification and that the degree of their specificity varied. . . . We believe, and agency officials concurred, that NIE should attempt to formulate more specific goals within program groups. By not having more specific goals, the program groups have difficulty focusing their research projects. A recent evaluation of NIE by a panel of independent consultants also concluded that the staff appeared to have differing perceptions of the major role of the agency and to be uncertain about how individual projects related to overall goals.¹²

¹²U.S., Comptroller General, Social Research and Development of Limited Use to National Policymakers. Report HRD-77-34. (Washington, D.C.: Comptroller General, 4 April 1974), p. 15.

4. Once priority problem areas in education have been systematically identified, the Federal Government's support of research in these areas should be on a programmatic basis. Government solicitations for research proposals should reflect this programmatic concern. Even the Government's funding of unsolicited proposals should give priority to those which would support the programmatic emphases.

Rationale. Problems in training and education are usually complex and will not yield to unitary, or even multiple discrete, attacks. The Army experience has been that broad problems in training are best solved by means of a program of interrelated projects, continued over a relatively extended period of time, by personnel who are not only skilled with regard to research methodology, but who also are increasingly familiar with the organizational element having the problem and with the problem area itself.

In the civilian educational research domain, the policy of the Federal Government was originally to fund research proposals submitted by researchers of good reputation, regardless of the subject area. The expectation was that, given time and resources, "a good man would produce good and useful results." Beginning in 1963, and accelerating in 1965-67, the emphasis shifted to support for research organizations with programs in specific problem areas; e.g., the R&D Centers and the Regional Educational Laboratories. The improvement brought about by this shift in policy, or by the manner in which the policy has been carried out, has not been entirely satisfactory. As recently as 1975, a panel of independent consultants examined the NIE's funding policies and commented:

We support strongly the problem-focus and regard the problems chosen as significant and needing attention. . . . we would welcome even sharper definitions of NIE targets, based on assessment of areas where the strongest impacts could be made with limited funds. . . . In the climate of tight money and demands for clarity now pressed on NIE, we see no alternative to such a policy of focus, no way that NIE could spend major funds, for example, simply according to scientific disciplines . . . In view of our concern about gaps in the coverage of present problem-areas, it seems to us that in developing plans for work within each problem-area, some more formal advisory or intelligence system could be at work to insure that the definition of the problem stays "real" and current with the state of the education system. . . . we sense that there is no long-range planning process either for changing the mix of activity within a problem-focus, or revising the overall set of problems.¹³

5. The Federal Government should develop and operate a system for providing management-type information on the nature, scope, magnitude, and future direction of ongoing research and development projects in education. Such a management information system would be extremely useful in program planning, decision-making, and in evaluating ongoing research and development efforts. It should also facilitate the coordination of such efforts among the Nation's various educational R&D agencies and organizations.

Rationale. One function of the Army R&D Information System is to mesh with the Department of Defense R&D Program Planning System in developing and maintaining a computer-based R&D project-planning data bank. All training research projects undertaken or funded by the Army are recorded in standardized fashion on special forms, providing information which is fed into the data bank. Periodically,

¹³[Roald F. Campbell and others], R&D Funding Policies of the National Institute of Education: Review and Recommendations. Final Report of Consultants to the Director and the National Council on Educational Research. (Washington, D.C.: National Institute of Education, August 1975), pp. 49-50.

and on demand, information about ongoing projects in definable areas is collated and made available to DoD and Army policy-makers. This provides the policy-makers with relatively current status reports on ongoing projects to match the information on completed work available to them through the Defense Documentation Center.

In civilian education, the Educational Resources Information Center (ERIC) provides information on completed educational R&D projects, especially those supported by Federal funding. However, there does not now exist any data bank which provides corollary information about ongoing work. (The Smithsonian Science Information Exchange attempts to maintain information on projects under way in most scientific fields, including education, but collects its data on a voluntary--and, therefore, incomplete--basis.) Too, any data bank supplied with information only on Federal-funded projects would provide an incomplete picture of the true national situation.

Even accurate information on Federal funding of educational research and development is hard to come by. As Mason explained in an internal NIE memorandum:

Unlike other aspects of educational R&D, for which data are largely lacking, resource data are available. Unfortunately, different sources of data vary considerably in scope, definitions, and level and aggregation and must therefore be interpreted with great caution. For example, if one asks what proportion of federal funds for educational R&D is provided by NIE, several answers are possible. . . . In order to obtain a clear picture of the federal effort, much more detailed classification of activity in terms of educational problems, target group characteristics, etc., is necessary. For this, project level data are needed. . . . The idea behind [a national current-projects data bank] is basically simple: to provide information to make utilization of resources more effective, while enabling broad monitoring of national educational R&D activities.¹⁴

¹⁴[Ward Mason], "Monitoring and Improving the Education R&D System," Interim Report on Council Resolution 19.1, from the National

6. In cooperation with the States, the Federal Government should establish a "county agent" type of extension service, providing technical assistance to school districts, schools, and individual teachers having problems for which completed R&D projects have produced at least tentative solutions. In essence, this would be a "linkage" service between information sources and educational personnel, encouraging initiation of new programs and procedures, and improvement of existing ones.

Rationale. In the Army's training research program, there has long been a category of effort known as Technical Advisory Services. Neither research nor development, but a form of consultation, this type of support has been provided the Army (1) when sufficient information was readily available to supply a sound answer to an Army training problem; (2) when, because of time pressures, the Army urgently needed a "best available" answer to some question or problem; and/or (3) when the Army requested help in implementing some research-based training innovation. The requesting Army elements have found this type of service to be of immediate and direct use, and the research organizations have found that it affords a natural opportunity to bring their previous research findings to bear on current Army problems.

In civilian education, few state departments of education are organized or staffed to provide this kind of technical assistance to their school districts, schools, and teachers. However,

If the role of users in the process of change can be restructured so that they develop the capacity to make choices

Institute of Education for the National Council on Educational Research, 26 March 1976.

and then use technology for desired ends, technology may serve as an inventory of innovations, information, and instructional options.¹⁵

For the past decade, the ERIC system has provided a national repository of reports of the results of educational research and development, forming a rather large corpus of "educational technology." But,

It should be noted that the highest frequency of ERIC use has been among college and university students. . . . Based on gross estimates of total users in an average week, it would seem that less than 2 percent of the nation's classroom teachers per week in 1970 drew upon ERIC. . . . Further, ERIC users among local educators are clustered disproportionately in the large districts. . . . Obviously, the ERIC system and other resources will not reach the classroom teacher without the intermediary of extension agents with teaching backgrounds.¹⁶

In 1970-71, the U.S. Office of Education selected three states for a Pilot State Dissemination Program utilizing extension agents to deliver the resources of ERIC and other knowledge bases to teachers in individual schools. Sieber and a group of colleagues were awarded a USOE contract to evaluate the effectiveness of this pilot program. They concluded:

. . . that enlightened educational reform at the local level depends upon three things. The first is access to the national pool of research and other exemplary information. Second is extension agents who are able to help clients determine their needs over time in interaction with data and ideas, and to assist them in using information addressed to these emerging needs. And third is the opportunity for clients to define their own needs and to choose from an array of options or alternative solutions.¹⁷

¹⁵Michael Fullan, "Overview of the Innovative Process and the User," Interchange 3 (Feb-Mar, 1972):37

¹⁶Sam D. Sieber, "Trends in Diffusion Research: Knowledge Utilization," Viewpoints, Bulletin of the School of Education, Indiana University, 50 (May 1974):69, 74.

¹⁷Ibid., p. 80.

Although the three states, individually, and Sieber and his colleagues as evaluators, adjudged the program to be a success, no further steps appear to have been taken by USOE (or by NIE, which has been created since the pilot study was completed) to follow through with plans for implementing such a program on a nationwide basis.

Recommendations

As has been suggested, the recommendations offered by an investigator should carry a higher degree of advocacy than his statements of implications. Given the wide differences between the parent systems served by Army training research and civilian educational research, the only recommendation one can feel justified in offering the civilian domain on the basis of this study is the traditional one calling for "more research."

It would obviously be helpful to have research projects similar to this one undertaken on the training research systems of the other three Services: the Navy, Air Force, and Marine Corps. This would make it possible to determine which organizational and functional aspects of the Army's system are unique to that Service and which are common across all Services. It may be that there is a single model of military training research-into-practice. If so, this would appear to lend additional weight to the implications set forth in the preceding section.

Similarly, research should be undertaken to discover the pattern of training research followed in American industry. A great deal of highly organized training research and development activity occurs within industrial settings, and this work and its results and

utilization are frequently overlooked by those who are studying the national educational R&D system.

When new conceptualizations of this national system are developed, research will obviously be required on the system as a whole and on its constituent elements. Such research should focus not only on the institutional agencies and their interrelationships, but also on the functions they perform (e.g., research, development, dissemination, diffusion, adoption). It is important that such research be specific to the educational R&D system. Educational organizations differ in many important ways from farms, underdeveloped communities and nations, and small ad hoc problem-centered groups. Yet many models of the planned-change process proposed as guides to educators were originally developed in the fields of agriculture, cultural anthropology, and social psychology. The applicability of these models to American education, and prescriptions derived from them, are currently a matter for conjecture.

More research is needed on the research-into-practice and KPU processes, in both military training and civilian education contexts, for it is a legitimate specialty in its own right. Science typically proceeds along a path that runs from description to understanding to prediction to control. In their desire to make these processes more effective in education, many individuals appear to have gotten out of sequence. They have proposed strategies for controlling the process before it has been adequately described or understood, much less reached a state of predictability or control. As a result, both their findings and their prescriptions are

equivocal. The state-of-knowledge about KPU appears still too primitive to permit truly useful generalizations.

Finally, research is badly needed to establish tools and techniques for evaluating and monitoring the national educational R&D system. At present, it is difficult to determine the effects that particular Federal policies have on the system's elements and functioning. It is not enough simply to assemble descriptive information on the system in time-series fashion, although even this would be helpful. Ways must be found to measure both the system's impact upon American education and its effectiveness in achieving this impact. Within the past decade, several new evaluation techniques (e.g., network analysis, goal-attainment, and decision-theoretical approaches) have surfaced in other social research fields. It is highly likely that some of these techniques would be useful in assessing the national educational R&D system, but situation-specific research appears necessary to determine whether this is true and, if so, which approaches are the most productive.

