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ABSTRACT

The objective of Work Unit SKYGUARD has been to facilitate the development of an improved Air Defense Officers Advanced Course (C-22) by the U.S. Army Air Defense School. Focus is on techniques for improving the completeness and relevance of the instructional objectives with respect to future job requirements. The job description procedures specified in CONARC, Regulation 350-100-1, "Systems Engineering of Training", February 1968, were evaluated as to adequacy for describing officer jobs, and to develop alternative or supplementary procedures, if necessary. It was proposed that major deficiencies could be avoided by beginning the job description process with the development of a job model to guide the rest of the descriptive process; consequently, a sample job model was developed to deal with common, non-trivial officer jobs. The partial job model for army officers includes coverage of systems assumptions underlying the identification of broad job functions; analysis and description of officer decision; behavior management (behavior analysis, group interactions, student concepts, functional model, information collection); goal-setting functions. (EA)

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

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SUBJECT: Use of the Job Model Concept to Guide Job Description Procedures for Army Officers

TO:

1. The research described in this report examined the job-description procedures set forth in CONARC Regulation 350-100-1, "Systems Engineering of Training," to evaluate their adequacy for describing officer jobs, and to develop alternative or supplementary procedures should the prescribed procedures be found deficient.

2. Many of the behavioral objectives for existing officers advanced courses do not specify job performances; an inexperienced officer can fail to meet a number of these objectives and still perform adequately in real-job situations, and vice versa. Not only many of the objectives but also many portions of related manuals and documents are concerned with such matters as format of reports rather than the process of job performance.

3. Major discrepancies between job descriptions and job performance can be avoided by beginning the job-description process with development of a job model. The partial model developed in this report examines three types of major activities in which officers most often function: operational decisions, leadership, and identifying and analyzing goals.

4. This report outlines a general prototype model that appears to be useful as a framework and approach to systems engineering career-type courses for Army officers. The methods for achieving effective and efficient use of human resources should be of particular interest to all persons serving in management or training-management positions.

FOR THE CHIEF OF RESEARCH AND DEVELOPMENT:

R. O. VITERNA
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Chief, Behavioral
Sciences Office

Technical Report 73-26

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HumRRO

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HUMAN RESOURCES RESEARCH ORGANIZATION

Work Unit SKYGUARD

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The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation. HumRRO's mission in work performed under Contract DAHC 19-73-C-0004 with the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

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FOREWORD

The research described in this report was undertaken by the Human Resources Research Organization under Work Sub-Unit SKYGUARD I, Construction of a Job Model for the Air Defense Officer. The objective of Work Unit SKYGUARD was to provide the U.S. Army Air Defense School with the necessary information for systematic modification and optimization of the existing Officer Advanced Course and of similar career type instructional programs.

The objective of the research described in this report was to evaluate the job description procedures specified in CONARC Regulation 350-100-1, *Systems Engineering of Training*, February 1968, as regards their adequacy for describing officer jobs, and to develop alternative or supplementary procedures, if necessary. It was proposed that major deficiencies could be avoided by beginning the job description process with the development of a job model, which serves to guide the rest of the descriptive process. A sample job model dealing with common, non-trivial officer jobs was developed.

The SKYGUARD research was conducted by HumRRO Division No. 5, Fort Bliss, Texas (now part of HumRRO Western Division). The work was begun while Dr. Robert D. Baldwin was Director of Division 5, work continued under Dr. Albert L. Kubala. The present Director of the Western Division is Dr. Howard H. McFann.

Military support was provided by the U.S. Army Air Defense Human Research Unit. LTC Frank K. Husted was Military Chief during the conduct of most of this research. LTC Frank D. Lawler was Military Chief at the time of its completion.

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Meredith P. Crawford
President
Human Resources Research Organization

SUMMARY AND CONCLUSIONS

PROBLEM

This report is concerned with techniques for improving the completeness and relevance of the Air Defense Officers Advanced Course (C-22). The research objective was to evaluate the job description procedures specified in CONARC Regulation 350-100-1, *Systems Engineering of Training*, February 1968 (1), as regards their adequacy for describing officer jobs, and, if the present procedures were found to be deficient, to develop alternative or supplementary procedures.

EVALUATION OF CONARC JOB DESCRIPTION PROCEDURES

Previous evaluations of the type of job description procedures specified in the CONARC regulation were reviewed, along with recent applications of these procedures to the description of officer job functions. This type of job description procedures was judged to be deficient for describing man-ascendant job functions. Most critically, these procedures are founded on the assumption that the job is currently being performed effectively or appropriately. They do little more than specify and authenticate the existing conception of the job. If the existing conception is not adequate, then application of existing procedures will do little to rectify the situation.

THE CONCEPT OF THE JOB MODEL

It is proposed that these major deficiencies can be avoided by beginning the job description process with the development of a job model as conceived by Ammerman (2). Such a model serves to guide the rest of the descriptive process.[1] The job model is viewed as having three major sections:

(1) A specification of broad job functions derived from appropriate system characteristics.

(2) A specification of general behavioral science considerations appropriate to the analysis of each broad job function; that is, a behavioral model of each job function.

(3) A specification of the information categories required for fully explicating each broad job function, the appropriate sources of such information, and the procedures for gathering the information.

A PARTIAL JOB MODEL FOR ARMY OFFICERS

A partial model of Army officers' jobs is presented as an example. This model is sufficiently general to apply to all Army officers. An officer's job assignment can be viewed as consisting of a cluster of position assignments in different decision-making and management systems—that is, in any given assignment, an officer functions in several

[1] While there will be an initial need for direct participation of behavioral scientists in the development of job models, the need can be minimized over time.

different systems. However, different assignments most often consist of different positions in the same system. Systems are the common characteristics that cut across assignments. Hence, systems should be the basis for organizing job descriptions and training sequences.

Four different kinds of systems in which officers most often function are identified: (a) major decision systems; (b) major fiscal, materiel, and personnel management systems; (c) behavior management systems; (d) goals identification and analysis systems.

Major Decision Systems. The decision systems of concern are those that require skilled judgments and complex mental processes, that deal with technical military content in some fashion, and that are important in their consequences. The behavioral analysis of each decision system should identify the subordinate decisions, judgments, and formulations that must be accomplished in order to arrive at an appropriate outcome. Only one decision system was identified and analyzed:

> *Determines the most appropriate course of action for a military unit during a dynamic combat engagement.*

Major Fiscal, Materiel, and Personnel Management Systems. None of these systems was analyzed at this time.

Behavior Management Systems. The true "leadership" was recast in a behavioral context by equating it to behavior management. Hence, this officer function was defined:

> Behavior Management. Designs and implements management practices that strengthen productive behaviors and weaken counterproductive behaviors in the unit.

Goals Identification and Analysis Systems. These systems are analyzed only in general terms at this time.

SUGGESTIONS TOWARD PROGRESSIVE CHANGES

It will require both a substantial effort and a considerable amount of time to prepare a complete and valid training program that is in accord with the job model. However, progressive changes can be made in the existing training program piece-by-piece with incremental improvements in validity.

Many of the behavioral objectives in the existing officers advanced courses do not specify job performances. It is quite conceivable that an experienced and qualified officer could fail to meet a number of these objectives and yet perform adequately in real job situations, and vice versa. Not only many of the objectives, but also much in the related manuals and documents are concerned with the format of reports rather than with the process of job performance. The preparation of performance objectives that at least approximate job processes could well be the first of a series of progressive improvements. As an interim measure, the schools might pool the information that their experienced officers have for each component in each job process.

CONTENTS

Use of the Job Model Concept To Guide Job Description Procedures for Army Officers

Chapter 1

INTRODUCTION

MILITARY PROBLEM

The objective of Work Unit SKYGUARD has been to facilitate the development of an improved Air Defense Officers Advanced Course (C-22) by the U.S. Army Air Defense School. Improvements may be made either in the completeness and relevance of the instructional objectives or in the effectiveness of the instructional methods. This report is concerned only with techniques for improving the completeness and relevance of the instructional objectives.

If the instructional objectives are not complete and relevant with respect to future job requirements, the graduates of the training program will perform inadequately on the job, regardless of the effectiveness and sophistication of the instructional methods. Job experience may or may not be sufficient in itself to overcome such training deficiencies. Even in those instances where job experience is sufficient, acquiring substantial amounts of proficiency on the job may be too costly to tolerate, particularly for combat skills. If such skills are not learned during school training, and if no war exists in which they can be learned on the job, then proficiency of the officer corps in these skills may slowly atrophy and would need to be reacquired at great cost during the initial stages of a future war. These costs would be particularly accentuated for the combat decision skills of field grade officers, because the outcomes of their decisions affect so many other individuals.

RESEARCH PROBLEM

Procedural guidelines for deriving training objectives for Army programs of instruction are provided in CONARC Regulation 350-100-1, *Systems Engineering of Training* (1). Informal reports have suggested that there are deficiencies in these procedures, particularly as regards "soft skills" such as leadership, management, and counseling.

The objective of this research effort is to develop alternative or supplementary procedures for describing officer careers, if the present procedures are indeed deficient. Thus, the first step is to evaluate the procedures specified in CONARC Regulation 350-100-1 as regards their adequacy in describing officer jobs.

Chapter 2

AN EVALUATION OF THE APPLICABILITY OF CONARC PROCEDURES FOR SYSTEMS ENGINEERING OF OFFICER TRAINING PROGRAMS

GENERAL DEFICIENCIES FOR DESCRIBING OFFICER JOBS

The job description procedures presented in CONARC Regulation 350-100-1 are the product of a sequence of job description developments that have been concerned with equipment-oriented jobs in machine-ascendant systems.[1] It is not surprising that job description procedures were developed first for machine-ascendant systems, since these are the systems that have generated the bulk of new training requirements during the last two decades.

Ammerman (2) notes several problem areas in applying these equipment-oriented procedures to the description of officer jobs. The two most critical problem areas that he identifies are:

(1) "Many portions of the techniques require analysts having special skills in job analysis and psychology. . . .

(2) "The approach covers only tasks directly involving equipment, a relatively small portion of the work activities for many officer jobs."

There are two other problem areas that should be added to Ammerman's list:

(3) The assumption in the procedures that all job incumbents perform essentially the same tasks is not true of officer jobs.

(4) The assumption that existing job practices and procedures are appropriate, complete, and effective is open to question.

SPECIAL SKILLS

The CONARC procedures are written as if the preparation of a job description did not require "special skills in job analysis and psychology." Job description is presented as consisting of routine clerical activities. R.B. Miller (4), who may be viewed as the single behavioral scientist most responsible for the development of job description procedures for training design, states that the notion that task descriptions can be developed by laymen as a routine clerical process is only partially true and is dangerously misleading. He points out that a prior behavioral understanding of the task will serve to identify those performance and environmental characteristics that need to be included in the description, and those that can be omitted.

Cronbach (5) essentially reiterates Miller's position in observing that, although the specification of the underlying psychological processes is not generally included in task descriptions, the analyst's conceptions of these processes very much influence what

[1] Follettie (3) distinguishes between man-ascendant and hardware- or machine-ascendant systems as the two ends of a continuum dealing with the relative amount of hardware that is critical to the functioning of a system. An infantry company is an example of a man-ascendant system, and a guided-missile battery is an example of a machine-ascendant system.

characteristics he selects for description. Although Miller and Cronbach are talking about the description of tasks in terms of task elements, the same comments can also be applied to the description of jobs and job duties in terms of tasks.

MACHINE-ASCENDANT SYSTEMS

The CONARC job description procedures, as specified in CONARC Regulation 350-100-1, are based upon an initial identification of tangible objects with which the job incumbent must interact. This is to be expected as, historically, these procedures were developed in the context of machine-ascendant weapons systems. In such contexts, the functions and subfunctions of the system and system components have already been derived by the equipment designer before the job analyst arrives on the scene. They are the "givens." The job analyst may have to ferret them out from the equipment functions and configurations, but he will not have to begin with an analysis of the system environment to determine gross system functions.

