DIMENSIONS OF CERTAIN ARMY OFFICER POSITIONS DERIVED BY FACTOR ANALYSIS

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Army Research Institute for the Behavioral and Social Sciences
Arlington, Virginia

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MANPOWER DEVELOPMENT AND UTILIZATION TECHNICAL AREA

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A new approach to the description of Army officer duty positions is to cluster functionally related tasks into "duty modules." This report assesses the efficacy of this approach. Task-analysis data were collected from [illegible] Infantry officers and [illegible] Quartermaster officers in representative duty positions described by [illegible] duty modules; data reflected duties both under actual or simulated combat conditions and under garrison conditions. These data were factor analyzed by the principal components method and the factors were rotated

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...), by the varimax method. Results indicate that Army officer duty positions can be divided into six factors that describe the functions of: Unit command, operations and training, manpower and personnel, logistics, intelligence, and troop welfare. The duty module concept is confirmed as a logical and parsimonious strategy for defining Army duty positions and determining relationships among these positions; this approach can be used to develop career progression models and to relate officers' training to their assignments, for the Officer Personnel Management System.

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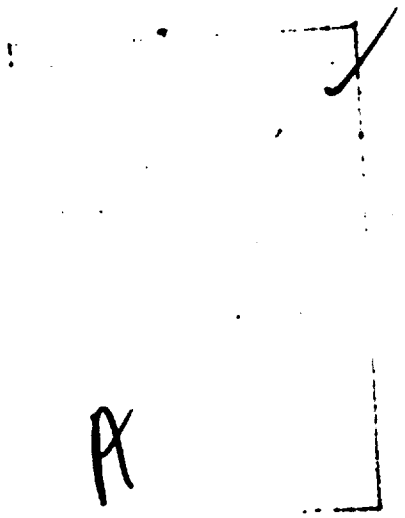

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Officer Career Mgmt Systems

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FOREWORD

An important part of the research of the Manpower Development and Utilization Technical Area of the Army Research Institute for the Behavioral and Social Sciences (ARI) supports effective career management for Army officer and enlisted personnel. ARI has developed the concept of the "duty module" in grouping sets of tasks and in defining relationships among MOS and career specialties; research in support of the Officer Personnel Management System (OPMS) has provided the methodological structure for a career development lattice to support effective career management needs, using the duty modules to define performance requirements across officer MOS and career branches. This report analyzes task-analysis field data on representative officer duty positions in the Infantry and Quartermaster branches and verifies that the duty modules adequately describe these duty positions. Duty module sets in the other officer career branches are under development. This research is conducted under RDTE Project 2O762717A712, FY 1975. Work is responsive to special requirements of the Deputy Chief of Staff for Personnel, particularly the Directorate of Military Personnel Management, Officer Division.

J. E. UHLANER
Technical Director

DIMENSIONS OF CERTAIN ARMY OFFICER POSITIONS DERIVED BY FACTOR ANALYSIS

BRIEF

Requirement:

To determine the underlying dimensions of representative Infantry and Quartermaster officer duty positions described in terms of duty modules (clusters of specific functionally related tasks), and the extent to which these dimensions correspond to functional groups of officer duties.

Procedure

Data were analyzed from a field survey of 403 Infantry officers and 74 Quartermaster officers in 93 different duty modules, the data reflected actual duties under actual or simulated combat conditions and under garrison conditions. A principal components factor analysis determined the basic dimensions of the duty modules and actual duties.

Findings

For both combat and garrison conditions, Infantry and Quartermaster officer duty positions can be described by six factors which reflect the functions of (1) unit command, (2) operations and training, (3) manpower and personnel, (4) logistics, (5) intelligence and (6) troop welfare, in that order of importance for combat conditions. under garrison conditions manpower and personnel functions rank second, operations and training functions third. The duty module concept is confirmed as a logical and parsimonious strategy for defining Army officer duty positions and for systematizing relations among those positions.

Utilization of findings

Duty modules can be used to identify relationships among duty positions, relate training and experience to officer assignment alternatives, and relate training programs to assignment needs. A career progression model for the Officer Personnel Management System, based on the structure provided by duty modules and related research, is expected to delineate officers' training and duty assignments and choices for career development in the major OPMS lines and career branches.