Conclusions

Over the past thirty-five years, the Army has developed a training research-into-practice system that appears to be increasingly productive in terms of improving the Army's training system. As this system has evolved, and as new needs became apparent, the Army responded by allocating the fiscal and manpower resources to meet those needs. With its predisposition toward utilizing the results of hardware-oriented research and development, the Army has provided a receptive field for innovations resulting from training

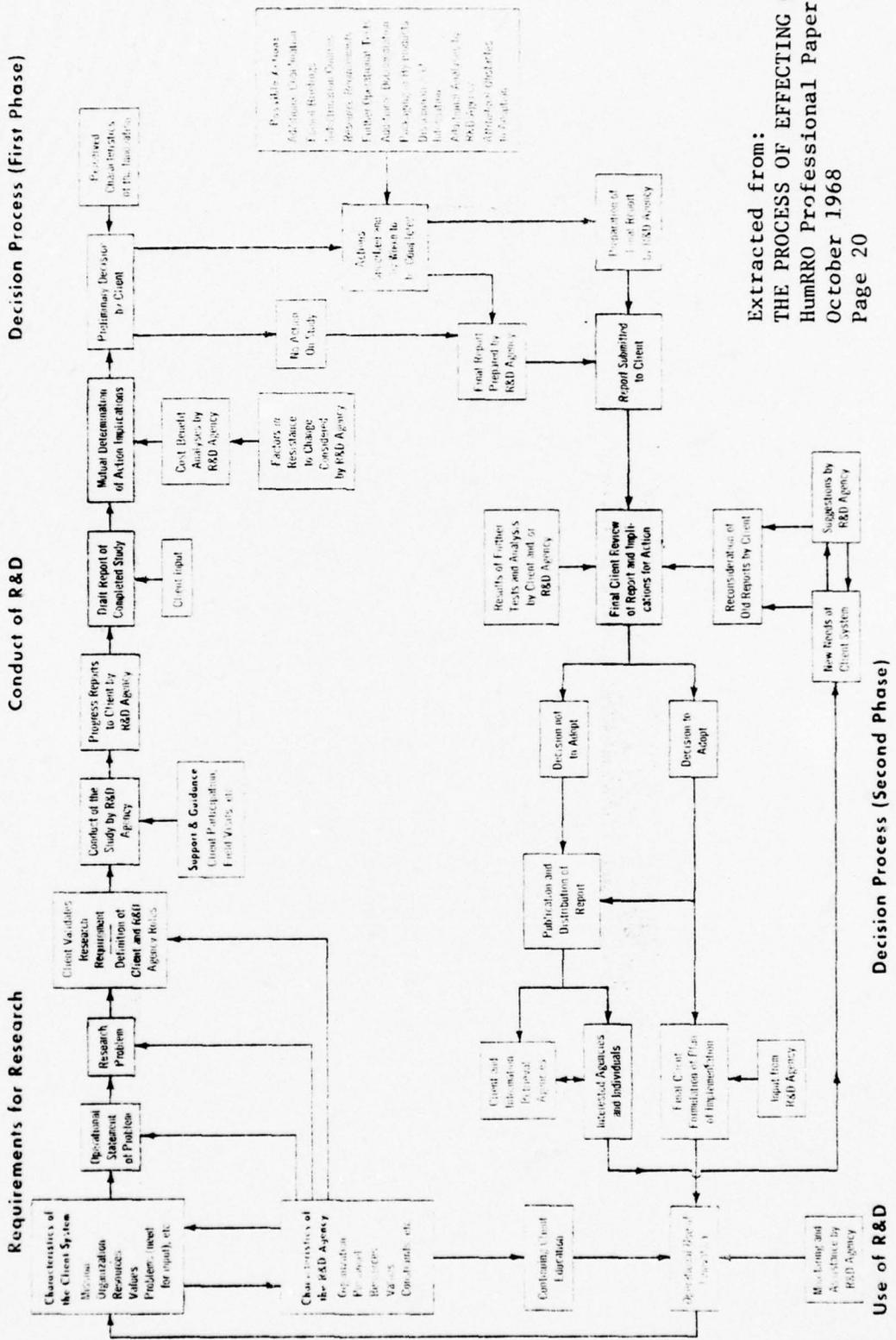
research. This receptivity has "paid off" for the Army, since research-based training innovations have reduced the costs of training (in terms both of dollars and other resources), have conserved training time, and have produced improved trainee on-the-job performance. Perhaps the key characteristic of the Army's training research-into-practice system has been that it has been organized, and has behaved, as a system.

While substantial differences between the Army's training system and the civilian educational system prevent use of the one as a model for the other, it would appear that those concerned with improving the national educational R&D system will find many aspects of the Army's training research system worthy of emulation.

APPENDIX A

McCLELLAND'S MODEL OF THE ARMY'S
RESEARCH-INTO-PRACTICE PROCESS

Paradigm for Inter-organizational Research and Development—Decision—Use Cycle



APPENDIX B

GLOSSARY

Glossary

- ACTIVITY:** A unit, organization, or installation performing a function or mission; e.g., reception center, distribution center, post, camp, or station.
- ARMY SCHOOL:** An educational institution established by Headquarters, Department of the Army. With the exception of the U.S. Military Academy, Army schools are classified as colleges, branch schools, or specialist schools.
- ARMY SUBJECT SCHEDULE:** An Army Subject Schedule provides instructors with detailed guidance for the preparation of lesson plans for conducting branch, general, and military occupational specialty training as outlined in Army Training Programs.
- ARMY TRAINING PROGRAM:** A detailed outline of training for units and individuals of the Army. It prescribes subjects and hours, the scope of the training, and lists essential study references and training aids.
- ARMY TRAINING TEST:** Army Training Tests are designed for use in evaluating training progress. They support Army Training Programs by providing a basis for direction of the training effort at appropriate stages in the formal phases of training.
- BEHAVIORAL SCIENCES:** A term commonly applied to sociology, psychology, social anthropology, and those areas of other social sciences that involve the application of experimental and observational methods to the study of the behavior of man and the lower animals.
- CLASSIFICATION:** The process of relating the abilities of a set of individuals to the demands of a set of jobs to be filled. The basic concept is that of matching individuals with assignments to maximize total performance. During World War II, the term "qualification" was generally applied to determining whether an individual was suitable for military service; "selection" was applied to picking candidates for school training; and "classification" referred to determining qualifications for duty. With the passage of time, the process of determining qualifications for both training and duty assignments has come to be called "classification."
- COLLECTIVE TRAINING:** The development in a group of men, a crew, squad, platoon, those interdependencies and teamwork that go to make up team performance.

DEVELOPMENT: The systematic use of research-based and other generalizations to create new educational methods, systems, materials, or devices which have practical utility. Included in development are the design and production of prototype processes and materials, and also pilot trials to test their feasibility and to gather ideas for their improvement. Development may be used to generate new curriculum materials, new teaching techniques, new types of media, new ways of assigning pupils to schools or classes, new architectural designs, and so on.

DEVELOPMENTAL RESEARCH: This is a process concerned with evaluation of military methods, procedures, and devices on a highly-controlled, usually experimental or quasi-experimental basis. It is to be distinguished from operations analysis which is concerned with the overall effectiveness of a system of operations as this may be estimated from uncontrolled data, taken as they fall.

DIFFUSION: In its broad sense, this term has been generally used by anthropologists and sociologists to mean the spread of culture through borrowing, suggestion, or migration, alone or in combination. lately, it has also been used to refer to all of the orderly processes which produce cultural similarities other than independent invention of similar traits to meet similar needs. It is frequently confused with dissemination.

DISSEMINATION: This is a major activity associated with research and development. The objectives of dissemination are to foster rational decision-making, to make possible effective implementation of new knowledge, and to ensure optimal use by practitioners of new products and procedures. The term refers to the sending of information either about the results of research or the products of development or the methods and materials resulting from a knowledge-producing activity.

EDUCATIONAL TECHNOLOGY: The systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and non-human resources to bring about effective instruction. The term has been loosely used and has evolved to mean the application of behavioral-science knowledge to solving instructional problems.

FIELD MANUAL: An Army publication containing instruction, informational, and reference material relative to military training and operations. Field manuals primarily contain doctrine and are subsumed under Army-Wide doctrinal literature.

GENERAL STAFF: A group of Army officers under the direction of the Chief of Staff who render professional advice and assistance to the Secretary, the Under Secretary, and the Assistant Secretaries of the Army, in developing and providing broad basic policies, plans, and programs for the guidance of the Department of the Army.

HUMAN FACTORS: The body of scientific facts about human psychological and biological characteristics in relation to complex systems, and the development and application of principles and procedures for accomplishing effective man-machine integration and utilization. The term is used in a broad sense to cover all biomedical and psychosocial considerations pertaining to man in the system. It includes principles and applications in such areas as human factors engineering, personnel selection, training, life support requirements, job performance aids, and human performance evaluation.

HUMAN FACTORS ENGINEERING: This is the name given to that area of human factors specialization which applies knowledge of man's capabilities and limitations to the planning, design, development, and testing of systems, equipment, and facilities to achieve optimum personnel effectiveness, safety, and comfort compatible with system requirements. The term is sometimes shortened, simply, to human engineering.

HUMAN RESOURCES RESEARCH: The process of discovering and developing principles and techniques for more effective utilization of personnel and increasing efficiency with which Army personnel perform their duties, operate and maintain their equipment, serve their weapons, give and accept commands, adapt to environmental and psychological stresses, and acquit themselves in combat.

HUMAN RESOURCES DEVELOPMENT: The process of planning, organizing, directing, coordinating, and controlling activities designed primarily for their effect on individual morale and organizational esprit, development of individual potential, and development of an organizational climate that enhances the attitudes, motivation, commitment, and sense of well-being of soldiers and their families.

IMPLEMENTATION: The organizational activity of putting R&D (and other) new knowledge, a new program, or other desired change into practice. It is a synonym for "R&D Utilization."

INDIVIDUAL TRAINING: Individual instruction and supervised practice given for the purpose of providing the student with a particular skill or specialty. It is that training which the Army conducts for the soldier to give him the skills and knowledges he needs to do his job. It is to be distinguished from unit training, which is designed to teach the soldier how to use his individual skills and knowledge as a member of a team.

INNOVATION: Any change which represents something new to the people who are being changed. An innovation is a practice or plan that is new to a particular institution and that, because it is new, requires or assumes some degree of modification or change in the behavior of the principal actors. It is to be distinguished from invention, which is generally thought of as a "thing," and which is a generally inappropriate term to use in referring to novel behavior patterns, theories, and/or social relations.

INSTRUCTION: The set of planned external events which influence the processes of learning and thus promote learning. These external events take place in the context of internal control processes that are already ongoing and that make learning possible. The external events do not produce learning; instead, they potentially support processes which are occurring within the learner.

CONVENTIONAL INSTRUCTION: Instruction in which the elements of time, content, and methodology are fixed with respect to the student's learning in classroom activities.

SELF-PACED INSTRUCTION: Instruction in which both content and methodology are fixed but time is variable. Under self-paced instruction, students are permitted to move as quickly as they can through instructional material. In general, self-paced instruction will use self-administered materials.

INDIVIDUALIZED INSTRUCTION: Instruction in which the student may choose from two or more available alternatives the methods and media by which he will learn.

INDIVIDUALLY PRESCRIBED INSTRUCTION: Instruction in which time, content, and/or methodology may be varied for individual students at the option of the instructor or the instructional system.

INSTRUCTIONAL SYSTEM: An integrated set of media, equipment, methods, and personnel performing efficiently the functions required to accomplish one or more training objectives.

INTERSERVICE SCHOOL OR COURSE: A school or course utilized by two or more Services/Agencies that is administered by a coordinating Service or Agency, and which presents a curriculum developed in coordination with the participating (using) Services and approved by the coordinating Service. Interservice Training is military training provided by one Service to members of another Service.

