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# ARMY STUDY HIGHLIGHTS



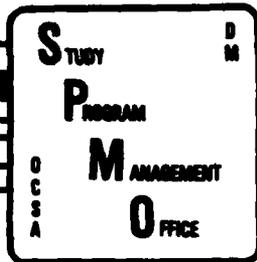
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VOLUME III

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**FOREWORD**

This report contains selected high quality analytic efforts recently completed within the Army study community. It is the third report of its kind; thus, it is designated Volume III of the series. Two similar reports were published in August 1981 and March 1982. The report is designed to widely publicize high quality studies, to encourage excellence in Army analysis activities, and to give visibility to deserving individual analysts.

The six studies contained in this report were selected from several nominations of top quality studies submitted by the US Army commands and agencies. The studies were selected by a peer review panel of HQDA officials. Selections were based on an assessment of the problem statement, approach, results, conclusions, and implementation of each study.

Volume IV of the series will be published in September 1983. US Army commands and agencies will be requested in June 1983 to forward nominations for the report to the Study Program Management Office (DACS-DMO), Headquarters, Department of the Army, Washington, D.C. 20310.



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STUDY A

1. Study Title. An Evaluation of the Adequacy of the Obstacle Plan Supporting CINCUNC/CFC OPLAN (Korea Barrier Study)

2. Sponsoring Organization and Point of Contact.

Headquarters  
Republic of Korea (ROK)/US Combined Forces Command (CFC)  
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BG Jung Ki Ro

3. Performing Organization and Principal Author.

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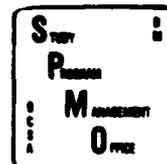
Mr. Elton H. Underwood, et al.

4. Problem. North Korea (NK) increased its potential offensive threat over recent years as revealed publicly by President Carter during his presidency. This news potentially affected the security of ROK and US forces in the ROK. As a result, the CFC decided to critique the obstacle plan which supports CINCUNC/CFC OPLAN to determine if it was designed effectively enough to meet the increased NK threat.

a. As a part of the evaluation of obstacles, the CFC sought to determine if planned and partially installed obstacles could be emplaced within very short warning scenarios. This evaluation was to consider both the availability of required obstacle materials and the capability of assigned units to emplace obstacles within designated time periods.

b. Also, as a part of the evaluation process, the CFC desired to have the obstacle plan data automated to include development and documentation of an automated program. The existing manually operated obstacle data system did not allow for fast changes, easy corrections, or simple retrieval of data.

c. A government-wide literature search and contacts with appropriate US and ROK agencies were conducted to insure that no duplication of effort occurred and to obtain information that would be useful in the analysis.



5. Approach. The initial step toward understanding all aspects of the problem was a visit to the ROK. Pertinent obstacle data were collected from the field units. An analysis was made of all available documentation and intelligence related to the subject. The overall study approach consisted of three broad parts:

a. Design of the entire obstacle plan.

(1) The North Korean Army (NKA) threat. The NKA threat to each ROK Army corps area was established, and the NKA major and secondary avenues of approach were projected.

(2) Terrain analysis. A terrain analysis was conducted for the ROK forward areas to determine the enemy cross-country movement (CCM) potential during summer (wet season) and during winter (frozen, dry season). This allowed an analysis of the positioning of obstacles in relation to the threat and terrain.

(3) Storage life, emplaced life, and faster emplacement methods for conventional mines. Current and past US and ROK testing programs for stored and emplaced mines were analyzed and the results were used as a guide to the reliability of currently emplaced mines and those currently in storage. Faster emplacement methods were researched for use during short warning situations.

(4) Obstacle density and mix. Based on current Army doctrine, the current NK threat, and the CCM potential for tank movement, the ROK obstacle plan was evaluated and a desired obstacle density and mix for all forward ROK division areas was established and compared with the obstacle density and mix as presented in the CFC Obstacle Plan.

(5) Support of defensive weapons fire. Obstacles and antitank weapon positions were plotted and analyzed to see if the obstacles were positioned correctly to support ROK antitank weapons fire.

b. ROK capability to install planned and partially installed obstacles.