In a man-ascendant system, however, this functional analysis may not have been accomplished prior to the arrival of the job analyst. Brown and Jacobs (6) comment as follows:

> "It is significant to note that the training objectives for members of a machine-ascendant system may be ascertained largely from an analysis of the functions of the machine; also, a criterion of satisfactory performance is readily available—the machine either works or does not work. To achieve the same ends for the members of the . . . man-ascendant system is clearly more complex."

In the man-ascendant system, the job analyst may have to structure the environment and identify its elements. He may have to make value judgments regarding the system's objectives. He may have to "invent" the functions or missions of the system. He will have to engineer the accomplishment of system missions by integrating behavior components in much the same manner as equipment engineers integrate machine components. There are behavioral principles that determine the design and arrangement of human components just as surely as there are engineering principles that determine the design and arrangement of hardware components to achieve the system's missions.

In dealing with a machine operator function, the analyst first determines what specific function the machine ought to perform in a given situation. Then, deducing from the theory of the machine's operation, he determines what the man must do to the machine in order to have it perform the specified function. In a similar manner, in dealing with a supervisory or leadership or counseling function, the analyst first determines what function the subordinate ought to perform in the situation. Then, deducing from a theory of operation for human beings, he determines how the leader or supervisor or counselor must treat the subordinate in order to have him perform the specified function. The crux of the difficulty in identifying and analyzing man-ascendant functions lies in the fact that analysts typically do not have at their disposal an appropriate theory of operation for human beings.

CONARC Pamphlet 350-11, *Systems Engineering of Unit Training*, (7) presents mission analysis as a routine and critical part of the systems engineering process. CONARC Regulation 350-100-1 would be greatly strengthened by inclusion of the mission analysis portion of this pamphlet. It could be incorporated without substantive changes, since it is already oriented toward military applications.

PROCEDURALIZED JOBS

The CONARC procedures were developed to describe relatively stable, largely proceduralized jobs in which all job incumbents perform essentially the same activities. The specific activities performed by officers, however, vary widely from one assignment to the next. The general duties required of officers in different assignments may be the same, but many of these duties have not yet been reduced to procedures.

EXISTING JOB PRACTICES

The CONARC job description procedures are written for existing jobs, with the assumption that these jobs are currently being performed effectively or appropriately. Adequate criteria for evaluating performance of some kinds of job functions do not exist. Without such criteria it is not possible to determine whether such functions are or are not being performed effectively.

Leadership, for instance, is a complex function that has been given many different meanings by different experts. There is a need for a definition of leadership that differentiates subordinate functions to an action or operational level. Typical leadership practices cannot be unequivocally accepted or rejected as appropriate job performances without such criteria.

The job incumbent does not necessarily constitute an authority regarding appropriate practices, although he can be used as a source of information regarding the incidence and characteristics of problem situations and current job practices. Nor can existing manuals on leadership be accepted unequivocally, since they are not based upon behavioral science theory and fact.

SUMMARY

The job description procedures in CONARC Regulation 350-100-1 are technically restricted in their range of application. They represent the job description process in a highly proceduralized fashion. They make no provision for developing a psychological or behavioral theory of the job and its system context prior to collecting specific information about the job. Since they use only existing information sources and job incumbents to determine appropriate job performance, they serve mainly to specify and authenticate the existing conception of the job. The adequacy of these procedures in describing a particular job depends primarily upon whether or not the existing conception of the job is considered adequate; if not, application of these procedures will do little to rectify the situation.

Chapter 3

THE CONCEPT OF THE JOB MODEL

BACKGROUND

In 1965, Ammerman (2) introduced the concept of the job model as follows:

> To facilitate the process of describing junior officer jobs, it appeared useful to provide a particular way of thinking about the officer job. This concept should form a basis for structuring and organizing the activities performed by job incumbents. Development of a job description procedure based on such a concept should make it possible for relatively untrained analysts (as might be available at a service school) to accomplish a complete and accurate description within a reasonable period of time.
>
> To provide this conceptual basis for officer job description, development of a model of junior officer job behavior was undertaken. This provides a frame of reference for the development of a job description procedure that a service school can use effectively to obtain a valid and complete inventory of the tasks performed by junior officers in a job assignment. In particular, the procedure was designed for use in those situations in which the analyst must fragment general statements of duties into specific component tasks that are performed by individual job incumbents.

Note that, in Ammerman's usage, the job model is developed prior to the conduct of the job description, as a basis for prescribing the procedures to be used in developing the description. The job model, in this sense, serves the same purpose at the job level as does the identification of psychological processes.

FUNCTIONS OF A JOB MODEL

Ammerman directly specifies two functions of the job model:

(1) ". . . form a basis for structuring and organizing the activities performed by job incumbents."

(2) Provide a basis for developing those job description procedures that can be accomplished by relatively untrained analysts.

He implies another function when he states that, "current ideas about how people behave in management roles were considered in relation to the model of officer job behavior, influencing its design and components." This suggested a third general function:

(3) Provide for the application of behavioral science data and theory to the definition and analysis of broad job functions. Ammerman developed a model of the general decision-making process from behavioral science considerations as the cornerstone of his job model.

A fourth function is implicit in Ammerman's discussion:

(4) Provide for the derivation of broad job functions from overall system characteristics.

COMPONENTS OF A JOB MODEL

The job model can be viewed as having three major sections:

(1) A specification of broad job functions derived from appropriate system characteristics.

(2) A specification of general behavioral science considerations appropriate to the analysis of each broad job function.

(3) A specification of the information categories required in order to fully explicate each broad job function, the appropriate sources of such information, and procedures for gathering the information.

If a systems analysis has been conducted beforehand, the first section should summarize the findings of the analysis, specify those system characteristics most pertinent to the derivation of broad job functions, and state the broad job functions themselves. If a complete, formal, and validated systems analysis has not been conducted, then this section should at least specify the assumptions that were made about the system in order to derive the broad job functions. Generally, this section should contain a schematic representation that relates job inputs and outputs to system requirements. It may also be necessary to identify the various job environments and to specify those characteristics, both physical and social, that may impose special requirements on job performance.

In some instances, it may be necessary to deal with multiple systems or multiple jobs, or with multiple jobs in multiple systems. For example, an officer might be assigned to any one of several jobs in the same system, or he may be assigned to function at any one of several jobs in different systems. Or a particular assignment may consist of several part-time jobs in several different systems. In these situations, the first section of the job model should include a summarization and schematization of each pertinent system, relating the requirements of each system to the inputs and outputs of each job as appropriate. It should also state the broad functions of each job as derived from the system requirements.

The second section of the job model should specify the behavioral processes pertinent to the performance of each job function. Identification of these processes may require expert knowledge in one or more specific behavioral science areas. There will be progressively less need for such knowledge as sophisticated models are developed for more and more common, broad job functions or duties. For instance, a sophisticated model of troubleshooting as a broad job function can be applied in the analysis of many, if not all, maintenance jobs. Such a model would specify the behavioral processes involved in performing troubleshooting. As Miller (4) points out, it would indicate what should and what should not be identified and described in detail. It may also specify the types of job aids to be used to support job performance. The formulation and existence of such models can serve as the focal point for research that can be broadly implemented in subsequent job description activities. As a number of such models evolve, they might be assembled in a handbook that could be readily updated for use by job analysts throughout the Army's schools and training centers.

The third section of the job model should specify the categories of information required to complete the job description, the appropriate sources for each category of information, and the appropriate procedures for obtaining the information. The job description procedures in CONARC Regulation 350-100-1 can serve as a guide for this section of the job model.

Different categories of information may have to be obtained from different sources. It should not be assumed that existing documentation and present job incumbents are appropriate and valid sources for all information. If the job function has not been performed adequately in the past, with regard to some job effectiveness criterion, then it may be necessary to invent new processes for performing the function, rather than just to

describe old processes. There may not even be adequate criteria for some job functions, such as leadership, supervision, and peer motivation. In such cases, it may first be necessary to invent the criterion.

The invention of a new criterion or a new process may require an extensive literature search, consultation with experts, and considerable ingenuity. In some cases, it may be necessary to field test a new process or experimentally evaluate several possible alternative processes.

Job incumbents will generally be the most appropriate sources for information about the frequency of various job situations, but they may be very poor sources for information about the criticality of tasks. In many instances, criticality may be more validly established by means of an analysis of missions and mission requirements (8).

If the job consists of more than one broad function, then the second and third sections of the job model may be combined by job functions. The model may be more readily understood if information categories, sources, and procedures for a given function are presented immediately following the analysis of the behavioral processes pertinent to the performance of the function.

Different analysts may construct different models for the same job. Where vast differences occur, emphasis should be placed on merging the two models rather than on selecting one over the other. Each analyst may have selected a different aspect of the system or job for major emphasis. Multiple analysts working independently may provide the best means of arriving ultimately at a comprehensive and efficient job model. The development of an effective job model may be viewed as a creative process; in this context, work by several analysts would increase the probability of evolving toward a comprehensive model, rather than being wasteful duplication.

JOB SPECIFICATION VERSUS JOB DESCRIPTION

Frederickson[1] suggests making a distinction between job description and job specification efforts. The former develop descriptions of jobs as they *are* in fact performed; the latter develop specifications of jobs as they *ought to be* performed. In job specification efforts, it is crucial to develop a set of rationales for determining how a job ought to be performed. This is the function served by the job model, particularly the behavioral rationales appropriate to the performance of each job function.

Boguslaw and Porter (9) define a continuum of system situations that is useful in determining whether a training development effort should proceed from a job description or from a job specification. They distinguish between *established* situations and *emergent* situations. In established situations, (a) environmental conditions, (b) the states of the system, and (c) the consequences of alternative courses of action are known. In emergent situations, (a) all environmental conditions have not been determined, (b) all states of the system have not been determined, and (c) complete analytic solutions have not been derived from existing technology.

Since all relevant factors are known in established situations, there is no need to develop a job model. Training development can proceed from a job description. Note that the characteristics of established situations are also characteristics of machine-ascendant systems. A systems analysis identifying the conditions of the environment and the states of the system must already have been accomplished by the equipment designer in order to determine the functional requirements of the equipment. Furthermore, if the equipment development effort has included a competent human engineering program, the

[1] E.W. Frederickson, personal communication.

alternative courses of action and their consequences have been established and specified for each position in the system.

Some systems that are not commonly classified as machine-ascendant qualify as established situations. The most obvious are personnel, materiel, and fiscal management systems. These systems are specified by the forms, records, and ledgers appropriate to each. These forms, records, and ledgers are designed in much the same manner as is the equipment in a machine-ascendant system. In spite of the fact that paper is not generally considered to constitute a machine, these paper-oriented systems possess all the critical characteristics of a machine-ascendant system.

Not all factors are known in emergent situations. Although some gross environmental conditions and states of the system may have been identified, they have generally not been analyzed into precise operational statements. In order to develop training programs for emergent situations, these unknown factors must be discovered. This is the purpose of the job model. The development of the job model proceeds either from knowledge of, or assumptions about, the system (that is, its environmental conditions and its various states) and includes the identification of alternative courses of action and their consequences. It must also include a specification of the behavioral processes required for effective performance on the job.

Since all machine-ascendant systems are established situations, all critical factors are known or readily derivable. As previously noted, these are the systems that have generated the bulk of new training requirements during the last two decades. Training for man-ascendant systems is now becoming critical, particularly for those in emergent situations. There is a need to develop procedures for constructing training programs for man-ascendant systems that are as valid and reliable as those that can be constructed for machine-ascendant systems. To do so requires that procedures be developed to derive those factors that have been provided as "givens" in constructing training programs for machine-ascendant systems. This is not a radically new kind of process, but simply an extension of an established process to incorporate a broader range of problems.