JOB MODEL: A set of detailed task descriptions defining the job performances toward which training is designed.

JOINT SCHOOL OR COURSE: A school or course used by two or more Services that has a joint faculty, and a director (Commandant) who rotates among the Services and is responsible under the direction of the Joint Chiefs of Staff for the development and administration of the curriculum.

KNOWLEDGE: The accumulated facts, truths, principles, and information to which the human mind has access; the outcome of specified, rigorous inquiry which originated within the framework of human experience and functions in human experience; the product of the operation of man's intellect, either within or apart from human experience. The simple form of knowledge is acquaintance with, or apprehension; when to this is added thoughts of relations, meanings, etc., the experience is called comprehension or understanding.

LABORATORY: A distinct organization responsible for research and/or development leading to increased knowledge of natural phenomena or new and improved products or processes. It is an investigative and creative unit headed by a director (either military or civilian) and composed of individuals with allied skills and knowledge that work on R&D projects related to these technical skills.

LEARNING: A change in human disposition or capability, which can be retained, and which is not simply ascribable to the process of growth. The kind of change called learning exhibits itself as a change in behavior, and the inference of learning is made by comparing what was possible before the individual was placed in a "learning situation" and what behavior can be exhibited after such treatment. With respect to the educational process, learning is defined as the acquisition of behavior brought about by the school environment and instructional means designed by the educator and the educational system.

MANAGEMENT SYSTEM: A documented method for assisting managers to define or state policies, objectives, or requirements; assign responsibilities; control the use of resources; periodically measure performance and compare it against stated objectives and requirements; and take appropriate action.

MAN-MACHINE SYSTEM: An organization whose integral components are men and equipment, characterized by a common purpose, and tied together by an information flow network.

METHOD, INSTRUCTIONAL: This refers to the formal structure of the sequence of acts commonly denoted by the term instruction. The term covers both the strategy and the tactics of teaching, and involves the choice of what is to be taught at any given time, the means by which it is to be taught, and the order in which it is to be taught.

MILITARY OCCUPATIONAL SPECIALTY: A term used to identify a grouping of duty positions possessing such close occupational or functional relationship that an optimal degree of interchangeability among persons so classified exists at any given level of skill.

MILITARY PERSONNEL MANAGEMENT: The process of planning, organizing, directing, coordinating, and controlling the procurement, training/education, utilization, separation/retirement, development, and motivation of military personnel to assist in the successful accomplishment of the organizational mission. It includes all procedures related to: military job analysis and evaluation; position classification; personnel classification, assignment, and utilization; maintenance of an adequate system of records and reports; development of individual potential; and development of an organizational climate that enhances the attitude, motivation, commitment, and sense of well-being of soldiers and their families. The Military Personnel Management System is the entire complex of policies, procedures, and operations required to supply the military with human beings with the characteristics required to play various assigned roles.

MILITARY PSYCHOLOGY: The application of psychological principles and knowledge to military problems. By ostensive definition, military psychology is clearly coextensive with all psychology, except perhaps developmental psychology, and has as its unique unifying characteristic merely the specific contexts of application. The appropriate analogy for military psychology is, therefore, industrial psychology, which is also defined by the specific contexts of application afforded by our business and industrial society.

MISSION: The task together with its purpose, thereby clearly indicating the action to be taken and the reason therefore. A broad statement of the objectives and area of responsibility assigned to the commander or chief of any Army activity.

MODEL: A representation of an object, process, or activity by symbols and/or procedures such that the important relations are amenable to analysis. There are many types of models, including physical, conceptual, mathematical, and schematic, and each one differs from every other. Models are not theories; they are, rather, ways of thinking or patterns that serve to organize discourse about that particular topic. Models derive their usefulness from their generality.

ON-THE-JOB TRAINING: A training process whereby students or trainees acquire knowledge and skills through actual performance of duties under competent supervision, in accordance with an approved, planned program.

OPERATIONS RESEARCH: A systematic analysis for problem solving. There are five steps inherent in the Operations Research approach: (1) formulating the problem; (2) constructing the model; (3) solving the model; (4) testing; and (5) implementing the solution under proper controls. An Operations Research Study normally addresses such areas as strategy and tactics, materiel systems, personnel systems, force structure, and technology. The term includes design, operation, and analysis of war games, design, analysis and review of experiments, strategic studies and technological forecasts related to military problems, and feasibility studies which explore the operational environment and tactical requirements for making comparative evaluations of present and future mixes of men, materiel, and weapons systems. Operations Research studies often require such techniques as analytical mathematical models, statistical analysis, network analysis, queuing theory, servo theory, Monte Carlo techniques, and linear, nonlinear, and dynamic programming.

PERSONNEL SELECTION RESEARCH: The development of psychological and psychometric methods through which the best candidates for successful training or job assignments are identified from a large applicant pool.

PERSONNEL UTILIZATION RESEARCH: Development of human factors knowledge and techniques aimed at improving individual and group performance on the job.

POLICY: A judgment, derived from some system of values and some assessment of situational factors, operating as a general plan for guiding decisions regarding the means for attaining desired objectives.

PROBLEM SOLVING: A term used widely and loosely to describe various activities which represent a step-by-step, or systematic, or rational approach to filling human needs. It usually includes distinct phases of problem definition or diagnosis, setting and prioritizing of objectives, search for and selection of solutions, and try-out of solutions with evaluation of the try-out.

PRODUCTIVITY: In simple economic terms, productivity is defined as "output per hour." In more complex terms, it means the overall efficiency and effectiveness of an operation. At the management level, it involves the efficiency with which managers use people, materiel, and money--our three main resources.

PROFESSIONAL MAN-YEAR. This is a unit measurement used to describe the level of effort of a research or study effort. A Professional Man-Year is considered to include the normal-duty-hour service of one researcher/analyst, supported by a proportionate share of the organization's clerical/administrative personnel, use of organizational resources, and appropriate overhead for one year.

PROGRAM OF INSTRUCTION: A Program of Instruction prescribes a training course conducted within the Army, and contains the purpose, the specialty toward which the program is directed, prerequisites, length, location, feeder pattern, academic subjects, and length of each subject.

PROGRAMMING: The process of relating means (resources) to ends (objectives) in terms of specific military missions or activities within a given period of time. Planning, programming, and budgeting are the three basic processes by which the Army determines its objectives and controls the resources necessary to attain them.

PROJECT: The basic unit of activity in conducting R&D that is typically directed by a principal investigator, and includes research design, data collection and analysis, and preparation of a written report. An RDT&E project is a specifically defined task or group of closely-related tasks established to fulfill a stated or anticipated military requirement. It may be complete in itself or it may be composed of more than one task.

PROPONENT: A school which has been assigned responsibility for developing and reviewing instructional material which is primary to its area of academic interest but which is also presented at one or more other schools. Also, an Army organization or staff which has been assigned responsibility for material or subject matter in its area of interest; e.g., proponent school, proponent staff agency, proponent center.

R&D ASSESSMENT: An activity--in itself a type of research study--that evaluates the state-of-the-art of R&D on a particular topic by (1) synthesizing research that has been conducted; and (2) calling attention to findings on which there is substantial agreement, findings that may be in contention, and prominent issues that have not yet been addressed.

R&D MANAGEMENT: The organizational activities in an R&D funding agency, including needs assessment; program planning and development; grant or contract solicitation, review, and award; project monitoring and evaluation; and dissemination and research utilization.

RESEARCH DESIGN: The formal logic underlying the conduct of a research study that relates the evidence to be collected to the main questions to be answered by the study.

SCREENING: The process of selecting from a pool of applicants the usable or most usable individuals for a given program of training or utilization. The concept is one of accept or reject, pass or fail. In the Army, standards for the abilities and aptitudes required for a particular job are set up, and a technique--usually a brief battery of tests--is used to indicate whether or not applicants possess those abilities and aptitudes.

SPECIALIST COURSE: A course given for the purpose of preparing the student for immediate utilization in a particular skill or specialty. Successful completion of a specialist course normally results in the award to the student of a Military Occupational Specialty rating.

STRATEGY: The combination of the principles of war selected for the conduct of a war or lengthy campaign. Strategy is distinguished from Tactics, which is the combination of the principles of war selected for the conduct of a single battle. The former is long-range; the latter is short-range.

STUDY: A critical examination or investigation of a problem, often employing analytical techniques, and designed to organize and evaluate information already existing, or which can be inferred from existing information. Studies are conducted to assist decision making and solving identified problems. This term encompasses the terms evaluation, analysis, applied research review, examination, investigation, inspection, appraisal, assessment, survey, and other similar terms.

SYSTEMS ANALYSIS: An orderly study of a management system or an operating system using the techniques of management analysis, operations research, industrial engineering, or other methods to evaluate the effectiveness with which missions are accomplished, and to recommend improvements. It frequently involves comparison and evaluation of costs, effectiveness, and technical feasibility of a group of alternative systems to predict optimum mixes. Sometimes an ideal model is developed and used as a point of comparison for existing systems.

SYSTEMS ENGINEERING OF TRAINING: A series of orderly, systematic steps designed to produce a course of instruction that will provide graduates with the skills and knowledges essential to perform their job duties.

TASK ANALYSIS: Identification of the knowledges, skills, and aptitudes required to bring about the transformation between inputs and outputs. These are psychological in nature, including sensing, discriminating, remembering, deciding, and choosing. The process of training involves inferring from task descriptions what skills, knowledge, and aptitudes are required to perform the task.

TASK DESCRIPTION: The process of describing the overt, observable activities involved in the task--the things a person does. Usually, such activities are of a physical nature, although they may be of a communicative nature.

TRAINING AID: Any item which is developed and/or procured with the primary intent that it shall assist in training and the processes of learning. These aids include training devices, graphic training aids (e.g., charts, posters, slides, transparencies), sound recordings, motion pictures, filmstrips, and television recordings.

TRAINING BASE: Those activities, facilities, equipment, and personnel which comprise the Army training centers, schools, and courses, and units specifically established or directed to conduct individual training on a recurring basis.

TRAINING CIRCULAR: A document which promulgates training directives, policies, or information of an interim nature which requires revision too frequently for inclusion in the permanent training literature. Training circulars are also used to promulgate new training doctrine, tactics, or techniques, the immediate dissemination of which is essential.

TRAINING DEVICE: A three-dimensional training aid, such as a model, miniature, or cutaway. The term also includes such complex mechanical or electronic aids as synthetic trainers, radar target simulators, mechanized evaluators, and simulated weapons and operational systems.

TRAINING LITERATURE: That body of writings published for the primary purpose of informing all concerned as to doctrine, tactics, techniques and procedures adopted for use in training individuals and units of the army.

TROOP TEST: A test conducted in the field, using existing units, for the purpose of evaluating operational or organizational concepts, doctrine, techniques, and procedures, or to gain further information on materiel.

USER: Any individual or group who can apply the information in a report to his or their work; potential beneficiaries of R&D efforts.