DIMENSIONS OF CERTAIN ARMY OFFICER POSITIONS DERIVED BY FACTOR ANALYSIS

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DIMENSIONS OF CERTAIN ARMY OFFICER POSITIONS DERIVED BY FACTOR ANALYSIS

A portion of the research effort in the Army Research Institute for the Behavioral and Social Sciences (ARI) is concerned with development of methodologies to facilitate implementation of the Officer Personnel Management System (OPMS).[1] One objective of this research is to design a career progression model that will reflect the skill and experience requirements in each of the different officer specialties at successively higher levels of responsibility. This model will facilitate the assignment of officers to those positions in which their prior experiences will be most useful.

Design of an adequate career progression model requires an adequate description of the duties and responsibilities in each of the various duty positions that Army officers occupy. Furthermore, the system used to describe the duty positions must also describe the experiences of the individual officer. One approach to this problem, task analysis, has the limitation that too many task statements are needed to describe a particular duty position. For example, Lane and Marshall[2] used [illegible] task statements in a study of the duties of Combat Information Center Officer in the Navy. Also, specific task statements are too fragmentary to describe a broad spectrum of duties or to define personnel or training requirements.

An approach that overcomes these limitations is to cluster functionally related tasks into duty modules. Any duty position may be described by one or more of these modules. Thus, the duty module rather than the specific task becomes the unit for description of a position. The duty module could be used to define not only the duties but the education and experiences of an individual.

In an earlier study, Sitterson and Wintersteen developed duty modules in the Infantry and Quartermaster branches.[3] They collected task-analysis

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[1] U.S. Department of the Army. Officer Professional Development and Utilization. DA Pamphlet [illegible]. Washington, D.C., [illegible].

[2] Lane, G. L., and Marshall, C. T. Occupational Analysis: Final Report on the Design of a Navy Officer Occupational Analysis System. [illegible]. Washington, D.C.: Naval Personnel Research and Development Laboratory, June [illegible].

[3] Sitterson, John D., Jr., and Wintersteen, Joseph O. Results of Field Survey to Evaluate an Experimental Set of Duty Modules. Silver Spring, Maryland: American Institutes for Research, January [illegible].

information on representative officer duty positions in these branches and developed [illegible] duty modules from this information. They then conducted a field survey, using these duty modules, to determine the adequacy of the new approach in describing positions under both combat and garrison conditions. The results of this survey verified the adequacy of the duty module approach in describing officer duty positions in these two branches.

The purpose of this research was to determine the underlying dimensions of Infantry and Quartermaster officer duty positions when these positions are described in duty module terms, using the data collected by Sitterson and Wintersteen.[4] The extent to which these dimensions correspond to functional groupings of Army officer duties provides an indication of the efficacy of the duty module approach. As a further evaluation of the new approach, the duty module data were analyzed for both combat and garrison conditions to determine if the same dimensions could be used for both.

PROCEDURE

Subjects were [illegible] officers, of whom [illegible] were in Infantry positions and [illegible] were in Quartermaster positions. The research data reflected the involvement of these officers in the [illegible] different duty modules in actual or simulated combat operations and support, and in garrison conditions.[5]

Separate parallel analyses were performed for these two types of conditions. Subjects were grouped by grade, position title, type of organization, and Military Occupational Specialty. For the purpose of these analyses, first and second lieutenants were pooled. Organizations were classified in terms of category e.g., Airborne, Infantry, Mechanized Infantry, or "not combat deployable" such as post headquarters and on the basis of function e.g., headquarters, line, or support).

After the subjects were divided into groups, two data matrices were constructed, one for combat conditions and one for garrison conditions. The rows of these matrices were defined by the groupings of subjects and the columns were defined by the [illegible] duty modules. The value of each cell entry in each matrix was defined by whether or not a member of a particular group performed the duties described by a duty module. If a member of a particular group performed the duties described by a particular duty module, then the cell entry defined by that group row and that duty module column was assigned a value of "1"; if not, then the cell entry was assigned a value of "0."

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[4] Sitterson and Winterseen, [illegible], op. cit.

[5] Field collection of data was performed by American Institutes for Research under Contract DAHC-[illegible]-C-[illegible].