BEHAVIORAL MODELS FOR JOB FUNCTIONS

Identifying and defining job functions from system characteristics, and formulating the behavioral processes underlying each function, require a behavioral science background. However, most of the rest of the job specification process can be accomplished by intelligent laymen. The need for direct participation by behavioral scientists in job specification efforts can be minimized over a period of time by deriving models of the general behavioral processes underlying many classes of job functions and making these available to lay job analysts in a reference source. The following are examples of classes of job functions that might be included in such a source.[2]

(1) Esprit—Establishing intragroup conditions that will maintain mission-oriented behavior in high threat environments.

(2) Visual detection—Emitting a differential response as soon as possible to the occurrence of a visual target with a subtended visual angle that increases at some specified rate from an initially imperceptible size in a visual field of specified dimensions and clutter.

[2]The reader may feel that these definitions contain too much behavioral science jargon. In time, a more suitable language should develop somewhere between the precise vocabulary of science and the richer vocabulary of everyday usage.

(3) Visual recognition of three-dimensional objects—Emitting the appropriate designation for any view of a set of three-dimensional objects at a specified visual size in a visual field of specified size and clutter.

(4) Behavior management—Defining, eliciting, and maintaining the occurrence of productive or appropriate behaviors from subordinates and identifying and minimizing the occurrence of inappropriate behaviors among subordinates.

(5) Counseling—Eliciting information about a personal problem from a distraught subordinate and facilitating the development and implementation of an effective course of action for alleviating the problem.

(6) Group problem solving—Facilitating the identification of problems and the development and implementation of encompassing, effective courses of action by a small group of individuals.

There is no need to develop an elegant classification of job functions in order to develop a reference source of behavioral models, although such a classification may eventually emerge. The issue for now is to identify the more critical job functions from a practical point of view and to develop workable behavioral models for each one. Additions and modifications can be made later on.

Behavioral models for classes of job functions can be compiled in looseleaf binders so that they can be readily revised. These compilations summarize behavioral science information bearing on the performance of each job function, and can also include information on training strategies for each job function. The compilations should be written in a style suitable for the job analysts who will use them.

Chapter 4

A PARTIAL JOB MODEL FOR ARMY OFFICERS

INTRODUCTION

The job model that follows is not complete and is not specific to Air Defense Officers—it is a partial model that is sufficiently general to apply to all Army officers. It is partial largely because of the present investigator's restricted knowledge regarding a number of military activities. The model's incompleteness does not detract from the purpose of this report, which is to develop the concept of the job model and to present extended examples of critical features of such models for Army officer jobs.

SYSTEMS ASSUMPTIONS UNDERLYING THE IDENTIFICATION OF BROAD JOB FUNCTIONS

Although officers perform many discrete tasks that differ from one assignment to the next, most of the differences are relatively trivial in comparison to the common functions that an officer performs in one manner or another in all his assignments. Many of the discrete tasks can be performed by an officer without specific training simply by following the instructions in manuals and regulations. The critical aspect of designing programs of instruction for officers is to identify nontrivial functions that cut across many or all officer assignments.

Army Pamphlet 600-15, *Leadership at Senior Levels of Command* (10), suggests three broad functions performed by commanders, as follows:

> "(1) The first activity of the commander involves operational decision-making. . . .
>
> "(2) Another major activity of the commander involves management—the development and application of proper procedures for allocating and utilizing the resources, both human and physical, of the organization. . . .
>
> "(3) . . . a third important aspect of command is leadership. It is the function of command leadership to stimulate, control, and direct the activities of individuals in the unit in constructive ways, so that the performance level of the organization may be optimally developed and maintained for mission accomplishment. Thus, command leadership is concerned with human performance. . . ."

Although these are cited as commander activities, officers in noncommand assignments also participate in them. Thus, although the commander is responsible for the final decision, many of his subordinate officers participate in delineating and evaluating the alternatives from which he chooses. In this sense, it is more accurate to speak of decision systems rather than individual decision makers.

Decision making, management, and leadership need to be goal or mission oriented at all times in order to be productive. Missions not only must be identified, but must be analyzed into specific goals. These goals, in turn, must be successively analyzed until meaningful performance objectives have been stated for each critical individual in the

organization. The identification and analysis of missions and goals constitutes a fourth command activity. CONARC Pamphlet 350-11, *Systems Engineering for Unit Training*, (7) provides excellent guidance for identifying and analyzing missions.

There are four different kinds of major activities, then, in which officers most often function: (a) making operational decisions, (b) managing fiscal, material, and personnel resources, (c) leadership, and (d) identifying and analyzing goals.

Only three of these activities will be dealt with in the present report. Analysis of fiscal, material, and personnel management activities or systems would have been well beyond the scope of this effort.

From an operational point of view, a decision system consists of procedures for collecting and processing information as a means of identifying the critical elements of a problem situation and as a basis for formulating and evaluating alternative courses of action. Major decision systems can be identified for each type of unit and organizational level within the Army.

Most often, the components of major decision systems are performed by different individuals. For example, one man collects one kind of information and another man collects another, a third man evaluates and collates the information collected by the first two, a fourth man formulates alternative courses of action and evaluates them in conjunction with a fifth man. These individuals are assigned different responsibilities in this decision system.

Members of a command group may participate in several such decision systems. Thus, a particular officer's job assignment may consist of an aggregate of responsibilities from several different decision systems. This situation is diagrammed in Figure 1. Job Assignment I is composed of the A responsibilities in Decision Systems 1, 2, and 3; Job Assignment II is composed of the B responsibilities in Decision Systems 1, 2, and 3; and so on.

Hypothetical Distribution of Responsibilities by Jobs in a Command Group

Responsibilities
(Decision System Components)

Decision Systems	A	B	C	D	E
1	1A	1B	1C	1D	1E
2	2A	2B	2C	2D	2E
3	3A	3B	3C	3D	3E
	I	II	III	IV	V

Job Assignments

Figure 1

If each of these Job Assignments is analyzed separately, the input-output linkages from one component of a decision system to the next will be deemphasized or even omitted from the analysis. Furthermore, if instructional units in the resulting training program are organized in terms of Job Assignments, all students are not likely to discover all input-output linkages. Hence, irrelevant information may be collected and processed,

and relevant information may be ignored, simply because the person responsible for collecting and processing information doesn't know how such information is to be used. Establishing rules for ensuring integration between components can make each component of a decision system difficult to learn and make the system rigid and unresponsive to improvement.

A graduate of the training program can be placed in any of the five job assignments. Although each assignment is composed of different responsibilities, all five assignments are concerned with the same three decision systems. For the command group to function most effectively, the components of each decision system must be fully integrated. Hence, it seems more appropriate to organize the analysis of job activities in terms of decision systems rather than in terms of job assignments. The resulting instructional program should also be organized in this same fashion. The Regular Course at the Command and General Staff College may be an example of this kind of organization. The Haines Board Report (11) indicates that the C & GSC curriculum integrates the functions of the general staff, rather than presenting them in separate G1, G2, G3, and G4 groupings.

Leadership will be defined as behavior management. The commander is responsible for defining, eliciting, and maintaining the occurrence of productive or appropriate behaviors and for identifying and minimizing the occurrence of inappropriate behaviors among his subordinates. Officers in noncommand assignments also participate in the control of behavior in the organization; it is more accurate to speak of a behavior management system than of individual behavior managers.

Effective identification and analysis of organizational goals is the basis for integrating management and decision-making activities throughout all levels and components of the organization. Goal setting should be a continually dynamic activity. Organizational goals and objectives should be responsive to changes in both the external and the internal environments of the organization. Ensuring that all activity is goal-oriented is a primary ingredient in effective management. It is more accurate to speak of a goal identification and analysis system rather than of individual analysis.

The following section will develop a model for each of the three systems—decision-making behavior management, and goals identification. The part dealing with the identification and analysis of decision-making systems will be restricted to only one decision-making system as an example. The identification and analysis of all major decision systems in which officers participate is beyond the scope of this effort. The example will analyze the following decision system:

> *Determines the most appropriate course of action for a military unit at any point during a dynamic combat situation.*

The part dealing with the analysis of leadership or behavior management will begin with an exposition of a behavioral approach to behavior management based primarily on the principles of operant conditioning. There are any number of theoretical approaches from which one could select: psychoanalysis, some particular personality theory, social exchange theory, cognitive dissonance theory, experiential psychology, and so on. Many of these other approaches are principally concerned with explaining leadership rather than with causing it to occur. Others do not provide a sufficiently rigorous basis for behavioral specification, which is a requirement for systems engineering. Social exchange theory is a variant of reinforcement theory and, hence, at no great odds with the present treatment.

There is also a personal bias in the selection of a theoretical approach for analyzing a behavioral function. Theories are scientific tools for analyzing problems. Each scientist uses those tools in which he is best versed. A person working with an unfamiliar tool is not as likely to be effective with it as would some other person who was skilled in its use. A different scientist might well select a different approach for analyzing leadership, depending upon his own skills.

ANALYSIS AND DESCRIPTION OF OFFICER DECISION, BEHAVIOR MANAGEMENT, AND GOAL-SETTING FUNCTIONS

IDENTIFICATION OF CRITICAL DECISION-MAKING SYSTEMS

The decision systems which are of concern are those that require skilled judgments and complex mental processes, that deal with technical military content in some fashion or another, and that are important in their consequences. Decisions regarding strategies and tactics in combat clearly meet these requirements. Decisions regarding the development of new pieces of equipment and weapons systems, or the development of more effective soldiers through training or physical conditioning also meet these requirements.

The behavioral analysis of each decision system should identify the subordinate decisions, judgments, and formulations that must be accomplished in order to arrive at an appropriate outcome. In some instances, a subordinate decision may be of sufficient importance to treat as a major decision system in its own right. For instance, determining the enemy's most probable course of action may be a subordinate step in determining one's own course of action, but it is of sufficient importance and complexity to be identified as a separate decision system.

Behavioral Analysis of a Decision System:

Determines the most appropriate course of action for a military unit at any point during a dynamic combat situation.

A general schematic representation of two military organizations in conflict is shown in Figure 2. One organization is designated RED (R) and the other is designated BLUE (B). Each organization is composed of an array of units, some line units (L) and some support units (S); individual units are designated by a numerical suffix.

A number of different relationships can exist among the units. The primary one is the conflict relationship between an individual line unit in one organization and one or more line units in the other organization. The present analysis is concerned with determining a course of action for a line unit engaged in such a conflict. The decision process is conceptualized as having three major components:

01 Determines the characteristics of success.

02 Formulates all reasonable alternative courses of action for achieving success.

03 Selects a course of action.

What variables enter into the determination of success in this conflict relationship? Forward movement? Losses inflicted upon the opponent? Isolation of the opposing unit? Denial of position or movement to the opponent? Destruction of the opponent's cohesive integrity? In selecting appropriate success variables for a specific unit level conflict, it may be necessary to consider requirements imposed by other relationships in which the unit of interest is involved. For instance, in a classical war of territorial conquest, success may consist primarily of forward movement. However, such movement must be strongly coordinated with adjacent line units. On the other hand, in a guerrilla war, success may consist primarily of losses inflicted upon the enemy, or upon denial of position or movement, or upon alienation of the indigenous population from the enemy. Coordination of movement with adjacent line units may be relatively unimportant. The selection of appropriate success variables and the importance ascribed to each is determined more by the state of organizational conflict than by the situation at the local unit level.