(1) Current obstacle plan requirements versus unit capability. A detailed analysis was conducted of the squad-hour requirements for the emplacement of obstacles assigned to each unit. The analysis was compared with the squad-hours generated by that unit starting at warning and ending at a pre-established time that obstacles should be in place, in relation to H-hour.



Travel times from unit positions to obstacle storage sites, loading times, and travel times to the obstacle installation sites were considered.

(2) Obstacle material--available stocks versus target requirements. This analysis evaluated the material availability versus target requirements in all ROK corps, assessed the adequacy of stocks in individual stock points to service assigned targets, and investigated potential bottlenecks at stock points.

c. Automated barrier program. A research effort was conducted to establish if programs developed previously for other obstacle systems might be used as a basis for automating the obstacle system in the ROK or, whether it was necessary to develop a new program.

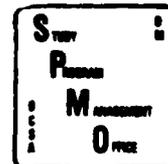
6. Results/Conclusions. The results of this analysis on the adequacy of the ROK obstacle plan are classified. Findings concerning most topics were presented for all command levels from CFC down to division. Significant findings on procedure were achieved for all of the analyses presented in the preceding paragraphs.

7. Recommendations. Recommendations to improve the obstacle plan were made at all levels within the CFC. All recommendations were achievable by using currently available resources.

8. Implementation. A committee chaired by the CFC C3 was established by the Commander-in-Chief, Combined Forces Command, to implement the recommendations of the study. The study results and conclusions were briefed and the study text was distributed at many levels in the CFC. The study was well accepted.

9. DTIC Accession Numbers.

Volume I - ADC028955L  
Volume II - ADC028956L  
Volume III - ADC028957L



STUDY B

1. Study Title. Middle East Target Analysis (META)
2. Sponsoring Organization and Points of Contact.

The Joint Chiefs of Staff  
Studies, Analysis, and Gaming Agency  
Special Studies Division  
Washington, DC 20310

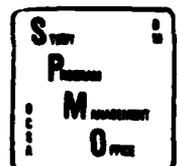
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Mr. H. Eugene Deibert - Senior Analyst  
Dr. Andrew W. Harrell - Analyst  
Mrs. Jean A. Lamrouex - Analyst

4. Problem. Various scenarios for a war in the Middle East depict Soviet combat divisions attacking toward various Middle Eastern objectives. The Special Studies Division of the Studies, Analysis, and Gaming Agency (SAGA) of the Organization of the Joint Chiefs of Staff (OJCS) has initiated a series of studies which examine the question, "Is a conventional defense in the Middle East feasible?" Research papers resulting from the series of studies have identified certain weaknesses in the line of communication (LOC) road network in the Middle East. One of the goals is to model the effects of interdiction on the movement of columns of vehicles into and through the Middle Eastern road network. Inherent to this model is an analysis of the various interdiction methods which could be used on the Middle Eastern LOC and an analysis of the capability of the Soviet Army to repair or bypass any obstacles created on the LOC roads. The META study examines the relationship of interdiction effort to enemy effort on certain notional targets in the Middle East, and estimates the total delay which could be caused by interdicting these targets.



5. Approach. The basic underlying assumption of the study was that there would be no contact between the US and Soviet forces. This allowed a detailed examination of the "pure" effort required by both sides to create and overcome the obstacles. Follow-on studies can use different scenarios allowing contact between forces. The results of META would then provide the starting point for effort estimates and delay calculations, which would be modified by the type of forces involved and the nature of their contact. The study was divided into four analytical phases. The first phase was notional target selection. During this phase, maps, reports, photos, and information from intelligence sources were studied in order to develop a set of notional targets. During the second phase, pre-defined US air and ground forces were used in simulated attacks on the notional targets. The levels of damage resulting from the attacks were standardized so that both air and ground attacks on a target would produce similar damage. The third phase was a simulation of a Soviet Motorized Rifle Division (MRD) which had to overcome the standardized levels of damage on the notional targets. The results of Phases II and III were levels of effort required by the forces involved to either create or overcome the standardized levels of damage. These levels of effort were then used in Phase IV, Target Analysis. The results were analyzed in Phase IV to develop a cost ratio (defined as Soviet engineer squad-hours divided by US engineer squad-hours) and total delay for each target. The targets were then ranked according to both cost ratio and total delay.