APPENDIX C

THE COMMITTEE ON CLASSIFICATION
OF PERSONNEL IN THE ARMY

The Committee on Classification
Of Personnel in the Army
1917 - 1918

Following is a list of names of individuals who served on the Committee on Classification of Personnel in the Army from its formation on August 5, 1917, to its absorption by the General Staff on September 5, 1918.

Walter Dill Scott, Director. Director, Bureau of Salesmanship Research, Carnegie Institute of Technology.

Edward L. Thorndike, Professor of Educational Psychology, Teachers College, Columbia University.

Walter Van Dyke Bingham, Head of Division of Applied Psychology, Carnegie Institute of Technology.

J. R. Angell, Dean of Faculties, University of Chicago.

R. C. Clothier, Assistant to the Vice President, A. M. Collins Manufacturing Company, Philadelphia, Pa.

John J. Coss, Assistant Professor of Philosophy and Business Ethics, Columbia University.

W. R. DeField, Supervisor of Systems, Montgomery Ward & Company, Chicago, Ill.

Raymond Dodge, Professor of Psychology, Wesleyan University.

H. L. Gardner, Director of Employment, Cheney Bros. Silk Co., South Manchester, Conn.

William B. Hale, Attorney, Kelly, Hale, Dammann & Coolidge, Chicago, Ill.

P. J. Reilly, Employment Manager, Dennison Manufacturing Company, Framingham, Mass.

Winslow Russell, Agency Manager, Phoenix Mutual Life Insurance Company, Hartford, Conn.

J. F. Shepard, Associate Professor of Psychology, University of Michigan.

Edward K. Strong, Jr., Professor of Psychology, George Peabody College for Teachers.

J. J. Swan, Consulting Mechanical Engineer, New York, N.Y.

Louis M. Terman, Professor of Educational Psychology, Stanford University.

John B. Watson, Professor of Psychology, Johns Hopkins University.

Robert M. Yerkes, Professor of Psychology, University of Minnesota.

When the Committee was absorbed by the Army General Staff in 1918, its membership consisted of: Messrs. Scott, Thorndike, Bingham, Angell, Clothier, Coss, Dodge, Hale, Reilly, Russell, Strong, Swan, Watson, and Yerkes.

SOURCE: U.S., Department of War, The Personnel System of the United States Army. Vol. I. History of the Personnel System (Washington, D.C.: Government Printing Office, 1919).

APPENDIX D

THE COMMITTEE ON SERVICE PERSONNEL

The Committee on Service Personnel

June 20, 1942 to October 7, 1943

The civilian members of the Committee on Service Personnel, and their organizational affiliations, were:

J. M. Stalnaker, Chairman of the Committee, Associate Secretary of the College Entrance Examination Board and Consultant to the Bureau of Naval Personnel.

G. K. Bennett, Director of the Test Division, Psychological Corporation and consultant to numerous war industries.

Leonard Carmichael, ex-officio member as Chairman of the Division of Anthropology and Psychology, NRC, and Contractor's Technical Representative for the contract covering the work of the Committee; President of Tufts College, active in research for Division 7, NDRC, and Director of the National Roster of Scientific and Specialized Personnel.

C. H. Graham, Associate Professor of Psychology, Brown University; active in research for Division 7, NDRC, and Consultant to Division 16, NDRC.

Morris S. Viteles, Professor of Psychology, University of Pennsylvania, Chairman of the NRC Committee on Selection and Training of Aircraft Pilots, Consultant to Division 6, NDRC, and to numerous industrial concerns and Government agencies.

The three Servicerepresentatives who were members of the Committee were:

Walter V. D. Bingham, Chief Psychologist in the Office of the Adjutant General, War Department.

Commander P. E. McDowell, U.S. Navy, Readiness Division, Office of the Commander-in-Chief, U.S. Navy.

Captain F. U. Lake, U.S. Navy, Training Division, Bureau of Naval Personnel, Navy Department. (Captain Lake was succeeded, in turn, by Lt. Commander H. J. Pohl, Lt. Commander R. A. Sentman, and Captain W. E. Moore, all members of the U.S. Navy.)

Members of the full-time professional staff supporting the Committee were:

Charles W. Bray, Executive Secretary of the Committee and Technical Aide in the Office of the Chairman, NDRC, for the business of the Committee. Associate Professor of Psychology, Princeton University; Research Investigator for the NRC Committee on Human Aspects of Observational Procedures, and consultant to Division 6, NDRC.

John L. Kennedy, Assistant to the Executive Secretary of the Committee. Assistant Professor of Psychology, Tufts College, and active in research for Division 7, NDRC.

SOURCE: Charles W. Bray, Psychology and Military Proficiency: A History of the Applied Psychology Panel of the National Defense Research Committee (Princeton: Princeton University Press, 1948).

APPENDIX E

ARMY AIR FORCES AVIATION PSYCHOLOGY

PROGRAM RESEARCH REPORTS

Army Air Forces Aviation PsychologyProgram Research Reports

- Flanagan, John C., ed., The Aviation Psychology Program in the Army Air Forces, Report No. 1. Washington, D.C.: Government Printing Office, 1948.
- DuBois, Philip H., ed., The Classification Program, Report No. 2. Washington, D.C.: Government Printing Office, 1947.
- Thorndike, Robert L., ed., Research Problems and Techniques, Report No. 3. Washington, D.C.: Government Printing Office, 1947.
- Melton, Arthur W., ed., Apparatus Tests, Report No. 4. Washington, D.C.: Government Printing Office, 1947.
- Guilford, J.P., ed., with the assistance of John I. Lacey, Printed Classification Tests, Report No. 5. Washington, D.C.: Government Printing Office, 1947.
- Davis, Frederick B., ed., The AAF Qualifying Examination, Report No. 6. Washington, D.C.: Government Printing Office, 1947.
- Gibson, James J., ed., Motion Picture Testing and Research, Report No. 7. Washington, D.C.: Government Printing Office, 1947.
- Miller, Neal E., ed., Psychological Research on Pilot Training, Report No. 8. Washington, D.C.: Government Printing Office, 1947.
- Kemp, Edward H., and Johnson, A. Pemberton, eds., Psychological Research on Bombardier Training, Report No. 9. Washington, D.C.: Government Printing Office, 1947.
- Carter, Launor F., ed., Psychological Research on Navigator Training, Report No. 10. Washington, D.C.: Government Printing Office, 1947.
- Hobbs, Nicholas, ed., Psychological Research on Flexible Gunnery Training, Report No. 11. Washington, D.C.: Government Printing Office, 1947.
- Cook, Stuart W., ed., Psychological Research on Radar Observer Training, Report No. 12. Washington, D.C.: Government Printing Office, 1947.

- Dailey, John T., ed., Psychological Research on Flight Engineer Training
Report No. 13. Washington, D.C.: Government Printing Office, 1947.
- Wickert, Frederic, ed., Psychological Research on Problems of Redistri-
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- Bijou, Sidney W., ed., The Psychological Program in AAF Convalescent
Hospitals, Report No. 15. Washington, D.C.: Government Printing
Office, 1947.
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ational Training in the Continental Air Forces, Report No. 16.
Washington, D.C.: Government Printing Office, 1947.
- Lepley, William M., ed., Psychological Research in the Theaters of War,
Report No. 17. Washington, D.C.: Government Printing Office, 1947.
- Deemer, Walter L., Jr., ed., Records, Analysis, and Test Procedures,
Report No. 18. Washington, D.C.: Government Printing Office, 1947.
- Fitts, Paul M., ed., Psychological Research on Equipment Design, Report
No. 19. Washington, D.C.: Government Printing Office, 1947.

APPENDIX F

THE COMMITTEE ON HUMAN RESOURCES OF THE
JOINT RESEARCH AND DEVELOPMENT BOARD

The Committee on Human Resources of the
Joint Research and Development Board

DIRECTIVE HR 1/1
COMMITTEE ON HUMAN RESOURCES

ORGANIZATION

1. The Committee on Human Resources is established as an agency of the JRDB to correlate the field of research and development with the human resources of the nation in the interest of national security.

OBJECTIVE

2. The Committee on Human Resources shall merge into a joint effort programs related to the supply and utilization of scientific, technical, and specialized professional personnel, and to the conduct of research and development relating to the *broad problems of Human resources.*

MEMBERSHIP

3. The Committee on Human Resources shall consist of:
- a. Four civilian members, including the chairman, appointed by the Chairman of the Board, one of whom shall be from the National Research Council.
 - b. Three members appointed by the Secretary of War, and
 - c. Three members appointed by the Secretary of the Navy.
4. A deputy to substitute with plenary powers for each member shall be designated by the appropriate appointing authority.
5. Appointment of members of the Committee and their deputies are subject to the approval of the Board. Appointments shall be for one year or until successors have been appointed by the appropriate authorities.

PROCEDURE

6. The Committee on Human Resources shall be encouraged to function as an independent entity within the limits of its terms of reference. In accordance with the Rules of Organization and Procedure of the Board, the Committee is authorized:

- a. To employ professional and other personnel as necessary to discharge its responsibilities, under a budget authorized by the Board through its Executive Secretary;
- b. To establish its administrative procedures;
- c. To organize its secretariat; and
- d. To establish such supporting panels and consulting agencies as it may deem advisable.

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TERMS OF REFERENCE

10. In pursuit of its stated objectives, the Committee on Human Resources shall:

- a. Collect complete information as necessary concerning:
 - (1) Problems of psychology and psycho-physiology related to military material and equipment;
 - (2) The methods of establishing qualifications and the methods of selection, allocation, and utilization of personnel;
 - (3) The requirements, activities, and availability of personnel essential for research and development phases of the national security program;
 - (4) The psychological and psycho-physiological problems involved in the civilian resistance and defense against enemy attack; and
 - (5) The psychological and psycho-physiological problems involved in handling military personnel;
- b. Analyze and evaluate the effectiveness and adequacy of:
 - (1) Research and development on problems of the Army and Navy in psychology and psycho-physiology relating to administration, supply, maintenance, training, combat, and other fields;
 - (2) Studies of administration of personnel essential to the research and development program.
 - (3) Research and development on methods and techniques for handling the human resources of the nation for purposes of national security.
 - (4) Personnel surveys, rosters and registry projects within the field of interest of the Board; and

- (5) Research and development related to civil defense plans, in the light of the best available knowledge concerning group behavior and overall utilization of human resources.

c. Present information and conclusions concerning:

- (1) Matters within the purview of general value to the JRDB and related agencies; and
- (2) The implications of strategic and operational planning of new knowledge of the use of human resources and other matters of interest to the policy council of the JRDB; and

d. In accordance with the regular procedures of the Board:

- (1) Coordinate programs for achieving more efficient and effective education, selection, employment, training, assignment, utilization, administration, and environment for those sections of the nation's manpower resources which are critically necessary to the military research and development program;
- (2) Formulate and recommend programs for improving the state of scientific knowledge and understanding of problems related to human resources; and
- (3) Allocate and, when desirable, reallocate responsibility between the services for research and development programs concerned with human resources.

.....

The original Executive Secretary of the Committee on Human Resources was Dr. L. V. Berkner. The four original civilian members were: Dr. Donald G. Marquis of the University of Michigan, Chairman; Dr. Samuel A. Stouffer of Harvard University; Dr. Carroll L. Shartle of Ohio State University; and Dr. William Menninger of the Menninger Foundation.