A matrix of the order 232 x 93 was derived for the data representing combat conditions for the 4[illegible] officers; another matrix of the order of 312 x 93 was derived for these subjects for garrison conditions. Then, for each matrix, columns in which less than 5% of the cell entries were "1" were deleted. The data matrix for combat conditions reduced to 232 x 25 and that for garrison conditions to 312 x 2 .

An intercorrelation matrix was next computed for both combat-related and garrison-related conditions using phi coefficients between duty modules across the groupings. These correlation matrices were factor analyzed. A principal components solution was obtained in which the highest absolute row value for each row was used as the diagonal estimate. Factors with eigenvalues greater than 1.00 were extracted and then rotated by the varimax method.

RESULTS

Combat Operations and Support Conditions

Six factors with eigenvalues greater than 1.00, accounting for 67.3% of the common variance, were extracted from the data on combat conditions. Table 1 shows the percent of variance and the cumulative percent of variance accounted for by each of these factors. Table 2 shows the percent of common variance and the cumulative percent of common variance accounted for by these six factors after orthogonal rotation. The six combat-related factors are arranged by decreasing size of their eigenvalues.

Factor I, Unit Command. This factor reflects a unit commander's activities in a variety of roles, ranging from unit administration to directing and controlling the tactical employment of troops, as indicated by the loadings of the variables on this factor Table 3). Other variables that load substantially on this factor include direct participation in combat, responsibility for supply operations, the training of troops, and general management. The role of the unit commander in exercising his authority on judicial matters, which is solely his prerogative, is reflected in the duty module on the exercise of military command authority.

Factor II, Operations and Training. This factor reflects an operations and training constellation of functions at the staff level. Five variables, shown in Table --, identify duty modules that involve general administration, operations staff functions, operations planning staff functions, training staff functions, and the organizing of staff functions. Defined by this factor are organizational duties such as providing advice on planning unit functions or on the use of manpower and material resources; these are reflected in the duty module on organization staff functions. Staff work directed toward defining the operational requirements of the organization and the monitoring of the execution of operational orders and directives is represented in the operations staff duty module; staff work involving the actual planning of operations is reflected in the operations planning module, and staff work essential to maintaining the operational readiness of the organization is reflected in the module on training staff functions.

Table 1

PERCENT OF VARIANCE ACCOUNTED FOR BY EACH OF THE SIX FACTORS
IN ACTUAL OR SIMULATED COMBAT OPERATIONS
AND SUPPORT ACTIVITIES

Combat-Condition Factors	% Variance	Cumulative % Variance
1 Unit Command	14.7%	14.7%
2 Operations and Training	18.7%	32.4
3 Manpower and Personnel	13.9	46.3
4 Logistics	7.6%	53.9
5 Intelligence	7.5	62.3%
6 Troop Welfare	5.4%	67.4%

Table 2

PERCENT OF VARIANCE ACCOUNTED FOR BY EACH OF THE SIX ROTATED FACTORS
IN ACTUAL OR SIMULATED COMBAT OPERATIONS
AND SUPPORT ACTIVITIES

Combat-Condition Factors	% Variance	Cumulative % Variance
1 Unit Command	13.7%	13.7%
2 Operations and Training	13.9	27.2
3 Manpower and Personnel	12.0%	39.3
4 Logistics	11.2%	50.51
5 Intelligence	8.40	59.01
6 Troop Welfare	8.43	67.44

Table 3

LOADINGS OF DUTY MODULE VARIABLES ON THE UNIT COMMAND FACTOR FOR COMBAT CONDITIONS AND FOR GARRISON CONDITIONS, AFTER ROTATION

Duty Module Variable	Loading	
	Combat Factor I_c	Garrison[a] Factor I_g
Performs unit administration	.77	.66
Directs and controls tactical employment of unit	.74	.49
Exercises military command authority	.73	.50
Trains troops and/or civilian employees in units and activities	.43[b]	.62[b]
Performs supply operations at consumer unit level	.62[b]	.—[b]
Participates individually and directly in ground combat	.63	—[c]
Performs command or general management	.36	.35
Supervises troop appearance and care and maintenance of material and facilities	.24	.39[b]
Counsels and evaluates subordinates as troop leader and takes action on personal problems	.25[b]	.3[b]
Supervises a staff section, detachment, or office	-.13[b]	-.31[b]
Performs general administration	-.29[b]	-.6-

[a] Garrison loadings have been reflected.