Once the success variables have been determined, winning is not simply a matter of maximizing those success variables that apply to the conflict relationship with the opposing unit. Different states of organizational conflict imply different success equations that impose different kinds of requirements on cooperative relationships between allied

Hypothetical Schema of Two Organizations in Conflict

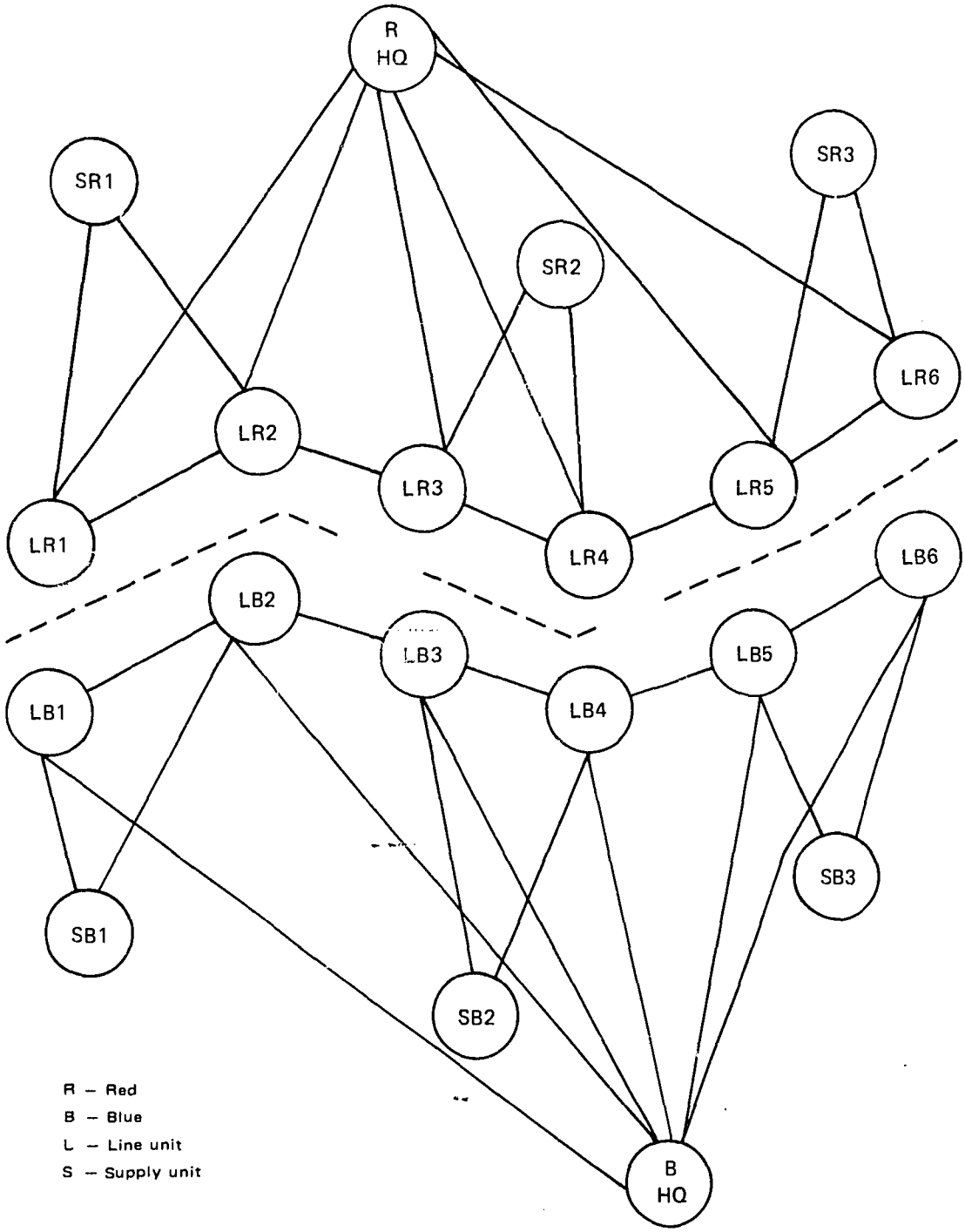

Figure 2

units. In view of this interdependence between unit success and organizational success, the first component in the decision process can be fractionated as follows:

01 Determines the characteristics of unit success.
01 01 Determines the goal state for organizational success.
01 01 01 Identifies requirements imposed by general organizational state of conflict.
01 01 02 Identifies requirements imposed by immediate organizational situations.
01 02 Determines characteristics of unit success required to attain organizational success.
01 02 01 Determines unit goal state imposed by organizational goal state.
01 02 02 Determines present state of the unit.
01 02 03 Determines difference between unit's present state and its goal state.

In formulating alternative courses of action for a line unit, it is first necessary to determine the success variables and weights appropriate to the organizational goal state. These variables and weights are used to define a minimally acceptable level of success. Alternative courses of action are formulated for attaining this minimum level. This second component in the decision process might be fractionated as follows:

02 Formulates all reasonable alternative courses of action for achieving success.
02 01 Formulates all possible courses of action that might decrease the difference between the unit's present state and its goal state.
02 02 Determines facilitations and restrictions on own courses of action.
02 02 01 Determines facilitations and restrictions imposed by the physical environment.
02 02 02 Determines facilitations and restrictions imposed by the indigenous population.
02 02 03 Determines facilitations and restrictions imposed by expected enemy actions.
02 02 03 01 Determines the most probable courses of action by the opposing enemy unit.
02 02 03 02 Determines effect of each probable enemy course of action on each possible own course of action.
02 02 04 Determines facilitations and restrictions imposed by unit situation.
02 02 05 Determines facilitations and restrictions imposed by allied line and support units.

The alternative courses of action must be evaluated and compared in order to select the most propitious one. Each is evaluated in terms of some combination of probability of success and projected unit losses. This evaluation must be balanced against the projected organizational losses resulting from failure of the line unit to attain its minimum success level. If the cost of failure is high at the organizational level, then projected losses in the line units may be irrelevant. In such a case, the selection of a course of action may be based solely on probability of success. On the other hand, courses of action for which projected unit losses exceed the cost of failure at the organizational level can be dismissed from further consideration. The third component in the decision process might be fractionated as follows:

03 Selects a course of action.
03 01 Estimates cost of unit failure to the organization.
03 02 Estimates probability of success for each course of action.
03 03 Estimates expected unit losses for each course of action.

03 04 Compares alternative courses of action with each other.

03 04 01 Removes from consideration those courses of action in which expected unit losses exceed cost of unit failure to the organization.

03 04 02 Arranges remaining alternative courses of action in order of preference, taking into account both the probability of success and the expected unit losses.

This conceptualization indicates that line unit command systems must possess information about certain aspects of organizational states of conflict and their effect on unit actions. At each unit level—individual soldier, squad, platoon, battery, battalion, division, and so forth—there should be a specific comprehension of the effects of conditions at the next higher level on the following component processes:

(1) The selection and weighting of success variables.
(2) The establishment of a minimum level of success.
(3) The estimation of the cost of unit failure to the organization.
(4) Relationships with allied line and support units.

Information Collecting Descriptions

The behavioral analysis of the decision process into its component parts provides a basis for structuring the information collection activities necessary for completing the description of the process. Two general categories of information must be obtained in order to design instructional materials and exercises for this decision process: First, delineate the relevant characteristics of the real situations in which this decision process occurs; second, derive the principles that govern each component of the decision process.

Essentially, it will be necessary to specify the flow of information available to the decision system during combat; that is, the kinds of information that are available or that can be made available to the unit's decision system at various points during the course of an engagement. Information flow models should be developed for different sizes and types of units involved in different kinds of engagements and in different kinds of environments. These models should be developed from descriptions of the information flow during actual combat engagements. Brown and Jacobs (6) have prepared the groundwork for such a methodology in an excellent and innovative study that was concerned with identifying the critical combat performances, knowledges, and skills for the Infantry Rifle Platoon Leader. The primary information, on which this study was based, consisted of more than 200 detailed descriptions of actual small unit combat actions.

If detailed descriptions of the information flow and decision process of actual combat engagements do not already exist, then they will have to be generated. Combat-experienced officers should be sought out and interviewed regarding specific engagements in which they participated. Where possible, it may be profitable to reassemble all the actual officers who participated in a particular action, or as many as possible, and interview them as a group. Descriptions might also be generated from mock combat field exercises.

Brown and Jacobs (6) inferred performances, knowledges, and skills directly from the combat descriptions. It may be desirable to proceed in the same manner as a basis for early improvements in training. However, in the long run, the development of information flow models should provide greater validity, generalizability, and flexibility for the decision process.

The information flow models provide a basis for building simulations of the decision process environment. The simulations can be used as a vehicle for deriving principles that govern the decision process, and for designing practice exercises to be used in the program of instruction. Decision principles can be investigated by having experienced officers make judgments and decisions in simulated situations.

A simulation may be concerned with only one component of the decision process or with the whole process. In the latter instance, the simulation will have to be adaptive to the officer's prior judgments and decisions. In both instances, officers may also be required to justify each judgment or decision in terms of some governing principle. Records of performance might then be analyzed for the following kinds of information:

(1) Consistency among experts. Do experts tend to make the same judgments and decisions in the same situations?

(2) Relationships between decisions and principles. Do experts tend to use similar principles to justify similar decisions? Does an expert tend to apply the same principles consistently to similar situations? Can more consistent principles be inferred from the performance of experts than from the performance that they themselves cite?

(3) The validity of principles. Comparing the performance of experts in simulated situations with the real instances on which the simulations are based may provide tentative inferences concerning the validity of some of these principles. Extreme caution must be exercised in this type of analysis, since it is certainly possible that a different outcome could not have been obtained in a particular instance, no matter what action might have been taken.

BEHAVIOR MANAGEMENT SYSTEM

The behavior management system designs and implements management practices that strengthen productive behaviors and weaken counterproductive behaviors in the unit.

Behavioral Analysis and Basic Principles

The basic principles of contingency management can provide the basis for a functional analysis of the motivating, guiding, and directing aspects of a wide array of managerial and leadership positions. Contingency management is a behavioral engineering field derived primarily from the basic science principles of operant conditioning,[1] conceived and developed by B.F. Skinner and his associates. Operant conditioning ascribes the cause of behavior to conditions in the environment that occur immediately following the occurrence of the behavior. For instance, sharp punishment immediately following a behavior will tend to decrease the frequency of occurrence of the behavior in the future. Operant conditioning is not concerned with attitudes, interests, motives, and the like as causes of behavior, nor with the history of a behavior in the person's prior experience. It is concerned only with environmental conditions that can be used to change the frequency of behavior.

The principles of operant conditioning appear to be as broadly applicable to behavior as the principles of mechanics are to matter; however, each must be translated into engineering rules and techniques to be applied to specific classes of problems and materials. Techniques of contingency management have been developed in the past six or seven years for use by teachers in managing the learning and social behaviors of school children. The general form of these techniques can be adapted to the management of adult behaviors in all work environments.

A contingency manager arranges for appropriate consequences to follow the occurrence of specific behaviors emitted by those whose behavior is being managed; that is, the consequences are contingent upon the occurrence of the behavior. There are four kinds of consequences with which the contingency manager is concerned. The first two

[1] An excellent basic textbook on operant conditioning has been written by Ferster and Parrott (12). A number of manuals on contingency management are commercially available; two excellent ones have been prepared by Homme and Tosti (13) and Hall (14).

are used to increase the frequency of occurrence of appropriate or desirable behaviors. They are (a) positive reinforcement, and (b) negative reinforcement. Positive reinforcement may be thought of as reward, and negative reinforcement may be thought of as avoiding punishment. A person may be rewarded by any number of things—food, desired objects, preferred activities, free time, success in performance or learning, attention, praise, approval. In negative reinforcement, a person is allowed to escape from or avoid an aversive or painful condition if he emits the appropriate or desired behavior.

The latter two of the four consequences with which the contingency manager is concerned are used to decrease the frequency of inappropriate or undesirable behaviors. They are (c) punishment, and (d) extinction. Punishment is an experience that is familiar to virtually everyone; it consists of delivering an aversive consequence following the occurrence of an undesirable behavior. Extinction consists of withholding reinforcement following the occurrence of behavior that was previously reinforced; most commonly, it may simply consist of the manager's ignoring inappropriate behavior that he had been previously reinforcing with his attention.