SOURCES: Joint Research and development Board Directive HR 1/1, 1 February 1947; and Joint Research and Development Board Directive HR 5/5, 21 July 1947. HumRRO Archives.

APPENDIX G

DELINEATION OF HUMAN RESOURCES RESEARCH
BY THE RESEARCH AND DEVELOPMENT BOARD

Delineation of Human Resources Research

By the Research and Development Board

The central goal of research and development in human resources research is to increase the military effectiveness of human processes. In terms of the major categories of the Master Plan bearing on human resources, this goal involves the improvement of PERSONNEL OPERATIONS, PSYCHOLOGICAL WARFARE OPERATIONS, and INTELLIGENCE PLANNING OPERATIONS. The applicable technical objectives with definitions are as follows:

PERSONNEL OPERATIONS - PO

Definition: More efficient utilization of human resources.

- PO-1 "Methods of determining military manpower needs and availability."
- PO-2 "Methods of assessment, selection, assignment, and evaluation of personnel."
- PO-3a "Training devices excluding training aircraft and target drones."
- PO-4 "Methods of training, including techniques, curricula, organization, and psychological procedures in re-education."
- PO-5 "Personnel management methods, including work on leadership, incentives, attitudes, morale, administration, group output, and social and psychological factors in individual adjustment and conduct."
- PO-6 "Techniques of equipment design to provide the optimum operator-machine combination; improvement of sensory and motor proficiency; associated psychophysiological studies."

PSYCHOLOGICAL WARFARE AND COLD WAR OPERATIONS - PC

Definition: The employment of any nonlethal or clandestine means to affect morale and behavior for a specific military purpose.

- PC-1 "Methods of determining feasible psychological warfare goals and targets and their value."

- PC-2 "Propaganda and informational weapons of all types aimed at individuals."
- PC-3 "Means of all types aimed at organizational units, including private and governmental."
- PC-4 "The psychological use of the threat of material weapons."
- PC-6 "Assessment of the effects of psychological warfare, including methods of poll-taking."
- PC-7 "Defense against propaganda, revolutionary effort, sabotage, and the psychological threat of material weapons."
- PC-8 "Techniques for the military government and demilitarization of defeated enemy nations."

INTELLIGENCE AND PLANNING OPERATIONS - IO

Definition: The preparation of effective military plans, and general considerations for the conduct of military operations. This includes the determination, interpretation, analysis, and application of intelligence and other factors required in preparing military plans, and the denial to foreign nations of such information about the United States.

- IO-1 "Methods for development of background encyclopedia on intelligence targets by means of basic studies of nations, national subgroups, and cities with reference to their sociological, psychological, economic, political, technical, scientific, and ecological status and trends."
- IO-10 "Methods and techniques for the collection of intelligence."

NOTE: These technical objectives refer to research and development of new and improved methods and techniques; an entirely separate problem from operational responsibility in these areas.

SOURCE: Attachment to Directive HR 1/1, Joint Research and Development Board, "Committee on Human Resources," 1 February 1947. HumRRO Archives.

APPENDIX H

JOINT ARMY AND NAVY AGREEMENTS FOR ARMY PARTICIPATION
IN THE NAVY SPECIAL DEVICES CENTER

Joint Army and Navy Agreements for Army Participation
in the Navy Special Devices Center

It is agreed between the Secretary of the Army and the Secretary of the Navy that:

The Army will participate in the activities of the Navy Special Devices Center in the evaluation, research and development, and procurement of certain training aids and devices, and for research in human engineering, subject to the qualifications in the succeeding paragraphs.

Wherever possible Army and Navy personnel, both military and civilian, will be integrated within existing activities at the Special Devices Center to the end that the missions of the Army and Navy in the Center may be accomplished by a unified effort.

The Army's participation will consist of an Associate Director (Army) and a staff of sixteen (16) Army officers and twenty-eight (28) civilians, as indicated in tabs "D" and "E" of the inclosed staff study.

Army participation during Fiscal Year 1951 will be concerned with preliminary groundwork, conducted by the officer who will be the Associate Director (Army) and not to exceed three additional officers, in preparation for full implementation of the plan in Fiscal Year 1952.

The Department of the Army will utilize existing facilities of the Special Devices Center initially augmenting certain of these activities with personnel as indicated in tabs "D" and "E" of the inclosed staff study.

The Department of the Navy will furnish office space, office equipment and facilities for the Army personnel during Fiscal Year 1951 and 1952, after which time the Department of the Army will include its proportionate share of the operation and maintenance of the Center in future Army budgets.

The Chief, Army Field Forces, will exercise operational control (management control) of the Army personnel at the Special Devices Center, and the military personnel will be assigned to First Army and be under the command of Associate Director (Army).

The Associate Director (Army), under directives of the Chief, Army Field Forces, will coordinate with the Commanding Officer and Director, Special Devices Center, in planning and directing the activities of the Army personnel.

Funds for the activity to include necessary funds for travel, will be included in Department of the Army budget estimates for Fiscal Year 1952 as follows:

For research and development of training devices . .	\$600,000
For procurement of training aids and devices	\$1,400,000
For personal services (salaries of DA civilians) . .	<u>149,000</u>
	\$2,149,000

Both Army and Navy funds appropriated for research and development may be utilized for joint projects in which both departments have an interest.

The Department of the Army will make an advance of funds to the Navy for deposit to the Naval Working Fund to cover the Army's proportionate share of the cost of civilian personnel services and of research and development expenses shown above, upon receipt of a Standard Form 1080 from the Department of the Navy.

All procurement of approved devices developed by the Army will be accomplished through the Chiefs of appropriate Army Technical Services until such time as joint procurement procedures are established.

The Commanding Officer and Director of the Special Devices Center will have no command responsibility over Army personnel at the Special Devices Center but will deal only through the Associate Director (Army) in such matters.

The Associate Director (Army) will have no command responsibility over Navy personnel at the Center but will deal with the Commanding Officer and Director, Special Devices Center, in such matters.

20 Mar 1950

/s/ DAN A. KIMBALL
ACTING SECRETARY OF THE NAVY

/s/ GORDON GRAY
SECRETARY OF THE ARMY

SOURCE: Archives of the Naval Training Equipment Center, Orlando, Florida.

The cells formed by the intersection of disciplines with career phases were filled, in 129 out of 143 possible cases, with problems to be examined. For example, the cell formed by the intersection of "Education, indoctrination, and conditioning" and "Transition from civilian to military life" indicated such problems as "classification by educational standards; transfer of general educational content to military performance." Similarly, the cell formed by the intersection of "Proficiency management" and "Procurement, recruitment, and induction" cited such problems as "proficiency of recruiting personnel; overemphasis on quotas; quality control; variations in induction examination procedures."

SOURCE: Sidney Adams and others, Report of Working Group on Human Behavior Under Conditions of Military Service, a joint project of the Research and Development Board and Personnel Policy Board in the Office of the Secretary of Defense (Washington, D.C.: U.S., Department of Defense, June 1951).

APPENDIX J

DIFFERENTIATION OF THE HumRRO MISSION FROM THOSE
OF OTHER HUMAN RESOURCES RESEARCH AGENCIES

Differentiation of the HumRRO Mission from Those
Of Other Human Resources Research Agencies

The missions of the several Human Resources Research Agencies within the Army differ in emphasis, but do not delineate sharply distinct areas of research responsibility. Main criteria in terms of which such differences in degree may be defined are the following: (a) content of research; (b) methods of research; (c) research approach; (d) application of research product; and (e) segment of Army studied.

The Personnel Research Branch, TAG

The kinds of research problems studied offer, in general, a basis for distinguishing the missions of the two agencies, HumRRO and PRB. PRB's stated research goals include "personnel management responsibilities for selection, classification and assignment, utilization and evaluation of military and civilian personnel of the Army." It has no primary mission in training, motivation, morale, and leadership, nor in psychological warfare, which are research areas falling under the cognizance of HumRRO. Fairly extensive areas of overlap do exist, however, as may be seen in the case of leadership studies, for example, where selection of leaders could scarcely be accomplished without consideration of leadership goals and practices, which fall, as an area of study, under primary cognizance of HumRRO.

Differences between research methods of the two agencies parallel, to some extent, differences in content. In general, the approach of HumRRO is experimental, requiring manipulation of variables under immediate investigation and control of others, while that of PRB is analytic, relying mainly on correlational techniques to isolate predictive significance of unit variables, and to hold extraneous influences constant. In actual practice, however, because the degree of control and manipulation required for experimental studies is often lacking under operational conditions, recourse must be had to quasi-experimental, or analytic methods of controlling and estimating effects of variables. Conversely, it is assumed that PRB, in comparing utility of several test instruments, for example, utilizes, when feasible, experimental methods of evaluation.

The research approaches of the two agencies are relatively distinct, that of PRB being mainly prediction, that of HumRRO, estimation of effects of experimental variations in conditions of behavior, for the purpose of establishing lawful relationships between these conditions and the actions governed. Prediction, or forecasting from an earlier (testing) situation, the result likely to be obtained in a later (criterial) situation, characterizes much of the human resources

effort oriented toward research applications of selection and classification. In experimental evaluation, by contrast, results emerge as estimates of effects, and as evidence for or against the hypothesis which the investigation was designed to test. Both types of research are critically dependent on measures of various kinds: the same instrument which is employed as a test or criterial measure for predictive purposes may also be employed, when the research approach is experimental, as a means of establishing the comparability of groups, or as an indicator of effects of an experimental variable. Thus, proficiency tests, for example, may properly be employed by both agencies for their respective purposes: PRB for prediction of individual accomplishment or qualification, and HumRRO for measurement of effects of training or leadership on groups of men. Research on the utilization of marginal personnel would similarly follow this general breakdown in terms of PRB's responsibility for studies of selection, and HumRRO's for training of personnel.

Each of the two agencies undertakes applied and fundamental research within its assigned areas of responsibility. The missions of the two agencies may be distinguished in terms of the use to which their end products are put. PRB contributes to the efficiency of Army operations through development of test instruments which facilitate selection of men best suited for a particular job, task, or mission. In supplement to such personnel selection procedures and devices, the end products of HumRRO, mainly in the form of technical information, are designed to increase efficiency of operations by devising and evaluating improved methods and techniques for adapting men's habits and motives to the military task. In general, PRB has primary cognizance of fundamental research on isolation of basic capacities, traits and attitudes, on methodology of constructing tests and other devices for selection and classification, and criteria for test validation. HumRRO is primarily responsible for fundamental research within the three content areas of training; motivation, morale, and leadership; and psychological and unconventional warfare; as well as for methodology of developing pertinent measures and principles of evaluation.