6. Results. The notional targets were examined under various damage level and situational factors, leading to over 400 variations in all. The results for each target under all conditions are presented in a separate volume--the Target Handbook. The study leads to the conclusion that, from the standpoint of effectiveness, there are two distinct classes of targets in the Middle East--bridges, and all others. Bridges are different because of the wide range of cost ratio values and the amount of total delay possible under the various conditions. These conditions have very little affect on the other targets (i.e., LOC bridging availability has little affect on the delay caused by a blocked tunnel). The overall target rankings are presented in the Target Handbook.

7. Conclusions. There is no single best method of destroying targets. All attack methods can damage most targets in similar ways. Selection of an interdiction method will depend on time and resource availability. The Soviet MRD is well equipped and organized for bridging and earth-moving operations, but has limited capacity for performing repair. Bridges and



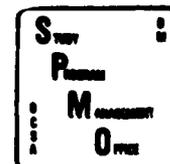
vulnerable highway segments are easy to attack and the results are predictable, but the delays caused by road craters on vulnerable highway segments are low. Landslide areas are easy to attack, but the results are unpredictable since they depend so heavily on geological conditions; however, under the right conditions the delays caused by landslides can be quite high. Tunnels are not good targets because they are very difficult to attack and the results are unpredictable. In addition, tunnels attacked with conventional munitions do not create high delays.

8. Recommendations. The study provides quantitative results for use in evaluating LOC networks. As a result, no courses of action were recommended.

9. Implementation. OJCS/SAGA immediately implemented the use of the study upon receipt of the draft report. The study results are being used in the development of a LOC model which will select targets for interdiction based on the payoff of the target (in terms of cost ratio or total delay) and which will allocate limited interdiction resources to these targets.

10. DTIC Accession Number.

DA0H0451



STUDY C

1. Study Title. Long-Range Army Manpower Projections  
(L-RAMP)

2. Sponsoring Organization and Point of Contact.

Office of the Deputy Chief of Staff for Operations  
and Plans  
Strategy Plans and Policy Directorate (DAMO-SSL)  
Washington, DC 20310

MAJ(P) J. Gatlin

3. Performing Organization and Principal Authors.

US Army War College  
Strategic Studies Institute  
Carlisle Barracks, Pennsylvania 17013

COL Patrick F. Passarella (Study Manager)  
Dr. John M. Weinstein

4. Problem.

a. The L-RAMP Study addressed three questions: (1) Under the current All-Volunteer Force (AVF) concept, what are the likely levels of quality manpower (17-19 year-old male high school graduates in Mental Categories I-IIIa) recruitment in the 1990-2000 period? (2) Will these levels of recruitment meet the anticipated requirements in the Army's Personnel Long-Range Plan (PLRP)? (3) If shortfalls occur, what options can the Army adopt to achieve its manning goals?

b. The L-RAMP Study also illustrated and refined a statistical methodology which can be applied to the study of future manpower availability.

5. Approach.

a. The L-RAMP Study collected and analyzed relevant quantitative recruitment and retention data to answer the questions posed above.

b. Factor analysis was used to identify the independent statistical dimensions of recruitment and retention behavior, and the operational variables which best describe these dimensions.



c. Multiple regression analysis was then used to explain various behavioral patterns of recruitment and retention, to assess the impacts of selected variables and Army policies on manpower availability, and to help predict the levels of recruitment and retention of quality manpower under six recruitment and retention scenarios developed by the study team.

d. These projections were then extended to the 1990-2000 period considering the declining population (which will reach its nadir in 1993) of 17-19 year-old males.

e. These scenario-dependent projections are compared to PLRP requirements to determine the existence and extent of quality manpower shortfalls in the 1990s.

f. During the course of the study, extensive interviews covering aspects of the methodology, the data, and the substantive questions were conducted with analysts and action officers at US Army Recruiting Command, Army Research Institute, United States Military Academy, Defense Manpower Documentation Center, and the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics).