[b] Variable has a substantial loading (i.e., over .30) on another factor in the same analyses.

[c] Variable not included in analysis of data for garrison conditions.

Table -

LOADINGS OF DUTY MODULE VARIABLES ON THE OPERATIONS AND TRAINING FACTOR FOR COMBAT CONDITIONS AND FOR GARRISON CONDITIONS, AFTER ROTATION

Duty Module Variable	Loading	
	Combat Factor II$_c$	Garrison Factor III$_g$
Performs organization staff functions in a general staff or other coordinating staff	.[illegible]	.[illegible]
Performs operations staff functions in a general staff or other coordinating staff	.[illegible]	.[illegible]
Performs training staff functions	.[illegible]	.[illegible]
Performs operations planning staff functions in a general staff or other coordinating staff	.[illegible]	.[illegible]
Performs general administration	.[illegible][a]	.[illegible]

[a] Variable has a substantial loading (i.e., over .30) on another factor in the same analysis.

Factor III, Manpower and Personnel. Table [illegible] shows the four variables that load substantially on this factor in the combat-condition analysis. These variables identify duty modules that involve supervision of a staff section, manpower management staff functions, personnel management staff functions, and staff functions pertaining to personnel services. Generally, this factor reflects planning and utilization of manpower resources as well as personnel management. The duty module on personnel services deals with provision for such things as the spiritual welfare, housing and dining facilities, and well-being of dependents, in order to insure the morale and well-being of personnel.

Factor IV, Logistics. This factor was defined by five variables, shown in Table [illegible], which correspond to duty modules dealing with general administration; supervision of a staff section, detachment, or office; performance of supply staff functions; the performance of maintenance staff functions; and the performance of logistical staff functions. This factor concerns the overall planning for and the acquisition of resources and material. Staff work necessary for the more specific aspects of operational support is also involved, as well as responsibilities for general administration and the supervision of a staff section.

Table

LOADINGS OF DUTY MODULE VARIABLES ON THE MANPOWER AND PERSONNEL FACTOR FOR COMBAT CONDITIONS AND FOR GARRISON CONDITIONS, AFTER ROTATION

Duty Module Variable	Loading	
	Combat Factor III$_c$	Garrison Factor II$_g$
Performs personnel management staff functions	.[illegible]	.[illegible]
Performs staff functions pertaining to personnel services	.[illegible]	.[illegible]
Performs manpower management staff functions	.[illegible]	.[illegible]
Supervises a staff section, detachment, or office	.[illegible][a]	.[illegible][a]
Performs special staff administrative or adjutant type functions	--[b]	.[illegible]
Performs headquarters management staff functions	--[b]	.[illegible]

[a] Variable has a substantial loading (i.e., over 30) on another factor in the same analysis.

[b] Variable not included in analysis of data for combat conditions.

Table

LOADINGS OF DUTY MODULE VARIABLES ON THE LOGISTICS FACTOR FOR COMBAT CONDITIONS AND FOR GARRISON CONDITIONS, AFTER ROTATION

Duty Module Variable	Loading	
	Combat Factor IV$_c$	Garrison[a] Factor IV$_g$
Performs logistical services staff functions	.[illegible]	.[illegible]
Performs supply staff functions	.[illegible]	.[illegible]
Performs maintenance staff functions in a general staff or other coordinating staff	.[illegible]	.
Supervises a staff section, detachment, or office	.[illegible][b]	.30[b]
Performs general administration	.[illegible][b]	.15

[a] Garrison loadings have been reflected.

[b] Variable has a substantial loading (i.e., over 30) on another factor in the same analysis.

Factor V, Intelligence. Four variables define this factor, as shown in Table [illegible], and correspond to duty modules on general administration, supervision of a staff section, combat intelligence staff functions, and counterintelligence and security staff functions. This factor describes the functions of an intelligence staff officer with responsibility for planning production, preparation, and dissemination of combat intelligence data as well as responsibility for the internal security of his unit. The factor also includes general administration and supervision of a staff section.

Factor VI, Troop Welfare. Four variables with substantial loadings on this factor, shown in Table [illegible], correspond to duty modules involving counseling and evaluation of subordinates, supervising troop appearance and care and maintenance of materiel and facilities in unit, performance of supply operations at the unit consumer level, and training. This factor is related to the duties that an officer performs in face-to-face relationships with troops. A primary concern for their welfare appears in the module on counseling and evaluation of subordinates; the module dealing with supervising troop appearance and maintenance of materiel expresses a concern for an environment conducive to unit effectiveness and for the comfort of his troops.