Within its defined area of interest, each agency services the Army as a whole, in addition to various specialized subdivisions. The responsibility of PRB is stated to be mainly in relation to development of instruments having large-scale or Army-wide applications. Studies are commonly undertaken by HumRRO under highly specific conditions of a particular branch of the Army, e.g., factors of attrition among Paratroop Infantry. Under such circumstances, experimental control of factors is likely to depend on development of selection tests, as well as on measures of training and motivation. Any restriction of this incidental selection of HumRRO's activities would not merely hamper its research, but would, in addition, often result in an understandable loss of interest on the part of the requesting agency. Under the restricted conditions specified, then, selection devices, developed as by-products of experimental studies, should be regarded as essential to the HumRRO mission. Standardization of instruments for Army-wide use in selection and classification falls within the province of PRB.

HumRRO assumes over-all responsibility for attitude surveys within the areas of motivation, morale, and psychological warfare. PRB, however, is authorized to conduct short-term studies directed by The Adjutant General in support of his assigned responsibilities for selection and management of individual personnel.

The absence of absolute differences between the missions of PRB and HumRRO, although permitting areas of potential overlap, need not result in wasteful duplication of effort if proper coordination is effected.

Operations Research Office

The scope of the Human Resources mission of ORO, as part of a broader program extending "across the board on Army problems," is defined to include "analysis of human factors in military operations." Emphasis is placed on the interaction of man and machine as components of a complex military system (for example, weapons systems). In general, operations research refers to evaluation, usually in terms of cost and effectiveness, of alternative courses of proposed administrative action, by means of applying available mathematical or other types of logical models to a specific problem. Operations research draws on all relevant scientific disciplines, utilizing all applicable methods of research. ORO is, therefore, differentiated from other Human Resources agencies not so much by its unique content or method, but rather by its "team approach" or integration of the efforts of diverse scientific specialists (chemists, engineers, psychologists, economists, political scientists, etc.) in a common attack on a problem. Restrictions imposed by the 'action' requirement of ORO research may imply relatively great dependence on readily available data and methods, and relatively little stress on extension of findings to situations beyond the one under immediate investigation.

Army Participation Group, Special Devices Center

The Army Participation Group of the Special Devices Center is responsible for development of training aids in support of Army training programs. The mission of SDC is further delineated to include development of three-dimensional devices, together with estimates of training situations and job analyses specifically necessary thereto; short-term survey research aimed at disclosure of training aid requirements; engineering research on, and user evaluation of these aids. SDC has no primary mission in research involving experimental studies of evaluation of training methods, effectiveness of training aids or devices, or other training research areas, which are specifically assigned to HumRRO.

Technical Services and The Surgeon General's Office

Under current regulations, human engineering problems belonging substantively to a single Technical Service fall under the scope of the agency involved. HumRRO interest is, therefore, limited within this area to projects which are of joint interest to two or more technical services. HumRRO participation is further delimited by the Surgeon

General's primary cognizance of the development of psychophysiological facts and principles (human engineering). Relevance to training research provides a broad guideline for HumRRO's participation in both the areas of human engineering and man-machine systems research.

Research on stress as a factor in deterioration in learning, motivation, and performance is viewed as a responsibility of HumRRO. However, insofar as extreme and permanent disturbance in character or mode of adjustment of individuals are the focus of investigation, these types of studies fall under the scope of the SGO.

SOURCE: Dr. John L. Finan, Associate Director of HumRRO, to Col. Charles W. Hill, Chief, Human Relations and Research Branch, Office of the Assistant Chief of Staff, G-1, Tab A, 16 February 1954. HumRRO Archives, Alexandria, Va.

APPENDIX K

THE ROLE OF THE HUMAN RESEARCH UNIT CHIEF IN
THE ARMY TRAINING RESEARCH PROGRAM, 1951-73

The Role of the Human Research Unit Chief in

The Army Training Research Program, 1951-73

Between 1951 and 1973, during the period when the Army's principal resource for conducting training research was the contract agency, HumRRO, that agency's field laboratories were collocated with, and supported by, Army Human Research Units. These units were typically commanded by a lieutenant colonel and staffed with from eight to fifteen enlisted personnel. The roles these units played were described in a 1965 letter from Lt. Col. Berkeley D. More, Chief of the Aviation Human Research Unit at Fort Rucker, Ala., to his monitor at the headquarters to which he reported, the U.S. Continental Army Command. What follows is extracted from that letter.

In your phone call of 16 August, you indicated that you wanted me to comment on the need for the five human research units (HRU). Generally speaking, the Unit is there to provide military support and guidance to the HumRRO research effort. Let me elaborate first on the support functions. The support in question, primarily administrative and logistic in nature, is without doubt much more easily handled by having a special TD military unit (the HRU) to do the job. All sorts of details such as security of classified material, access to distribution of military publications and reports, government mailing privileges, the issue of and accounting for government property, and the operational management of military funds provided for program-wide facilities and installation support of research (RDT&E P5700 money) are considerably simplified when a military unit is dealing with the installation agencies involved. This type of support is the purview principally of the Unit Chief and his chief NCO.

Other support is rendered by those EM qualified as personnel research specialists; these individuals actually research literature, conduct testing of military experimental subjects, compile statistics, gather data, and in other ways support the research work proper, both in the office and during field experiments. A very definite and necessary purpose is thus served by these EM. Possibly HumRRO could perform the functions in-house by hiring more people--an alternative which would be at least as costly to the government, although in a different pocket.

The foregoing bit on the support activities of an HRU covers one of the three principal functions of the Unit Chief. In my opinion, it (the support function) is the least important of the three. The most meaningful functions of the Unit Chief lie in the area of military guidance furnished to his associated director of research. These functions, two in number, can be summed up under the heading of effective liaison--a two-way street, of course.

Traveling the street in one direction, the Unit Chief must insure that the research is responsive to military requirements. He must keep the Director of Research informed of military operational and administrative considerations which might affect the research program; develop the military structure for field experiments, and act as liaison between HumRRO researchers and military commanders for this purpose; and insure proper integration of appropriate military knowledge into all the research work. The Unit Chief must keep himself well informed of Army-wide policies, organizational interrelationships, and concepts; and he is the individual who is in the daily business of interpreting to the researchers the implications (to research work in hand) of these matters. Finally, down the same street in the same direction, the Unit Chief is the man basically responsible for seeing that the complete coordination and staffing of research efforts with appropriate military agencies are accomplished throughout--from the time research or studies are even proposed until the time the findings have been submitted to OCRD with sponsor approval. In this regard, he must be a research-oriented military professional.

Traveling the same street in the other direction, the Unit Chief has the job of being a military-oriented individual well versed in research potentialities and procedures. He, as the military man most familiar with all details of a particular research task, should play a large part in securing a receptive hearing for whatever results are forthcoming. He must be able to put across the value of the research, the idea that objective and factual investigation is preferable to conditioned, and sometimes emotional, opinion; and often he has to present a particular application of this concept in the face of just such opinion. Certainly, a Unit Chief is not solely responsible for the Army's acceptance of research findings. He does, however, have an important role in presenting to proper authority the value, potential or realized, of research effort already undertaken or being considered for initiation.

With those thoughts on the need for HRU's (and Unit Chiefs), I'll drop that subject after adding the thought that, no matter whose TD he appears on, AR 70-8 quite clearly indicates that he should be attuned to Army-wide (not specific installation) requirements in the "military guidance" aspects I've described.

SOURCE: Lt. Col. Berkely D. More to Lt. Col. E.H. Skiffington, Training Research Division, Office of the Deputy Chief of Staff for Individual Training, Headquarters, U.S. Continental Army Command, 20 August 1965.

APPENDIX L

TASK TRAINFIRE: CURRICULUM DEVELOPMENT
FOR A SINGLE SUBJECT-MATTER AREA

Task TRAINFIRE: Curriculum Development
For a Single Subject-Matter Area

If there is one single skill that is common to all soldiers, irrespective of their particular military occupational specialties, it is rifle marksmanship. With very few exceptions, every new soldier must learn to use this basic Army weapon. Consequently, a training research project which produces improved instruction in rifle marksmanship will naturally have an Army-wide impact, if it is adopted and implemented. That is precisely what occurred in the U.S. Army in the 1950x.

For 15 years, from early World War II until mid-1957, the standard Army rifle marksmanship training program was a 90-hour course involving five sequential phases of instruction: sighting and aiming; firing positions; trigger squeeze; sustained fire; and sight setting. This program required trainees to fire a total of 377 rounds of ammunition at bullseye targets on known-distance ranges.

In May 1957, the Army began implementing a new marksmanship program developed by its contract training-research agency, HumRRO. The new program (identified by the code-name TRAINFIRE) was designed to provide trainees with marksmanship training more carefully oriented toward combat requirements than the standard course. It required only 78 hours (as compared with 90) and only 343 rounds of ammunition (as compared with 377), and it was built around the realistic employment of a remotely-controlled pop-up target that was "killable" in action, together with concurrent training in the field detection of live targets. The Army found this new program, which incorporated a number of well-established training principles, to be so effective that it was adopted immediately after a large-scale series of field trials.

Task TRAINFIRE involved a five-step developmental attack.

1. Researchers analyzed the battlefield situation encountered by a rifleman and determined the essential marksmanship skills. They analyzed battle reports and other written accounts. They interviewed literally hundreds of combat veterans. From the information so collected, they developed a number of premises which, when validated by Infantry School experts, became the basis on which the remainder of the project was conducted: (a) the combat rifleman's targets consist of enemy personnel who are rarely visible except in close combat; (b) he rarely sees or fires upon enemy personnel more than 300 yards away and, when he does, he locates them by fleeting indications such as smoke, flash, dust, noise, or movement; (c) he rarely uses his rifle sling to steady his aim, but will always attempt to support his rifle in some manner if support is available; (d) the sight picture he uses in combat differs

from that he uses in firing on bullseye targets, and he rarely takes advantage of the possibility of adjusting his rifle sights to take account of windage; and (e) his effectiveness as a rifleman depends on his ability to hit individual enemy targets rather than simply to inundate an enemy-occupied area with unaimed or poorly aimed rifle fire. The Infantry School experts agreed that the known-distance ranges then in use did not teach trainees some of the firing skills they needed in combat. They also agreed that training should include firing on surprise targets at several different distances (rather than at fixed and known distances), and that targets should be visible to the firer for only short intervals (because that is almost always the case in combat).

2. Researchers next developed proficiency tests to measure individual mastery of the critical rifleman skills. Two types of skills were found to be essential--target detection as well as simple marksmanship. Therefore, the TRAINFIRE team constructed two types of proficiency-measurement ranges, one to assess the trainee's ability to detect targets and a second to assess his ability to hit those targets with rifle fire. These ranges approximated, as closely as considerations for measurement and safety would allow, the situation encountered by a rifleman in a daylight fire-fight with an enemy.

3. The third step in the TRAINFIRE research and development program was development of a training method which would integrate all of the essential skills into a coordinated program that would take account of a number of well-established principles of training: providing for transfer of training; motivation, knowledge of results; meaningful units of instruction, repetition; distributed practice; and variety in training materials.

As part of the developmental effort, the TRAINFIRE team devised a "killable" target, which they nick-named "Punchy Pete." Under remote control, this target would suddenly pop up from some type of concealment and would remain exposed to view for a brief interval. If the trainee fired and hit the target, it would fall as though it had been wounded or killed (thereby providing immediate knowledge of results and enhancing trainee motivation). It also taught the trainee that if he missed with his first shot and could still see the target, he should fire a second time, just as he would be expected to do in a real combat situation.