Consequences are categorized as positive or negative reinforcers or as punishers on the basis of their effects. If a contingency manager applies a particular treatment in the hope of increasing the frequency of a given behavior, and the treatment has no effect, then that treatment cannot be categorized as a reinforcer. Until its effect has been ascertained in a particular situation, a treatment can only be tentatively categorized. The contingency manager must remain flexible and ready to change from one treatment to another until he obtains the desired effect.

Negative reinforcement and punishment produce undesirable side effects. They elicit avoidance, escape, and aggressive behaviors. Their frequent use may cause the student or the worker to avoid the school, office, or shop, or engage in inattention or work slowdown. Consequently, the effective contingency manager uses negative reinforcement and punishment sparingly, if at all, and only as a means of obtaining quick control during emergencies.

Not only does the effective contingency manager avoid introducing aversive conditions into the environment, but he also seeks to reduce their occurrence in the environment from other sources, such as hostility among his people, harassment from trivial regulations, difficult living conditions, and the like. Such conditions can interfere with the occurrence of behaviors in which the manager is interested or cause those whose behavior he seeks to manage to avoid the very environment in which he can manage them.

Productive Behavior and Objectives

The primary task of the contingency manager is to provide his subordinates with opportunities in which they can emit productive behaviors and be positively reinforced. This is the key to the effective management of human behavior. This requirement generally cannot be met simply by providing opportunities for "busy work." Even though accompanied by positive reinforcement, such "busy work" often has overriding aversive consequences. To give value to his subordinates' behavior, the contingency manager identifies nontrivial organizational goals or objectives and analyzes them into appropriate behaviors for each person.

For instance, a teacher establishes performance objectives for his students and identifies enabling behaviors by which each student in his class can attain them. A platoon leader establishes performance objectives for his platoon and identifies enabling behaviors by which each man in his command can attain them. A company president establishes objectives for the company and identifies subordinate objectives for each department to attain; these, in turn, are analyzed successively at each level of management until enabling behaviors are identified for each employee in the company. Or, in

some instances, organizational objectives are built up, at least in part, from individual goals, as might be done in a research laboratory, where each scientist is an independent expert in his area and where innovation is critical.

Whatever the procedure used in any particular instance, the object is to identify opportunities for positive reinforcement that are sufficiently frequent to maintain productive behavior from each individual and yet keep the requirement for productive behavior within the capability of each individual.

In some instances, the manager may find that a person's job simply does not provide sufficient opportunities for productive behavior. This situation is not uncommon either in industry or in the military services. The job may have to be retained because of legal requirements, union agreements, or long-standing regulations that are not easily changed, or because it is necessary to have people available to perform a job required only during emergencies, such as an infantry rifleman between wars. In this case, it may be in the organization's best interests for the manager to provide a person in such a job with support to engage in non-job activities. Such activities may be of service to other members of the organization, or they may be of personal benefit to the person himself. They may provide the person with an opportunity to maintain some of his job skills, or allow the unit to maintain cooperative behaviors among its members, thus facilitating effective job performance.

A contingency manager not only arranges for enough opportunities in which to provide positive reinforcement, but also identifies effective reinforcers for each individual and devises a method for delivering the reinforcers as appropriate behaviors occur. Some individuals require more than success and expressions of approval from their manager to maintain productive behavior. To identify effective reinforcers, the contingency manager collects information about potentially reinforcing events for his people. He may seek out information about their reinforcement history, or he may observe them to determine what kinds of reinforcing events maintain their present behavior and what kinds of behaviors they most frequently emit, or he may interview them to learn their preferences regarding potentially reinforcing events.

In the classroom, to keep all his students engaged full time in productive learning behavior and to maximize success as a reinforcer, the contingency manager generally has to use some form of individualized instruction. At a minimum, he has to implement an instructional system that allows students to begin at different points along the continuum of objectives and attain various instructional objectives at their own rate. In a similar manner, the contingency manager in a work environment may have to implement a management system that allows for individual differences in point of initiation and in rate of progress in at least some job behaviors. Individualization in the classroom and on the job imposes a requirement for extensive record keeping on the part of the manager. At a minimum, he needs to record each individual's behavioral progress toward objectives, the nature of reinforcers being used, and the effect of previously used reinforcers.

To keep adequate records of performance, the contingency manager must observe behavior. The teacher must come from behind his desk and observe students. The manager must come out of his office and observe his staff. Without frequent and scheduled observations, and records of those observations, the manager may fail to detect progress or lack of progress toward the attainment of specific objectives. If he does not detect progress, he cannot apply appropriate consequences to maintain it. And if he does not detect lack of progress, he cannot take corrective action.

The occurrence of productive behaviors by most adults in our society can generally be enhanced through the application of readily available social reinforcers, such as contingently administered interpersonal attention, praise, verbal feedback regarding progress, and so on. The application of such reinforcers may require the behavior manager to learn positive interpersonal and problem solving habits towards his

subordinates in place of old fault-finding and blaming habits. He will also need to learn to respond to subordinates as individuals by setting goals commensurate with each individual's present level of behavior and by selecting reinforcers that are individually effective.

Finally, he will need to learn to schedule reinforcements to fit each individual's frequency of productive behavior: The lower the frequency of productive behavior, the higher the rate of reinforcement.

These kinds of actions will not require a great increase in the manager's control of his subordinate's environment. The principal change required of the manager will be in his manner of interacting with his subordinates. Special behavioral problems, however, will often require increased control over a particular subordinate's environment, but such problems will typically be the exception rather than the rule. Such special problems typically decrease in frequency in an individualized, positively reinforcing, non-aversive work environment.

The contingency manager may not always have direct access to his ultimate charges, but controls indirectly through one or more levels of subordinate managers. In such instances, he uses his subordinate managers to establish and operate an integrated contingency management system. He identifies appropriate management behaviors for his subordinate managers and reinforces the occurrence of such behaviors—that is, he reinforces their behaving as contingency managers themselves. In any complex management system, records need to be compiled that are appropriate for each level of management. Thus, the superordinate manager needs performance records in detail for his immediate subordinate managers and in summary for intermediate managers and for the ultimate charges of the management system.

Inappropriate Behavior

Inappropriate or undesirable behavior will sometimes occur among a contingency manager's staff and may sometimes be inadvertently maintained by him. Frequent criticism by a teacher of student misbehavior can actually increase the frequency of such misbehavior, although the criticism stops each instance at the time it occurs.[2] The effective contingency manager changes his own behavior, if need be, to avoid such pitfalls. Generally, he minimizes the frequency of inappropriate behavior by means of extinction and counterconditioning: He ignores the inappropriate behavior and positively reinforces incompatible appropriate behaviors.

Sometimes, the contingency manager may use punishment in place of extinction with particularly resistive or harmful inappropriate behaviors. For the most part, however, he avoids the use of punishment because of its undesirable side effects. When he does use punishment, he uses it effectively: He uses an appropriate and sufficiently intense punisher, applies it immediately and contingently, facilitates the occurrence of appropriate behavior following the application of punishment, and reinforces the appropriate behavior.

He avoids setting unequals in competition against each other, as is done by teachers who grade on a curve. Such practices are aversive to the less able students and may set up conditions that reinforce inappropriate classroom behaviors, such as cheating. He also avoids setting groups in a larger organization in competition against each other, as, for instance, separate divisions in an industrial firm. Such practices can reinforce behaviors that are counterproductive with respect to larger organizational goals.

[2] Becker (15) has termed this phenomenon "the criticism trap." The manager's criticizing behavior is reinforced by the subordinate's stopping his inappropriate behavior at the time as a result of the criticism. However, the frequency of the subordinate's inappropriate behavior often increases because of the reinforcing effects of the manager's attention.

Sometimes, inappropriate behavior is maintained by peer reinforcement among the manager's people, they may engage in aggressive behavior toward each other. In such instances, the contingency manager may use a group or yoked reinforcement condition in which the reinforcement for one person depends, at least in part, upon the behavior of another. Such reinforcement conditions can also be used to build cooperative behaviors among members of a team.

Group Interactions

The nucleus of most management and decision systems is generally composed of a small group of individuals who interact on a face-to-face basis. In large organizations, management and decision systems most often consist of many such groups arranged in an interlocking hierarchy. The effectiveness of these systems is highly dependent upon the characteristics of the interpersonal behavior among the members of these groups.

These small management groups are concerned with establishing goals and objectives, identifying problems, formulating solutions to problems, and implementing a solution with a high probability of success. The interpersonal behaviors of the members of the group toward each other should have the following effects:

(1) Increase the number and kinds of problems and problem characteristics identified by the group.
(2) Increase the number and quality of alternative solutions proposed for problems by the group.
(3) Increase the number and appropriateness of evaluative statements of each alternative solution proposed by the group.
(4) Increase the frequency of solutions that are selected by group consensus.
(5) Increase the number of subsequent behaviors that facilitate implementation and decrease the number of subsequent behaviors that impede implementation of the selected solution.

Individual behaviors that contribute to these effects should be reinforced by the other members of the group. Such reinforcement may be differential for different members of the group and for different qualities of behavior.

These behaviors clearly should not be met with aversive consequences. However, critical evaluative statements are aversive in themselves. To minimize suppressive effects on the analysis of problems and formulation of alternatives, evaluation should be separated from earlier parts of the process.

In a similar vein, the proposing of alternative solutions too early in the process can have the effect of decreasing the number of problems and problem characteristics that are identified by the group. Hence, the proposing of alternative solutions should be separated from the earlier step of identifying problems and problem characteristics. In each step, reinforcement in the form of group approval should be provided for quality and productivity. A single member of the group may well identify apparently irresolvable problem characteristics or conflicting alternative solutions. Such behavior should be reinforced by the other group members so as to decrease the probability of an individual formulating a single unitary position that he defends to the end. On the other hand, reinforcement should be withheld from the member who steadfastly espouses one position and attacks all others; such behavior should be ignored (extinguished).

Many common management practices and many of the ways in which people in our society typically interact with each other lead to the reinforcement of individual behaviors that disrupt effective group interactions. The man who takes a hard position on an issue and discredits and derides opposing positions with clever personal invectives or with sarcasm, often receives the approval of his peers; the man who exploits his fellows may be promoted because of his aggressive competitiveness. Such consequences actually serve to maintain counterproductive group interactions.

Our society encourages eristic or adversary discourse, that is, discourse in which the purpose is to impose one faction's point of view on all. The issue is often decided not on its merit but on the political skill and bargaining position of a particular faction. The opposite of eristic discourse is irenic discourse. Its purpose is to solve problems, to arrive at a conciliation among all factions; Maier and Sashkin (16) term this conciliation the integrative solution. Alternative points of view are often responsive to different aspects of a problem. They may not actually be in opposition, but the consequences provided in the environment may place factions that espouse these different positions in opposition to each other.

The integrative solution is facilitated by problem solving discourse and is a more encompassing solution than any of the individual solutions that it incorporates. Groups don't naturally engage in problem solving discourse. Our society, for the most part, does not build nor maintain such behaviors in its people. Groups must be trained to engage in problem solving discourse and must be provided with a favorable social environment in which to do so.

Adversary discourse most often results in a particular faction's either winning or losing. Compromises occur between factions only to the extent that they lead to an alliance sufficiently strong to dominate the rest of the group. Adversary discourse invariably leads to the existence of losers. At best, the losers will accept the winner's solution, but without enthusiasm; at worst, they will seek to sabotage implementation of the solution. Such sabotage may be reinforced if the winners and the losers are in competition for raises, promotions, power, prestige, or survival in the organization. Problem solving discourse does not lead to the existence of winners and losers—only winners. Hence, all factions are reinforced for successful implementation of the integrative alternative.