Garrison Conditions

Six factors with eigenvalues greater than 1.00, accounting for 57.1% of the variance, were extracated from the data on garrison conditions. Table [illegible] shows the percent and cumulative percent of the variance accounted for by these factors. Table [illegible] shows the percent and cumulative percent of the common variance accounted for by these factors after orthogonal rotation.

The six factors that emerged showed broad similarity of content to those that emerged from the data on combat and combat-related activities. However, these factors differed in one respect in terms of the size of their corresponding eigenvalues, which were, in descending order: Factor I, Unit Command; Factor II, Manpower and Personnel; Factor III, Operations and Training; Factor IV, Logistics; Factor V, Intelligence; and Factor VI, Troop Welfare. In the analysis of the garrison-related data the sequence of magnitudes of the eigenvalues was slightly different from that in the analysis of combat-conditions data. The factor reflecting manpower and personnel functions had a higher eigenvalue in the garrison-condition analysis that the factor reflecting operations and training functions; the reverse occurred in the combat-condition analysis.

Factor I, Unit Command. This factor was defined by duty modules that ranged from unit administration to tactical employment of troops. Table [illegible] shows the reflected loadings of the variables on this factor, which tended toward bipolarity with two of the ten variables showing substantial negative loadings. Unit administration has the highest positive loading, as in the combat-condition analysis; general administration has the greatest negative loading. One end of this bipolar factor represents

Table

LOADINGS OF DUTY MODULE VARIABLES ON THE INTELLIGENCE FACTOR FOR COMBAT CONDITIONS AND FOR GARRISON CONDITIONS, AFTER ROTATION

Variable	Loading	
	Combat Factor V_c	Garrison Factor V_g
Performs counterintelligence and security staff functions in a general staff or other coordinating staff	.[illegible]	.[illegible]
Performs combat intelligence staff functions	.[illegible]	.[illegible]
Supervises a staff section, detachment or office	.3[illegible][a]	.20
Performs general administration	.3[illegible][a]	.1[illegible]

[a] Variable has a substantial loading (i.e., over .30) on another factor in the same analysis.

Table

LOADINGS OF DUTY MODULE VARIABLES ON THE TROOP WELFARE FACTOR FOR COMBAT CONDITIONS AND FOR GARRISON CONDITIONS, AFTER ROTATION

Variable	Loading	
	Combat Factor VI_c	Garrison Factor VI_g
Supervises troop appearance and care and maintenance of materiel and facilities in unit	.[illegible][a]	.[illegible][a]
Counsels and evaluates subordinates as troop leader and takes action on personal problems	.[illegible][a]	.[illegible][a]
Performs supply operations at consumer unit level	.[illegible][a]	.[illegible][a]
Trains troops and/or civilian employees in units and activities	.[illegible][a]	.[illegible][a]

[a] Variable has a substantial loading (i.e., over .30) on another factor in the same analysis.

Table 9

PERCENT OF VARIANCE ACCOUNTED FOR BY EACH
OF THE SIX FACTORS IN
GARRISON ACTIVITIES

Garrison-Condition Factors		% Variance	Cumulative % Variance
1	Unit Command	16.95	16.95
2	Manpower and Personnel	11.66	28.61
3	Operations and Training	10.31	38.92
4	Logistics	7.60	46.52
5	Intelligence	6.10	52.62
6	Troop Welfare	4.57	57.19

Table 10

PERCENT OF VARIANCE ACCOUNTED FOR BY EACH
OF THE SIX ROTATED FACTORS IN
GARRISON ACTIVITIES

Garrison-Condition Factors		% Variance	Cumulative % Variance
1	Unit Command	13.64	13.64
2	Manpower and Personnel	11.55	25.15
3	Operations and Training	10.63	35.82
4	Logistics	8.77	44.59
5	Intelligence	6.69	51.28
6	Troop Welfare	5.91	57.19

the unit command activity, while the other represents an administrative function. Five of the six variables that had substantia' loadings on this factor for combat conditions also had substantial loadings for garrison conditions; the sixth, participation in ground combat, was not used. Two variables which did not define this factor for combat conditions--general administration and the supervision of a staff section, detachment, or office--had substantial negative loadings. The unit command factor appears essentially the same for both combat and garrison conditions.