In addition to providing this greater realism, the new program also provided better grounding in such fundamentals as the proper sight picture, sight alignment, and trigger control. Trainees fired the rifle early in the program to avoid building up fear of the weapon's "kick" (which fear leads to "flinching" and jerking the rifle off the target). They learned to battle-zero their rifles, that is, to adjust sights for the combat situation rather than for competitive firing on the known-distance ranges. The program also provided for concurrent training in both detection and marksmanship skills, culminating in proficiency tests of both these skills.

The final segment of the program is the Record Course, the proficiency test which measures how well the trainee has learned both the fundamentals and the finer points of target detection, marksmanship, and field firing. The trainee goes to a different range than the one on which he trained. There, targets appear at surprise points, stand briefly, and then disappear. This course begins with the trainee in a stationary, defensive position in which he can use a support for his rifle. He then "goes on the offensive," firing without support at targets as they appear. The trainee is scored on the basis of hits and misses.

4. In the fourth phase of the TRAINFIRE project, a company of basic trainees was made available by the Army for an experimental evaluation of the new rifle marksmanship program. The company was divided into two groups, the experimental numbering 112 and the control 108 soldiers. They were divided as equally as possible in terms of intelligence, proportion of Negroes and Whites, and other variables which might influence the results, such as previous experience with weapons. Both groups knew they were participating in an experiment so that the special interest and motivation was presumably equal for both groups. The control group received the standard eight-week Basic Combat Training program. The experimental group received this same program except for the rifle marksmanship program; they received the TRAINFIRE instruction. In addition to the control group trained entirely at Fort Benning, Ga., (where the TRAINFIRE course had been developed), another group of 50 soldiers trained in the conventional program at Fort Jackson, S.C., was sent to Fort Benning to fire the record course. These soldiers constituted a second control group.

5. As the final phase of the TRAINFIRE project, all three aforementioned groups fired the TRAINFIRE Record Course. The results of the experiment found that the experimental group scored the most hits on targets; the Fort Benning control group had the next highest scores; and the Fort Jackson group scored the lowest of the three. Similarly, in target detection, the experimental group exceeded the scores of both control groups, with the Fort Benning control group doing better than the Fort Jackson control group in this area, too.

On the basis of these experimental results, the Army then directed that a troop test be conducted to determine if TRAINFIRE's superiority to the standard rifle marksmanship course would "hold up" when training was conducted in a number of different locations with different instructors and trainees. This troop test was conducted between August 1, 1955, and October 31, 1955. It involved 4,200 trainees at Fort Jackson, S.C., and 6,700 trainees at Fort Carson, Colo., a total of more than 10,000 experimental "subjects." Results of this troop test confirmed the researcher's findings. In every instance, the average score on record firing of trainees in test companies was higher than the average score for trainees in control companies. In fact, the company average for the best control companies was below the company average for the poorest test company.

The Infantry School evaluated the test results and recommended that the TRAINFIRE program be adopted as the Army's standard program of basic rifle marksmanship training. This recommendation was approved by the U.S. Continental Army Command, which concluded that the research-based program better prepared soldiers to detect targets, and that TRAINFIRE soldiers were better able to hit targets once they were detected. The research-based program also took less training time and was more economical in overhead and maintenance than the conventional course. Army-wide implementation of the program began in 1957 and was completed for training installations within the United States in 1959. TRAINFIRE was also implemented by Army installations overseas and by the Army Reserve and National Guard. As a sidelight, it should be noted that this new training program was also adopted by the Canadian and Israeli armies in the late 1950s and early 1960s.

SOURCES: Howard H. McFann and others, TRAINFIRE I: A New Course in Basic Rifle Marksmanship, Technical Report 22 (Washington: Human Resources Research Office, George Washington University, October 1955); U.S., Department of the Army, Field Manual 23-71, Rifle Marksmanship Course: TRAINFIRE I, September 1957; U.S., Department of the Army, Pamphlet No. 355-14, Troop Topics: TRAINFIRE, July 1958; U.S. Department of the Army, The Infantry School, TRAINFIRE, 25 September 1959; U.S. Department of the Army, U.S. Continental Army Command, Pamphlet 350-15, Techniques of Marksmanship Training, 15 June 1965; and, Francis Jones, "TRAINFIRE I Briefing Data, Tripartite Conference," 2 November 1956, HumRRO Archives.

APPENDIX M

TASK SHOCKACTION: CURRICULUM DEVELOPMENT FOR
A COMPLETE PROGRAM OF INSTRUCTION

Task SHOCKACTION: Curriculum Development for
A Complete Program of Instruction

The research-based TRAINFIRE program of basic rifle marksmanship produced significant improvements in a single subject-matter area and was adopted and implemented by the Army. In Task SHOCKACTION, the Army's contract training-research agency, HumRRO, produced a complete program of instruction for Armor tank crewmen which was adapted and implemented by the Army.

This project began in 1954 with a request from the Army's training headquarters, U.S. Army Field Forces, for research to improve the Armor Advanced Individual Training (AIT) program. (AIT was the second of two eight-week phases of Recruit Training; unlike the general military instruction provided in the first phase, called Basic Combat Training, AIT prepared the new soldier for a particular military occupational specialty.) The Chief of Army Field Forces complained that the proficiency of Armor trainees at the end of AIT was below that required for satisfactory on-the-job performance. The request was for research to produce new methods and techniques of instruction for improving training and, through training, the performance of tank gunners, drivers, and loaders.

This research project was undertaken in six subtasks or phases. First, HumRRO scientists determined what each member of the tank crew needed to know in order to perform his job with maximum proficiency. Lists of job requirements were developed on the basis of doctrinal literature and used in developing interview forms and observation checklists. Following pilot test and revision, these forms and lists were used to study tank crew performance in a number of combat-ready Armor units. Data collected in this manner were evaluated by experienced Armor officers and shaped into criterion lists of the duties, activities, and responsibilities of tank crew members.

Next, two tests of Armor knowledge were developed, one to be used at the end of the AIT period and the other to be used in testing crewmen already on the job. Preliminary versions of the test were administered to both trainees and experienced tankers. The results were analyzed and the tests were revised until both their validity and reliability were established satisfactorily.

In the third phase of Task SHOCKACTION, these tests were administered to more than 6,000 tank crewmen throughout the Active Army and Reserve Forces to find out how knowledge of important Armor duties varies with training and experience. Trainees with no Armor experience,

recent AIT graduates, and tank crewmen in units throughout the United States were tested. Results confirmed the assessment which generated the study; overall proficiency was not satisfactory and improvement in the Armor AIT program was needed.

Army doctrine directs that all tank crew members be cross-trained, that is, that each man be capable of performing the duties of every other crew member. If one member is injured in combat, another can do his job. Also, such cross-training facilitates assignment of crew replacements. In the fourth phase of Task SHOCKACTION, the effectiveness of this cross-training was assessed to determine the actual "interchangeability" of tank crew members. A proficiency test was administered to 100 tank crewmen at each of the crew positions, and it was learned that the men did not know the other jobs as well as the one to which they were assigned, and that both experience and aptitude were clearly related to both proficiency and crew position.

The fifth phase of the research involved an intensive examination of the then-current Armor AIT program to see if there were any "obvious" ways in which it could be improved. Experiments were conducted to determine if trainees could master the essential skills in the time, and with the instruction, provided. Other experiments were conducted to determine the effect on learning of increasing and decreasing time devoted to particular subject-matter areas. Proficiency tests were developed for 20 of the most important subjects and skills in the standard AIT program and were administered to typical groups of trainees immediately after instruction had been completed. Learning curves for each of the units were then constructed by allowing the trainees to continue practicing their new skills until each curve reached a stable level.

Information collected in the first five phases of Task SHOCKACTION was used in the sixth phase in the design and construction of an improved AIT program. This new program required only six weeks of training (as compared with eight weeks required by the conventional course.) It minimized all training not directly related to the essential Armor skills. It included special administrative procedures to insure maximum use of available instructional time. It incorporated a number of well-known principles of instruction: (1) adhering to training objectives; (2) interrelating tasks with each other and with the whole program; (3) emphasizing learning-by-doing; (4) adequately communicating the materials; (5) giving immediate knowledge of results; (6) providing motivation; and (7) attempting to approach the realism of the actual job situation.

The detailed job descriptions which had been prepared for the crew positions were used to establish what should be taught in the training program. The criterion in all cases of reduction or elimination of subject matter was relevance or irrelevance of the topic to tank crewman functions. Special job aids were developed; photographs were made of steps in each crew member's job and put into book form, with each trainee receiving his own copy. Small-group instruction was stressed. Instructor lesson plans were heavily detailed, in many cases even to the point of including complete scripts.

Finally, the six-week experimental AIT program was administered to a company of Armor trainees. At the end of the course, a proficiency test was administered simultaneously to this company and to a comparable one (i.e., a control group) that had just completed the standard eight-week course. Members of the control company scored higher on three of 21 subtests. The two companies scored comparably on seven others. But graduates of the experimental course scored significantly higher than their conventionally-trained peers on 11 subtests and, perhaps more importantly, on the ones covering the more complex Armor skills. In sum, then, the research-based training program not only saved time and money (by reducing course length 25 percent), but also produced more capable graduates than the then-standard course.

HumRRO recommended that the Army adopt the prototype six-week program in place of the standard eight-week course. However, before endorsing this recommendation to its higher headquarters, the U.S. Army Armor Training Center first "beefed up" the experimental program by adding a seventh week of instruction. At the time this research was conducted, there was a Federal law which required that a new soldier receive at least 16 weeks of individual training before he could be sent overseas as a replacement. The seven-week AIT program, when added to the eight-week Basic Combat Training phase, only totaled 15 weeks, so the recommendation was turned down. With technical assistance from the SHOCKACTION research team, the Armor Training Center further built up the research-based program by adding still another week of instruction and practice. Then, in 1960-61, the Army began implementing this adaptation of the SHOCKACTION training program.

SOURCES: Robert A. Baker, The Determination of Job Requirements for Tank Crew Members, Technical Report 47 (Washington: Human Resources Research Office, May 1958); Robert A. Baker and others, An Evaluation of the On-the-Job Proficiency of Trained Tank Crewmen, Special Report 14 (Washington: Human Resources Research Office, June 1958); Robert A. Baker, The Achievement of Active-Duty and Reserve Tank Crewmen in Areas of Essential Armor Knowledge, Special Report 15 (Washington: Human Resources Research Office, November 1958); Robert A. Baker and others, The Effects of Increasing and Decreasing Training Time on Proficiency in the Critical Armor Skills, Technical Report 55 (Washington: Human Resources Research Office, June 1959); and Eugene F. MacCaslin and others, An Improved Advanced Individual Training Program for Armor, Technical Report 59 (Washington: Human Resources Research Office, December 1959).