Typical Conceptions Held by Students

The preceding considerations are not in themselves an adequate basis for developing a program to train students to develop a reinforcing, non-aversive environment for others. It is also necessary to consider the "information" and beliefs that students are likely to bring with them to the training situation. They are likely to believe that the alternatives for motivating others lie between permissiveness on one hand and strictness on the other. Regardless of which alternative they favor, they must be dissuaded from conceptualizing the problem in such simplistic terms.

Permissiveness refers to noncontingent reinforcement; the individual is rewarded no matter what he does. Consequently, inappropriate behaviors are as likely to be reinforced as appropriate ones. Strictness refers to practices that are solely punitive. Such practices not only introduce aversive stimuli into the environment, they also fail to reward appropriate behaviors. Strictness is restrictive in the range and effectiveness of techniques that it takes into consideration. Neither permissiveness nor strictness provide an appropriate basis for formulating effective behavior management practices, either singly or in some kind of mixture. These terms are simply irrelevant to the issue.

Students are likely to enter training with the belief that motivation and discipline are concerned with attitudes and traits or similar constructs, rather than behaviors. Such beliefs are not in consonance with this model. They may need to learn that attitudes and traits are constructs inferred from behavior and that it is not necessary to invoke the construct in order to change the behavior. They may need to learn to describe individuals in terms of the behavior they display in a situation rather than in terms of inferred attitudes and traits.

Students from Western cultures are also likely to have some misinformation and false beliefs regarding the efficacy of competition as a means of motivating others. They are likely to view competition in an undifferentiated manner as a desirable technique.

Competition can inadvertently reinforce inappropriate behaviors, particularly in work situations, where it can lead to disastrous intergroup rivalries. It can strengthen those behaviors that are relevant to winning the competition, regardless of whether they are also relevant to the performance of the task. For the loser, competition may have the same effect as aversive stimuli. Competition is clearly not an all-purpose motivational technique.

Many decision-making groups in our society operate ineffectively. Most often, they are composed of factions contending with each other for power or resources rather than joining together to solve mutual problems. It is a common belief in our society that decision-making groups are inherently ineffective and don't really solve problems—the joke about the camel being a horse designed by a committee reflects a popular view. Yet, the research evidence is clear—for many kinds of problems, a properly trained and managed group can perform more effectively and more quickly, and develop and implement better solutions, than individuals working alone (17, 18). The belief that decision-making groups are ineffective is probably well founded in prior societal experience. Managers may need to learn that such a state of affairs is not inherent in the group, but is the product of inappropriate behavior management practices.

Implementation Considerations

Significant changes in leadership practices are not likely to occur as a result of simply informing leaders about the characteristics of leadership and motivation. Effective leadership consists of the application of appropriate cognitive and interpersonal skills. Such skills are learned by being practiced under conditions of guidance and feedback either in simulated situations or on the job itself. Since other people are the critical components of the leadership environment, simulations will invariably need to involve other people in role-playing situations.

Furthermore, the leadership trainee must be provided with appropriate positive reinforcements to strengthen and maintain his newly acquired leadership skills on the job. He may also need to have access to expert guidance in dealing with unusual problems, so as to prevent the debilitating effects of failure. Failure to provide on-the-job reinforcement and guidance could result in a dissipation of all the gains made in training.

Functional Model

The primary function of a manager as regards guiding, directing, and motivating his people can be stated in this manner:

> Designs and implements management practices that strengthen productive behaviors and weaken counterproductive behaviors emitted by his people.

This primary function can be fractionated into three first-order subordinate functions on the basis of contingency management considerations, as follows:

01 Designs and implements practices for reinforcing productive behavior.

02 Designs and implements practices for minimizing the inadvertent reinforcement of counterproductive or disruptive behavior.

03 Designs and implements practices for minimizing the occurrence of aversive stimuli in the environment.

In order to design and implement practices for reinforcing productive behavior, the contingency manager must accomplish the following second-order functions:

01 01 Identifies and defines productive behaviors.

01 02 Specifies and implements techniques for monitoring the occurrence of productive behaviors.

01 03 Identifies potentially effective and feasible positive reinforcers.

01 04 Designs and implements techniques for the contingent administration of positive reinforcers on an appropriate schedule.

01 05 Modifies reinforcement program if desired changes fail to occur.

To accomplish the first of these second-order functions, the contingency manager must be able to identify valid organizational objectives, analyze organizational objectives into individual objectives, and analyze individual objectives into behavior sequences. To accomplish the second, he must have a catalog of monitoring techniques appropriate to the kinds of people and to the organizational situations with which he is concerned. To perform the third, he must have information regarding potentially effective reinforcers for the kinds of people he manages. Also, to accomplish the fourth second-order function, he needs a catalog of appropriate techniques.

To design and implement practices for minimizing the inadvertent reinforcement of nonproductive or disruptive behavior, the contingency manager must accomplish the following second-order functions:

02 01 Identifies and defines counterproductive or disruptive behaviors.

02 02 Specifies and implements techniques for monitoring the occurrence of counterproductive or disruptive behaviors.

02 03 Designs and implements techniques for eliminating the inadvertent reinforcers.

02 04 Modifies reinforcement elimination program if desired changes fail to occur.

The contingency manager needs to know what kinds of counterproductive or disruptive behaviors are likely to occur among the kinds of people he is managing, and the kinds of inadvertent reinforcers that typically maintain such behaviors. For instance, is he inadvertently reinforcing counterproductive behavior? He needs to have catalogs of appropriate techniques available to him.

To design and implement practices for minimizing the occurrence of aversive stimuli in the environment, the contingency manager must accomplish the following second-order functions:

03 01 Identifies aversive stimuli in the environment.

03 02 Designs and implements techniques for eliminating or reducing aversive stimuli in the environment.

The contingency manager needs to know what kinds of stimuli are likely to be aversive for the kinds of people he is managing. Are living conditions aversive? Do some of his staff intimidate others? Are some of his own mannerisms aversive? Again, he needs a catalog of techniques available to him from which to select tentative courses of action.

When the contingency manager's practices fail to have the desired effect, he does not simply fix the blame and fire or transfer one of his staff; instead, he modifies his management practices. He may change to a potentially more powerful reinforcer, he may shift to a higher schedule of reinforcement, he may introduce a punisher, or he may change the techniques by which he administers various consequences. And, as he becomes more experienced, he will become more precise and sure in the corrections he makes following occasional initial failures.

Fry[3] prepared an historical description of the actual application of contingency management techniques by an Army battalion commander that clearly illustrated the positive flexibility and strong solution orientation of these techniques. Furthermore, this case history demonstrated the applicability and effectiveness of these techniques in a military environment.

[3]John P. Fry, "The Army Officer as Behavior Manager," unpublished paper, June 1972.

Information Collection for Contingency Management

The principles and general techniques of contingency management are well established. However, there is a need to identify common behavior management problems and to collect specific information and develop specific techniques for applications in military environments. A substantial portion of the effort should be concerned with conducting a behavioral analysis of adversary discourse as it occurs in military environments. Thus, answers need to be developed for the following questions:

(1) What kinds of counterproductive behaviors occur in various military environments? Particular emphasis would be placed on identifying the specific behaviors that constitute adversary discourse in military environments.

(2) What kinds of inadvertent reinforcers typically maintain various counterproductive behaviors? Particular emphasis would be placed on identifying the reinforcers that maintain the behaviors of adversary discourse.

(3) What kinds of changes are typically effective in stopping the inadvertent reinforcement of counterproductive behaviors? What changes need to be undertaken to reduce the frequency of adversary discourse?

(4) What kinds of events or conditions do men generally consider aversive in various military environments?

(5) What kinds of changes are typically effective in minimizing aversive events and conditions?

(6) What kinds of productive behaviors typically occur too infrequently in various military environments? To what extent do elements of problem-solving or conciliatory discourse already occur in Army management practices?

(7) What kinds of conditions or events can function as positive reinforcers of productive behaviors? What kinds of consequences can serve to increase the frequency of problem-solving discourse?

(8) What kinds of techniques can be used to monitor the occurrence of productive and counterproductive behaviors in various military environments?

(9) What kinds of procedures are most suitable for operating behavior management systems in military environments?

(10) What kinds of procedures are typically effective for delivering reinforcers contingently and quickly upon the occurrence of productive behaviors?

(11) What kinds of counterproductive behaviors may require punitive consequences in order to decrease their frequency of occurrence?

(12) What kinds of punitive treatments are most effective with the least side-effects?

Answers to these questions might best be obtained by actually applying contingency management procedures in various military environments in behavioral engineering development tests. All members of the command system of a unit would be trained on the job in the principles and general techniques of contingency management by a team of experts. The experts would remain available as consultants, observers, and change agents for a period ranging from 9 to 18 months. They would work with the command system in establishing effective behavior management practices in the unit. In conjunction with the command system, they would keep detailed records of the behavior problems that arose, the solutions that were attempted, and the outcome of each solution attempt.

GOALS IDENTIFICATION AND ANALYSIS SYSTEM

The goals identification and analysis system establishes performance objectives that are related to unit and organizational goals for each individual in the unit.

Behavioral Analysis of Organizational Goals

The command system of a unit is primarily concerned with directing the activities within the unit so as to be maximally productive. Productiveness is determined by the relationship of the activity to unit and organizational goals. Hence, organizational goals must be identified and analyzed into unit goals, which, in turn, must be analyzed into individual performance objectives for all appropriate unit personnel.

Broad unit or organizational goals that are not analyzed to a level of individual performance objectives generally have little more than inspirational impact on individual activities. On the other hand, individual objectives that are not explicitly derived from or related to unit and organizational goals may be unknowingly irrelevant or even counter-productive. In the absence of organizational and unit goals, it is often impossible to establish priorities among individual objectives.

The establishment of integrated goals and objectives facilitates communication between command levels and clarifies job responsibilities. It directs all elements of the organization toward the attainment of common ends.

There have been a number of highly successful management-by-objectives efforts in industry during the past decade (19, 20), but some of their procedures will have to be modified for application in a military environment. The primary goal in industry is to make a profit—clearly not an appropriate goal for the military services. However, the concept of management by objectives and many of the procedures for establishing objectives with subordinates, for assessing progress towards established objectives, and for revising objectives are applicable. In addition, the establishment of objectives is a necessary prelude to many behavior management activities involving the application of principles of operant conditioning. In this usage, the development and application of objectives goes well beyond the usual requirements for a management-by-objectives effort.

Effective management is based on establishing goals and objectives, assessing progress toward them, and revising them in the light of changing conditions. However, requirements cannot be simply imposed from the top. Realistic estimates of feasibility, time schedules, and support requirements for attaining organizational goals often cannot be determined until after those goals have been analyzed into individual objectives, because the ability to make such projections may be possessed only by subordinate experts throughout the organization. Even they may not be able to make accurate projections regarding the attainment of relatively distant goals. Hence, it may be necessary to have projections for some goals in a state of constant revision as the basis for prediction improves over time. In such instances, the command system will have to provide for continual two-way communication about progress toward the attainment of crucial subordinate goals and individual objectives. The process of establishing goals and objectives should involve all levels of the organization. This is not an activity for some small group of planners detached from the rest of the organization.

The primary function of the command system of a unit with regard to goals and objectives can be stated in this manner:

> Establishes performance objectives that are related to unit and organizational goals for each individual in the unit.

This primary function can be fractionated into three first-order subordinate functions on the basis of rational considerations, as follows:

01 Determines organizational goal states and goals.

02 Determines unit goals required to attain organizational goals.

03 Analyzes unit goals into individual performance objectives for all appropriate unit personnel.

There are many different kinds of organizational and unit goal states. A goal state identifies an ideal condition. A goal identifies existing deficiencies with regard to a goal state. Information about goal states may come from regulations, standing operating

procedures, mission assignments or expectations, and rational analyses and projections of existing conditions.