## 6. Results.

a. The study identified six dimensions of recruitment and retention. These dimensions are economic, educational, quality of life in the Army, societal attitudes toward the military, job satisfaction, and expectation of future economic prospects. Each dimension was operationalized with a variable identified as most appropriate by the factor analysis.

b. Selected recruitment findings are: economic variables have the most impact upon recruitment; high levels of youth unemployment increase enlistment prospects although Category I-II youths are less affected by a bad economy than their Category III peers; and, recruitment contract data give different insights into recruitment behavior than accession data.

c. Selected retention findings are: educational level affects retention decisions; first-term and career reenlistment decisions are affected by different criteria; and, military pay and public attitudes toward the military most affect reenlistment decisions of career personnel.

## 7. Conclusions.

a. As currently instituted, the AVF concept is unlikely to



enable the Army to achieve the quality enlisted end-strength levels envisioned in the PLRP even under the most optimistic scenarios. The most severe shortfalls will occur in 1992-1993.

b. However, numerous options exist that may enable the Army to reduce the projected quality manpower shortfalls while maintaining the essential features of an AVF. These can be grouped into three categories: (1) those which change the level of composition of end-strength; (2) those which influence recruitment accessions; and, (3) those which affect separation rates.

(1) End-strength options include: increase civilian end-strength; increase female end-strength; increase the ratio of officers to enlisted; and, increase Army latitude in setting end-strength levels.

(2) Options to reduce recruitment requirements include: extend term of first-term enlistment; increase recruitment of prior-service males; slightly relax height, weight, and selected medical entry standards; expand lateral entry into Army to highly trained civilians; and, increase pay, benefits, and recruiting efforts.

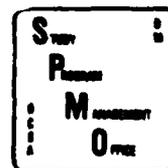
(3) Retention options include: increase career mix of Army personnel; reduce turbulence--expand COHORT programs; and, increase quality of life.

8. Recommendations. The Army is urged to (a) conduct an early examination into the suitability, feasibility, and acceptability of the above options, (b) determine the precise nature of its quality personnel requirements, (c) continue to standardize and centralize its personnel data bases, and (d) encourage efforts to gather and analyze contract data.

9. Implementation. The L-RAMP study has received wide distribution in the Office of the Deputy Chief of Staff for Personnel and the data base collected by the study team is being transferred to interested parties. The study is to serve as a model for a major analytical effort mandated by the Deputy Chief of Staff for Personnel (DCSPER). Finally, the DCSPER has directed his analysts to examine the suitability, feasibility, and acceptability of the L-RAMP Study's recommended options.

10. DTIC Accession Number.

B070380L



STUDY D

1. Study Title. Econometric Model for Optimizing Troop Dining Facility Operations

2. Sponsoring Organization and Point of Contact.

Office of the Deputy Chief of Staff for Logistics  
Transportation, Energy, and Troop Support Directorate  
Troop Support Division (DALO-TST-F)  
Washington, DC 20310

Ms. Sarah Nelson

3. Performing Organization and Principal Author.

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CPT (P) August C. Manguso

4. Problem. The current method of developing the Master Menu is a subjective technique using manual and partially automated procedures. There is no consistent analytical approach to providing the best menu in terms of food cost, acceptability, and nutritional adequacy. In addition, no consideration is given to the relative labor costs involved in preparing the menu. While the role of the dietician and nutritionist is not to be minimized, there is significant need for an efficient planning tool that is capable of rapidly and accurately responding to changes in food cost, nutritional requirements, and preference patterns. Existing procedures are considered to be inadequate.