APPENDIX N

A SYSTEMS ENGINEERING APPROACH
TO ARMY CURRICULUM DEVELOPMENT

A Systems Engineering Approach
To Army Curriculum Development

In February 1968, the U.S. Continental Army Command, the headquarters responsible for training all individuals and units within the Nation's borders, adopted a systems engineering approach to the development of curricula for all officer and enlisted functional and MOS-producing courses. By means of CONARC Regulation 350-100-1, the headquarters directed all its subordinate training commands to systems engineer all existing courses for which they were responsible, and to do so within the ensuing five years.

CONARC defined the systems engineering of training as "that series of orderly, systematic steps designed to produce a course of instruction that will provide graduates with the skills and knowledges essential to perform at the entry level in his MOS. CONARC Regulation 350-100-1 identified the processes involved in systems engineering training as: (1) job analysis; (2) selecting tasks for school training; (3) training analysis; (4) developing training materials; (5) developing testing materials; (6) conduct of training; and (7) quality control of training.

This model of training development matched very closely a seven-step approach to training development projects which the Army's contract training research agency, HumRRO, had followed since the mid-1950s. As explained in a number of technical reports and in one well-received book, this approach consisted of the following seven steps: (1) analysis of the military system from the human factors point of view; (2) analysis of the particular job; (3) specification of the required knowledges and skills; (4) determination of training objectives; (5) development of measures of job proficiency; (6) construction of the training program; and (7) evaluation of the training program.

The similarity was not accidental. The committee of Army education specialists who developed the CONARC regulation were all familiar with the HumRRO approach. Dr. John E. Taylor, a senior member of the HumRRO staff, served as consultant to the Committee, which was composed of representatives from the following Army schools: Adjutant General; Quartermaster; Ordnance; Infantry; Southeastern Signal; and Missiles and Munitions. The Committee was chaired by Jim Sherrill, Educational Advisor for the Adjutant General School. Its members met for six monthly, week-long working sessions between January and July, 1967.

As Dr. Taylor recorded in a Memorandum for the Record:

"At the outset, a couple of the committee members seemed to be concerned about the presence of a HumRROvian until assured that HumRRO was there truly as an advisor-consultant rather than as a quarterback.

For the first couple of days, the HumRRO representative walked on eggs, keeping his own speech-making to a minimum, going to the blackboard only once, and generally speaking only to reinforce points made by others, or to answer direct questions.

"[At the following month's session], the HumRRO representative was a fully accepted working member. As a consequence, he made speeches, traveled frequently to the board, and made one or two persuasive pleas to follow HumRRO's 7-step model exactly at critical points in the development process. At the end of the session, the HumRRO representative was assigned the job of follow-up reviewer. While others are to generate new sections for Session 4, he is to put the previously written material into final form."

In 1966, when this Army Committee was meeting to develop the Army regulation on the systems engineering of training, the research agency had been conducting Army training research for 15 years, and had had a number of its recommendations and research-based products adopted for Army use. It had established a reputation as an organization that was dedicated to using research to help improve Army training. For their part, the Committee members were equally dedicated to their task. As Dr. Taylor recorded, in his general impressions of Committee meetings:

"This is a unique committee. They border on being evangelists, and they are getting something done! They all believe strongly in their mission and they work day after day without let-up. . . . They see themselves as the group with responsibility for bridging the gap between training research and the operating Army school system. They want to collect research-generated wisdom and translate it into practical procedural guidance for use by those who develop and conduct training. They are all members of the HumRRO fan club and they are surprisingly familiar with the relevant pieces of HumRRO literature. . . . Each member knows all about one or more of the various pieces, having applied them at his own school, but they would like to have HumRRO help in putting it all together. HumRROvians needn't feel that they alone have found the handle, nor that people in the Army school system aren't just as concerned about the need for change along the very lines we have been advocating. . . . this is a rare opportunity to help prepare guidance designed to get all the Army schools going with the 7-steps."

USCONARC Regulation 350-100-1, "Systems Engineering of Training (Course Design)," appeared on February 1, 1968. It included 15 references, of which six were HumRRO technical reports. The similarity between the regulation and the HumRRO-recommended approach is even more striking than might be perceived from the labels applied to the respective "7 Steps." A comparison of the regulation with Crawford's chapter on the HumRRO approach in Psychological Principles in System Development demonstrates quite clearly the influence the research agency had on the Army's approach to training development.

It should be noted that this influence did not result from any single training research project, but rather from an accumulation of evidence from numerous projects that a systematic approach to course

development could pay dividends in terms of three goals: increased trainee proficiency; decreased training time and costs, and decreased aptitude requirements. As Crawford pointed out:

"When the psychologist is working at the development of a specific training program, he is functioning as an engineer, bringing his technological information and skill to bear on each step. In such work, he is able to see the utility and the limitations of current technology, and so becomes well oriented toward further research designed to strengthen the technology."

SOURCES: Meredith P. Crawford, "Concepts of Training," in Psychological Principles in System Development, ed. Robert M. Gagne (New York: Holt, Rinehart and Winston, 1962), pp. 301-39; USCONARC Regulation 350-100-1, "Systems Engineering of Training (Course Design)," 1 February 1968; John E. Taylor, HumRRO Memorandum for the Record, 21 April 1967; Arnold A. Heyl, HumRRO, to Lt. Col. John T. Gillespie, USCONARC, 8 January 1970; Robert G. Smith, Jr., The Design of Instructional Systems, HumRRO Technical Report 66-18 (Alexandria, Va.: Human Resources Research Office, 1967).

APPENDIX O

INTRODUCING PERFORMANCE-ORIENTED TRAINING
INTO THE ARMY TRAINING CENTER SYSTEM

Introducing Performance-Oriented Training
Into the Army Training Center System

In its training research and development activities for the Army, HumRRO has long focused on performance-oriented training as a vehicle for effectively training people at all aptitude levels. This approach has been prominently featured in individual research projects since the 1950s. However, in 1970, when the Army began making plans to revert to an all-volunteer force, an opportunity arose to influence the Army to adopt this approach in all its training programs. That year, the Army created the position of Special Assistant for the Modern Volunteer Army (SAMVA) to plan and test innovations in recruiting, Army life style, and training.

HumRRO scientists assisted the SAMVA with two of his responsibilities: evaluating the effects of changes in Army life style, and accomplishing a large-scale innovation in the Army Training Center system. In this latter assignment, the scientists worked with training officials at Fort Ord, Calif., to develop an Experimental Volunteer Army Training Program (EVATP)--a combined Basic Combat Training (BCT) and Advanced Individual Training (AIT) Program for the Infantry soldier. This project was not simply an attempt to introduce a series of unrelated innovations into the BCT/AIT training structure, but an attempt to fundamentally revise the instructional and testing structure into an integrated and progressive 16-week training sequence.

The EVATP incorporated six well-established training principles derived from educational psychology, instructional technology, and past HumRRO research. These were:

- (1) Performance-Based Instruction in which the student learns the skills required for job performance, with emphasis on active practice rather than passive reception of information.
- (2) Absolute Criterion, which meant that every student was required to reach a standard of performance in every skill, with advancement in the program determined on a go/no-go basis.
- (3) Functional Context, meaning that the student learns in a job-relevant situation, and that abstract and theoretical material is presented only when the student needs it to learn a skill.
- (4) Individualization, with students allowed to learn requisite skills at their own rates (within maximum bounds).
- (5) Feedback to both instructors and students.

(6) Quality Control to insure that the instructional system is functioning properly.

In designing a training system that incorporated these principles, research agency personnel first identified the specific skills trainees needed to learn in each subject area. Next, they used these skills, dissected into tasks, in developing the program of instruction and performance tests. Finally, they proposed instructional methods that would allow the men to learn the skills as actively and as completely as possible.

To convert the conventional training system to the EVATP program required a number of changes. "Familiarization" and orientation instruction had to give way to training that ensured that program graduates would be able to actually perform high-priority combat skills. Standardized written/performance tests with normative 70 percent passing scores were replaced by randomized performance testing using an absolute go/no-go criterion. In place of the traditional lecture-demonstration-practice instructional paradigm, the EVATP program maximized hands-on experience and practice while placing verbal presentations in context. Trainees learned at their own pace rather than in lock-step. The instructor's role shifted from information-presenter to one of demonstrating skills, organizing skill practice, checking student performance, and providing immediate feedback. Finally, a single end-of-course test was replaced by check-out immediately after instruction, diagnostic testing midway through BCT, and a final comprehensive proficiency test at the end of the course.

The new program was implemented on a pilot test basis at Fort Ord, Calif., in January 1971. Later that year, an independent evaluation team from the U.S. Army Infantry School compared the performance of EVATP graduates with that of conventionally-trained graduates (from Fort Jackson, S.C.) on tests it had prepared without input from the EVATP's developers. The results of this testing showed that EVATP graduates were superior to their peers on five of the seven BCT subjects, and equal to them in the remaining two. At the AIT level, the EVATP graduates were superior on seven of nine subjects, and equal on the remaining two. This superiority ranged from a low of eleven percent in use of the Starlight Scope night vision device to a high of eighty-two percent in use of the M72 LAW weapon system.

The EVATP program proved so successful that the U.S. Continental Army Command directed that all Army Training Centers reorient their programs along the lines of performance-oriented training. By late fall, 1971, all other Army Training Centers were using the Fort Ord program as a model for this reorientation. The EVATP development team assisted this conversion effort by conducting workshops for each of the Army's training centers. By the time the effort was completed, the HumRRO scientists had reached the following conclusions:

(1) The problems encountered in effecting massive institutional change in the Army Training Center context are formidable. Quick conversion from one training system to another is not possible. Of the

several components of the ATC system that must change, by far the most resistant is instructor/cadre attitude. There exists a basic reluctance to depart from familiar instructional techniques.

(2) A performance-based training system that integrates Basic and Infantry MOS training can be implemented within an ATC's normal operating resources. It produces graduates with higher levels of demonstrated skill proficiency than does the conventional system.

(3) The system permits the attainment of higher levels of skill performance within the same or shorter time frames.

(4) Performance-based training permits high achievement by low- as well as by high-mental category personnel. The system tends to attenuate achievement differences attributable to aptitude level.

(5) In such a system, the use of an absolute go/no-go criterion of skill attainment is feasible and administratively practicable.

(6) The system provides a means for frequent assessment of the development of skill proficiency.

(a) Feedback of this information during instruction to both trainees and trainers provides an important feedback loop missing in the conventional system.

(b) Close monitoring of the available performance data by training managers at all levels provides a quick-response quality control system whereby strengths and weaknesses in any component of the training system can be pinpointed.

SOURCES: John E. Taylor and others, The Concepts of Performance-Oriented Instruction Used in Developing the Experimental Volunteer Army Training Program, Technical Report 72-7 (Alexandria, Va.: Human Resources Research Organization, March 1972); John E. Taylor and others, Establishing the Concepts and Techniques of Performance-Oriented Training in Army Training Centers: A Summary Report, Technical Report 75-21 (Alexandria, Va.: Human Resources Research Organization, June 1975); U.S. Army Infantry School, Training Management Digest: Performance-Oriented Training, Training Circular 21-5-2 (Fort Benning, Ga.: U.S. Army Infantry School, September 1973).

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