Information Collection for Management by Objectives

The principles and general techniques of management-by-objectives are well established. However, there is a need to identify similarities that cut across military environments and to collect specific information and develop specific techniques for applications in military environments. Collecting such information might be best accomplished by combining the management-by-objectives and the behavior management portions of the model into a single effort in which both sets of principles are applied simultaneously in various military environments as engineering development tests. As with the behavior management system, all members of the command system in a unit would be trained, on the job, in the principles and general techniques of management-by-objectives by a team of experts.

Chapter 5

SUGGESTIONS TOWARD PROGRESSIVE CHANGES

GENERAL APPROACHES

It will require a substantial effort and a considerable amount of time to prepare a complete and valid training program that is in accord with the job model presented in the preceding chapter. It is neither necessary nor desirable to wait until the entire job description has been completed and until a maximally valid training program has been developed. Progressive changes can be made in the existing training program piece-by-piece, with incremental improvement in validity.

Changes in career training programs constitute only one method of changing actual job practices. In order to hasten changes at the job level, consideration should be given to developing supplementary programs aimed at officers who are not due to enter a regular career training program for several years.

IMPROVEMENTS IN THE SPECIFICATION AND TRAINING OF BEHAVIORAL PROCESSES

The following performance objectives concerned with the Intelligence Estimate are typical of those found in officer advanced courses:

a. Define strategic intelligence, combat intelligence, and counter-intelligence.
b. Explain how the mission, enemy, weather, and terrain affect the intelligence effort.
c. Explain the difference between an intelligence source and an intelligence agency.
d. Explain the three steps in the processing phase of the intelligence cycle.
e. Define and give three examples of periodic reports as used in disseminating intelligence data.

These statements are behavioral objectives, but the behaviors that they specify are not job performances. They are verbal behaviors that simply require students to regurgitate textual content. It is not sufficient for objectives to be behavioral; the behaviors specified by the objectives should also be the same as those required for job performance or direct derivatives from job behaviors. The job simply does not require an officer to "define and give three examples of periodic reports. . . ." It is conceivable that an experienced and qualified officer could fail to meet a number of these objectives and yet perform well in both simulated and real job situations, and *vice versa*.

These objectives do not specify the decision processes required on the job. Furthermore, the content of the related manuals and documents is more concerned with the format for reporting the intelligence estimate than with the process for deriving it. The preparation of performance objectives that at least approximate job processes could well be the first of a series of progressive improvements in the current training program.

The critical feature in the preparation of an intelligence estimate is not the format in which it is presented, but rather the rational process used in arriving at conclusions. At the highest level, this decision process might be stated as follows:

> Determines the most probable courses of action by the opposing enemy unit.

Note that this decision process is a fourth-level component (02 02 03 01, page 17) of the earlier Decision System example: "Determines the most appropriate course of action for a military unit at any point during a dynamic combat situation." However, it is a sufficiently extensive activity in itself to be treated as an independent decision system.

This decision process is conceptualized as having three major components:

01 Formulates reasonable hypotheses regarding enemy courses of action.

02 Tests each hypothesis regarding enemy courses of action.

03 Reformulates reasonable hypotheses regarding enemy courses of action.

Further fractionation of the branch of the model concerned with formulating hypotheses is patterned after the mental processes implicit in the structure of the intelligence estimate, which consists of the formulation of partial hypotheses (i.e., facilitations and restrictions) on the basis of three different kinds of information, as follows:

01 01	Identifies the facilitations and restrictions on the selection of enemy and friendly courses of action that are imposed by the characteristics of the area of operations.
01 01 01	Identifies facilitations and restrictions imposed by the physical environment.
01 01 01 01	Prepares a general description of the physical characteristics of the area of operations.
01 01 01 01 01	Collects information basic to the description.
01 01 01 01 01 01	Collects information on climatic and weather conditions.
01 01 01 01 01 02	Collects information on terrain.
01 01 01 01 01 02 01	Collects information on relief and drainage systems.
01 01 01 01 01 02 02	Collects information on vegetation.
01 01 01 01 01 02 03	Collects information on surface materials.
01 01 01 01 02	Arranges information into an appropriate report format.
01 01 01 02	Prepares an analysis of the military aspects of the physical environment with regard to both enemy and friendly forces.
01 01 01 02 01	Analyzes tactical aspects.
01 01 01 02 01 01	Analyzes for observation and fire aspects.
01 01 01 02 01 02	Analyzes for concealment and cover aspects.
01 01 01 02 01 03	Analyzes for obstacles.
01 01 01 02 01 04	Analyzes for key terrain features.
01 01 01 02 01 05	Analyzes for avenues of approach.
01 01 01 02 02	Analyzes combat service support aspects.
01 01 01 02 02 01	Analyzes for personnel aspects.
01 01 01 02 02 02	Analyzes for logistics aspects.
01 01 01 02 03	Determines the effects of the physical characteristics of the area on both enemy and friendly courses of action.
01 01 01 02 04	Arranges the results of the preceding analyses and determinations into an appropriate report format.

01 01 02	Identifies facilitations and restrictions imposed by the characteristics of the inhabitants.
01 01 02 01	Prepares a general description of the sociology, politics, economics, psychology, and so forth, of the inhabitants of the area.
01 01 02 02	Determines the effects of the characteristics of the inhabitants on both enemy and friendly courses of action.
01 01 02 03	Arranges the preceding information and determinations into an appropriate report format.
01 02	Identifies the facilitations and restrictions on the selection of enemy courses of action that are imposed by the enemy situation.
01 02 01	Prepares a general description of the enemy situation.
01 02 01 01	Collects information basic to the description.
01 02 01 01 01	Collects information on the enemy disposition.
01 02 01 01 02	Collects information on the enemy composition.
01 02 01 01 03	Collects information on the enemy strength.
01 02 01 01 03 01	Collects information on enemy committed forces.
01 02 01 01 03 02	Collects information on enemy reinforcements.
01 02 01 01 03 03	Collects information on enemy air strength.
01 02 01 01 03 04	Collects information on enemy nuclear weapons and chemical and biological agents.
01 02 01 01 04	Collects information on recent and present significant activities by the enemy.
01 02 01 01 05	Collects information on peculiarities and weaknesses of the enemy.
01 02 01 01 05 01	Collects information on enemy personnel.
01 02 01 01 05 02	Collects information on enemy intelligence.
01 02 01 01 05 03	Collects information on enemy operations.
01 02 01 01 05 04	Collects information on enemy combat service support.
01 02 01 01 05 05	Collects information on enemy civil-military operations.
01 02 01 01 05 06	Collects information on enemy personalities.
01 02 01 02	Arranges information into an appropriate report format.
01 02 02	Determines the effects of characteristics of the enemy situation on enemy capabilities and courses of action.
01 03	Determines possible enemy courses of action and estimates the probability of occurrence of each course of action by collating and integrating all previous information, analyses, and determinations.
01 03 01	Lists all possible courses of action identified during the preceding activities.
01 03 02	Collates and evaluates all preceding information, analyses, and determinations bearing on the likelihood of each possible course of action.
01 03 03	Arranges collations and evaluations into an appropriate report format.

The further fractionation of the component, testing each hypothesis, incorporates elements of the intelligence collection process as follows:

02	Tests each hypothesis regarding enemy courses of action.
02 01	Identifies information required for testing each hypothesis.
02 01 01	Identifies the critical indications that contribute to the probability of the occurrence of each possible course of action.
02 01 02	Evaluates existing information confirming or denying each critical indication.
02 01 03	Identifies those critical indications that can be neither confirmed nor denied on the basis of existing information.
02 01 04	Identifies those kinds of information required to either confirm or deny the above critical indications.
02 02	Arranges for collection of required information.
02 02 01	Selects appropriate collection agency.
02 02 02	Prepares and processes recommendations, orders, and requests for obtaining the required information from the selected agencies.
02 03	Evaluates each possible course of action on the basis of the incoming information.
02 03 01	Evaluates incoming information.
02 03 02	Interprets evaluated information.
02 03 02 01	Analyzes information by relating each element to appropriate critical indications.
02 03 02 02	Evaluates adequacy of existing and incoming information to confirm or deny each critical indication.
02 03 02 03	Assesses indications associated with each possible course of action and reevaluates the likelihood of occurrence of each possible course of action.

The further fractionation of the component dealing with reformulating hypotheses is new, as follows:

03	Reformulates reasonable hypotheses regarding enemy courses of action.
03 01	Removes low likelihood courses of action from list of possible courses of action.
03 02	Adds new courses of action to list of possible courses of action.
03 02 01	Updates information, analyses, and determinations.
03 02 02	Reviews consistency of all indications with listed possible courses of action.
03 02 03	Identifies those indications that are not consistent with any listed possible courses of action.
03 02 04	Identifies courses of action that are consistent with the previously excluded indications and adds them to the list of possible courses of action.
03 02 05	Returns to task 02: Tests each hypothesis regarding enemy courses of action.

Fractionation should continue until a level of component tasks is reached that can be accomplished by virtually all students coming in to the training program. Tests for each critical component task should require the student to perform the component in simulated task contexts, rather than simply asking for definitions and verbal statements of categories of principles. Those component tasks that cannot be effectively accomplished by most incoming students constitute the basis for the performance objectives for a given segment of training.

Identifying job processes is just an initial step in the formulation of valid performance objectives. It is still necessary to identify the characteristics of the job situation and the principles that govern job performance. However, applying the procedure for obtaining validated characteristics and principles would take too long to allow for quick improvements. As an interim measure, the schools might simply pool the information possessed by their experienced officers for each component in the job process.

Note that this is not the same as validating the tasks against job experience as currently prescribed by CONARC Regulation 350-100-1. In this instance, experienced personnel are being used as sources of information about job situations, but not as ultimate authorities about job processes. As systems analysis data become available, these initial estimates of job situations can be updated.

Many of the decision processes should be applicable at different levels of officer career training. The functional components of the process may well be the same, but the situations in which they are applied will be very different from level to level.

A program of instruction based upon an analysis of a decision system into its component process might proceed as follows:

(1) The student would first learn those lowest level processes that he was not quite capable of performing upon entering the program. In this particular instance, he might begin by learning to identify facilitations and restrictions on military courses of action imposed by characteristics of the physical environment. This act appears as task 01 01 01 in the preceding analysis and includes all of its subordinate tasks. He would be instructed, would practice, and would be tested in a broad array of situations representing many different kinds of physical environments and conditions and differently equipped units. As soon as this subordinate process had been mastered, he would move on to learning to identify facilitations and restrictions imposed by characteristics of the indigenous population. This act appears as task 01 01 02 in the preceding analysis. Again, he would be instructed, would practice, and would be tested in a broad array of situations representing different kinds of indigenous populations and different kinds of military units.

(2) Having learned all of the subordinate processes that constitute a single superordinate process, the student would then learn to perform the superordinate process itself. Continuing the previous example, he would now be instructed, would practice, and would be tested in the integration of facilitations and restrictions derived from the physical environment and those derived from the indigenous population. This act appears as task 01 01 in the preceding analysis. The facilitations and restrictions would be provided as "givens" in the simulations, and the student would be required to integrate them.

(3) Having mastered a superordinate process, the student would then proceed to a subordinate level of the next superordinate process; for instance, task 01 02 01: Prepares a general description of the enemy situation. The student would proceed in this manner from subordinate to superordinate process until he was ready to move to higher-order superordinate processes.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The object of this study was to examine the job description procedures specified in CONARC Regulation 350-100-1, *Systems Engineering of Training*, February 1968, with reference to their use for officers' jobs, and to develop supplementary procedures for rectifying any deficiencies. Previous evaluations and recent applications of these kinds of procedures to officer jobs were reviewed; the major problem found was that the procedures authenticated existing conceptions of a job. It is proposed that (Continued)

20. (Continued)

major deficiencies can be avoided by beginning the job description process by developing a job model having three major sections: (a) broad job functions derived from appropriate system characteristics, (b) general behavioral science considerations appropriate to the analysis of each broad job function, and (c) information categories, sources, and collection procedures required to fully explicate each broad job function. A partial model of Army officers' jobs is presented as an example.