Factor II, Manpower and Personnel. Five variables had substantial loadings on this factor, which was Factor III in the combat-condition analysis. Table shows the loadings for these variables. Three of the variables that had substantial loadings in the combat-condition analysis also had substantial loadings on this factor in this analysis: manpower management, personnel services management, and personnel management at the staff level. Two variables not included in the combat-condition analysis also had substantial loadings on this factor: staff management functions at the headquarters level and special staff administration. The variable representing supervision of a staff section had a loading of .2[illegible] in the garrison condition analysis.

Factor III, Operations and Training. This factor emerged with substantial loadings on the same four variables as in the combat-condition analysis, in which it was Factor II (Table 4). Loading of the fifth variable, general administration, was .19 in this analysis and .37 in the previous one.

Factor IV, Logistics. This factor also had substantial loadings on the variables that defined staff officer functions in the general field of logistics, supply, and maintenance (Table 6).

Factor V, Intelligence. Again clearly defined by this factor is the function of the intelligence staff officer, as indicated by the loadings of the two variables that indicate activities in the areas of combat intelligence and counterintelligence (Table 7).

Factor VI, Troop Welfare. This factor is defined by substantial loadings, as shown in Table , on the two variables that represent counseling and evaluating subordinates and supervision of troop appearance.

DISCUSSION

The results indicate that the duty positions held by Army officers in both combat-related and in garrision-related activities can be divided into six factors. These six factors describe the following functions: unit command, operations and training, manpower and personnel, logistics, intelligence, and troop welfare.

The unit command factor includes a diversified group of duties centering on exercise of command functions in all areas of command responsibility; these define the unit command function as the execution of policies and procedures developed in staff activities. The functional

staff factors reflect the specialized requirements of their respective areas of operations, personnel, logistics, and intelligence. The troop welfare factor appears to define the duties of an officer involved in face-to-face leadership of troops who has first-line responsibility for their well-being and motivation.

These findings tend to support current military educational practices of providing the potential commander with a broad knowledge of staff functioning and capabilities as well as the proper application of completed staff work. Also, these findings tend to support current practices of providing highly specialized education opportunities to those officers who are likely to occupy positions in staff agencies.

The data reduction strategy employed in this research appears to be a fruitful method for analysis of duty module data. Factor analysis permits a ready evaluation of the relative contribution of each duty module in the different functions that emerge.

Continued research on duty modules should lead to development of a system defining all Army officer duty positions in explicit functional terms. This system can then be used to 1) identify functional relationships among positions, 2) develop a career progression model, 3) relate training and experience to officer assignment alternatives, and 4) relate training programs to assignment needs.

The relationships among duty positions can be precisely defined by factor analysis. The underlying dimensions that define the relevant duty positions can be established, and the degree to which the various duty modules are revelant to these dimensions can be evaluated. The overlap among duty modules should be evaluated to determine the degree to which the experiences gained in one duty module may contribute to performance in other modules.

The functional requirements of duty positions and the interrelationships among these positions, stated in duty module terms, can be used to define career development patterns in the Army officer corps. The development patterns thus defined can be incorporated into a career progression model that will reflect the possible progression paths of an officer at successively higher levels of assignment in his military career. These patterns would also reflect the critical choice points in the officer's career, based upon the degree to which alternative assignment options are available in terms of Army requirements and experiences in the different duty modules. Refinements on the career progression model would incorporate not only the fact that experience in a particular duty module is required for a particular assignment but also the duration, recency, and quality of performance required in that duty module.

Assignment profiles for officers can be developed to incorporate the assignment requirements defined by the career progression model. The assignment requirements can then be compared with available officers' assignment profiles, so that selection for assignment will become a matter of optimizing the congruency between the assignment profiles and position requirements.

Not only can duty modules describe duty positions, they can describe training requirements for different assignments. Again, as in the assignment paradigm, the experience of an individual officer can be compared with the training requirements of a military course, to determine the segments of that course which he must complete.

A refined career progression model should show the grade or responsibility level at which significant additions or deletions of key functions occur. Significant additions or changes in scope of functions will then define the period in which further training or education is appropriate.