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1 COMDT USA CHAPLAIN SCH ATTN DOI FT HAMILTON
1 COMDT ARMY CHEM CORPS SCH FT MCCLELLAN ATTN EDUC ADV
1 USA FINANCE SCH FT BENJ HARRISON ATTN EDUC ADV
1 COMDT USAIS ATTN EDUC ADV FT BENNING
1 LIB ARMY QM SCH FT LEE
1 COMDT USA QM SCH FT LEE ATTN EDUC ADV
1 COMDT ARMY TRANS SCH FT EUSTIS ATTN EDUC ADV
1 COMDT USA MIL POLICE SCH ATTN PLNS &PROG DOUI FT GORDON
2 COMDT US ARMY SOUTHEASTERN SIG SCH ATTN EDUC ADV FT GORDON
1 COMDT USA AD SCH ATTN DOT FT BLISS
1 CO USA OAD CTR & SCH OFC OF OPS ATTN AMSN-O APG MD
1 COMDT ARMED FORCES STAFF COLL NORFOLK
1 COMDT USA SIG CTR & SCH ATTN DOI FT MONMOUTH
1 COMDT JUDGE ADVOCATE GENERALS SCH U OF VA
1 EDUC CONSLT ARMY MILIT POLICE SCH FT GORDON
1 COMDT ARMY AVN SCH FT RUCKER ATTN EDUC ADV
1 DIR OF MILIT INSTR US MILIT ACAD WEST POINT
2 COMDT US WAC SCH US WAC CTR ATTN AJMCT FT MCCLELLAN
2 HQ ABERDEEN PG ATTN TECH LIB
1 CO USA INTELL CTR & SCH ATTN DIR OF ACADEMIC OPS FT HUACHUCA
1 COMDT USA CGDSC OFC OF CHF OF RESIDENT INSTR FT LEAVENWORTH
1 COMDT USA CA SCH ATTN DOI FT BRAGG
1 COMDT USA CA SCH ATTN EDUC ADV FT BRAGG
1 COMDT USA CA SCH ATTN LIB FT BRAGG
1 LIBN USAIS FT BENNING
1 COMDT USA ARTY SCH ATTN EDUC SERVICES DIV FT SILL
1 COMDT USA ARTY SCH ATTN EDUC ADV FT SILL
1 COMDT USA TRANS SCH ATTN LIB FT EUSTIS
1 USA INST FOR MIL ASST ATTN EDUC ADV FT BRAGG
1 COMDT USA CGSSC ATTN ATSCS-DJ ISPWARI
1 COMDT USA ARTY SCH ATTN LIB FT SILL
1 COMDT USA AD SCH ATTN AABAAS-DL-EA FT BLISS
1 LEADERSHIP COM CO OPS DEPT US ARMY INF SCH FT BENNING
2 DIR COMPANY TACTICS DEPT USAIS FT BENNING
1 CG USA SIG CTR & SCH ATTN ATSSC-DP-COM FT MONMOUTH
1 SECY OF ARMY, PENTAGON
1 DCS-PERS DA ATTN CHF C4S DIV
2 ACSFOR DA ATTN CHF TNG DIV WASH DC
2 CG ARMY MED RSH COMD ATTN BEHAV SCI RES BR
1 US ARMY BEHAVIOR & SYS RSCH LAB ATTNCRD-AR ARL VA
1 USA BEHAVIOR & SYS RSCH LAB ATTN CRD-AIC ARL VA
1 COMDT USA CBI SURVEIL SCH & TNG CTR ATT CO ADV FT HUACHUCA
2 TNG & DEVEL DIV DCSPERS
1 PRES ARMY INF BD FT BENNING ATTN FE+SP DIV
1 CG CONARC ATTN COL E M HUDAK ATIT-SA FT MONROE
15 CG CONARC ATTN ATIT-STM FT MONROE
2 CG CONARC ATTN LIB FT MONROE
1 CHF USA AD HRU FT BLISS
1 CHF USA ARMOR HRU FT KNOX
1 CHF USA AVN HRU FT RUCKER
1 CHF USA INF HRU FT BENNING
1 CHF USA TNG CTR HRU PRES OF MONTEREY
1 CO USA PARTIC GP USA TNG DEVICE CTR FLA
1 DIR ARMY LIB PENTAGON
1 US ARMY TROPIC TEST CTR PO DRAWER 942 ATTN BEHAV SCIEN CZ
1 RSCH CONTRACTS & GRANTS BR ARO
1 CINC US ATLANTIC FLT CODE 312A USN BASE NORFOLK
1 CINC PACIFIC SCIEN ADV GP FJ3051 BOX 13 FPO 96610
1 CDR TNG COMMAND US PACIFIC FLT SAN DIEGO
5 TECH LIB PERS LIB BUR OF NAV PERS ARL ANNEX
1 ENGNR PSYCHOL BR ONR CODE 455 ATTN ASST HEAD WASH DC
3 CO & DIR NAV TNG DEVICE CTR ORLANDO ATTN TECH LIB
2 CO FLT TNG CTR NAV BASE NEWPORT
2 CO US FLT TNG CTR NORFOLK
1 CO FLEET TNG CTR US NAV STA SAN DIEGO
1 CLIN PSYCHOL MENTAL HYGIENE UNIT US NAV ACAD ANNAPOLIS
1 PRES NAV WAR COLL NEWPORT ATTN MAHAN LIB
1 CHF OF NAVL RSCH PERS & TNG BR (CODE 458) ARL VA
1 CHF OF NAV RES ATTN DIR PSYCHOL SCI DIV CODE 450
1 CHF OF NAV RES ATTN HEAD OF PSYCHOL BR CODE 452
1 DIR US NAV RES LAB ATTN CODE 5120
1 CHF OF NAV AIR TNG TNG RES DEPT NAV AIR STA PENSACOLA
3 OIC NAV PERS RES ACTVY SAN DIEGO
1 NAV NEUROPSYCHIAT RES UNIT SAN DIEGO
1 DIR PERS RES LAB NAV PERS PROGRAM SUPPORT ACTIVITY WASH NAV YD
5 COMDT MARINE CORPS HQ MARINE CORPS ATTN CODE AO-1B
1 DIR MARINE CORPS EDUC CTR MARINE CORPS SCH QUANTICO
1 DIR MARINE CORPS INST ATTN EVAL UNIT
1 CHF OF NAV OPNS OP-01P1
1 CHF OF NAV OPNS OP-07TL
2 COMDT HQS 8TH NAV DIST ATTN EDUC ADV NEW ORLEANS
2 COMDT PIP COAST GUARD HQ
1 CHF OPER PERS RES + REVIEW BR COAST GUARD HQ
1 SUPT US COAST GUARD ACAD NLW LONDON CONN
1 AIR TNG COMD/XPT RANDOLPH AFB
1 TECH DIR TECH TNG DIV(HRD) AFHRL LOWRY AFB COLO
1 CHF SCI DIV DRCIE SCI + TECH DCS R&D HQ AIR FORCE AFRSTA
1 CHF OF PERS RES BR DRCTE OF CIVILIAN PERS DCS-PERS HQ AIR FORCE
1 AIC ATXRQ RANDOLPH AFB
1 AFHRL/VII ATTN CAPT W S SELLMAN LOWRY AFB
2 MILIT TNG CTR OPE LACKLAND AFB
1 USAFA DIR OF THE LIB USAF ACAD COLO
2 CO HUMAN RESOURCES LAB BROOKS AFB
1 AFHRL (FTI) WILLIAMS AFB ARIZ
1 PSYCHOBIOLOGY PROG NATL SCI FOUND
1 DIR NAIL SECUR AGY FT GEO G MEADE ATTN DIR OF TNG
1 DEPT OF STATE BUR OF INTEL + RES EXTERNAL RES STAFF
1 SCI INFO EXCH WASHINGTON
2 CHF MGT & GEN TNG DIV TR 200 FAA WASH DC
1 EDUC MEDIA BR OF HEW ATTN T D CLEMENS
1 OFC OF INTERNATL TNG PLANNING & EVAL BR AID WASH DC
2 ERIC OE WASH DC
2 SYS DEVEL CORP SANTA MONICA ATTN LIB
2 DUNLAP + ASSOC INC DARIEN ATTN LIB
2 RAC ATTN LIB MCLEAN VA
1 RAND CORP WASHINGTON ATTN LIB
1 GP EFFECTIVENESS RSCH LAB U OF ILL DEPT OF PSYCHOL
1 MITRE CORP BEDFORD MASS ATTN LIB
2 LEARNING R&D CTR U OF PITTS ATTN DIR
1 HUMAN SCI RES INC MCLEAN VA
1 CHRYSLER CORP MSL DIV DETROIT ATTN TECH INFO CTR
3 CTR FOR RSCH IN SOCIAL SYS ATTN LIBN MD
1 MGR BIOTECHNOLOGY AEROSPACE SYS DIV MS 8H-25 BOEING CO SEATTLE
1 IDA RSCH & ENG SUPT DIV ARL VA
1 HUGHES AIRCRAFT COMPANY CULVER CITY CALIF
1 DIR CTR FOR RES ON LEARNING + TEACHING U OF MICH
1 R M STOGDILL OHIO STATE UNIV
1 EDITOR TNG RES ABSTR AMER SOC OF TNG DIRS U OF TENN
1 U OF CHICAGO DEPT OF SOC
1 DIR CTR FOR RSCH IN SOCIAL SYS KENSINGTON MD
3 CANADIAN JOINT STAFF OFC OF DEF RES MEMBER WASHINGTON
3 CANADIAN ARMY STAFF WASHINGTON ATTN G502 TNG
2 OFC OF ARMED FORCES ATTACHE ROYAL SWEDISH EMBSY DC
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1 DR GEORGE T HAUTY CHMN DEPT OF PSYCHOL U OF DEL
1 HEAD DEPT OF PSYCHOL UNIV OF SC COLUMBIA
1 U OF GEORGIA DEPT OF PSYCHOL
1 U OF UTAH DEPT OF PSYCHOL

1 GE CO WASH D C
1 AMER INST FOR RSCH ATTN LIB PALO ALTO CALIF
1 COLL OF ARTS & SCI U OF MIAMI ATTN L L MCQUITTY
1 SCI RSCH ASSOC INC DIR OF EVAL CHICAGO ILL
1 DR J R CULLEN DEPT OF SOC & ANTHROP UNIV OF RI
1 AMER PSYCHOL ASSOC WASHINGTON ATTN PSYCHOL ABSTR
1 NO ILL U HEAD DEPT OF PSYCHOL
1 GEORGIA INST OF TECH DIR SCH OF PSYCHOL
1 LIFE SCI INC HURST TEXAS ATTN W G MATHENY
1 AMER BEHAV SCI CALIF
2 DIR INSTR RESOURCES STATE COLL ST CLOUD MINN
1 COLL OF WM + MARY SCH OF EDUC
1 SO ILLINOIS U DEPT OF PSYCHOL
2 ASSOC DIR CDC TNG PROG ATLANTA GA
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1 DR V ZACHERT RT 1 GOOD HOPE GA
2 CHRYSLER CORP DEF ENGR ATTN DR H BERMAN DETROIT
1 DR C HELM DEPT EDUC PSYCH CITY U OF NY
1 DR H SHOEMAKER DIR TNG RSCH GP NY
1 U OF MINN DEPT OF INDUST EDUC ATTN R E KUHL
2 LIB GEO WASH UNIV ATTN SPEC COLL DEPT WASH DC

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