5. Approach.

a. Goal programming (GP). The selection of an analytic methodology was based on the need to select the best combination of menus in terms of the following objectives: meet nutritional needs, remain within food cost allowances, hold down labor costs, and maintain high acceptability. GP is a tool that allows for the incorporation of multiple objectives into the mathematical optimization process and was therefore the basis of the menu planning model. The GP methodology is based on an attempt to achieve each objective in a preemptive fashion. Prioritizing the goals implies that one is preferred to another, which is preferred to another, etc., while preemptive



prioritization implies that one is preemptively, or infinitely, preferred to another.

b. Menu attributes. The relative worth of menus is measured in terms of attributes for food cost, labor cost, acceptability, and nutritional content. The study methodology incorporates a procedure for assessing the worth of menus in terms of these four attributes. The procedure involves the determination of the menu attributes based on appropriate linear combinations of the attributes for those recipes comprising each menu. This procedure allows for the consistent analytical determination of menu attributes which are subsequently used as inputs to the GP algorithm.

6. Results. The study resulted in the design of a comprehensive menu planning tool. The ability to reorder priorities and rapidly rerun the model has made the identification of resource tradeoffs a simple process. The menu planner is able to interface with the model at several points in the menu planning process. As a result, changes to recipe attributes, composition of menus, order of priorities, and goals may be made quickly and easily. The effect of these changes may be assessed within the context of a series of solution reports.

7. Conclusions. The emphasis in model design was on flexibility, ease of operation, accuracy and reliability. The concept of integrating the model into the existing system was considered so that the menu planners would find the model useful for maintenance of data, assessment of the relative worth of menus, and development of complete menu plans. A concern with making the model as user friendly as possible has resulted in a model that the menu planners should feel comfortable operating on a daily basis.

8. Recommendations. The use of this highly flexible menu planning tool should be incorporated into the menu planning process at the US Army Troop Support Agency (TSA), Fort Lee, VA.

9. Implementation. As part of the study effort, the model was placed into operation with sample data files on the computer system available to TSA. Coordination with the study sponsor has resulted in the development of a plan for the validation and implementation of the menu planning model. A comprehensive user's guide and programmer's reference manual has been developed in order to assist in this process.

10. DTIC Accession Number.

ADA122635



STUDY E

1. Study Title. HAWK Training Subsystem Effectiveness Analysis

2. Sponsoring Organization and Point of Contact.

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Fort Bliss, Texas 79916

LTC Bruce Drees

3. Performing Organization and Principal Authors.

US Army TRADOC Systems Analysis Activity  
White Sands Missile Range, New Mexico 88002

Mr. Alan D. Hansen  
Mr. Abel A. Vargas

4. Problem. The study was undertaken to assess the status of HAWK crew training and its impact on system performance.

5. Approach. A total of 1815 test subjects were evaluated during this study. Subjects tested at the US Army Air Defense School (USAADS) included trainees at the completion of either One Station Unit Training or Officer's Basic Course. The remainder were in field units and included crewmembers, mechanics, systems technicians, and officers in 11 HAWK batteries in United States Army Europe (USAREUR), 14 batteries in Forces Command (FORSCOM), and three United States Marine Corps (USMC) batteries under the Commander-in-Chief Pacific Fleet (CINCPACFLT). The Military Occupational Specialty (MOS) 160 Missile Crewmembers, and the 16E Fire Control Crewmembers were tested with hands-on, written skills, and knowledge tests to determine operator proficiency in selected critical tasks. The 24C Firing Section Mechanics, 24E Fire Control Mechanics, and 24G Information Central Mechanics were also tested to determine their proficiency as maintainers of the system. All written and hands-on tests were at Skill Level I. The same tests were administered to soldiers in both USAADS and the units. Written and hands-on tests covered each major end-item for which each MOS was responsible. Demographic information was also gathered for each MOS. Data were analyzed with respect to proficiency, demographic characteristics, and major area of assignment (USAADS, Continental United States (CONUS), outside Continental United States (OCONUS), and USMC).

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6. Results. Seven different MOSSs were evaluated. The study report contains the results and analysis of written skills, knowledge, and hands-on tests in the seven MOSSs.

7. Conclusions. There are two overriding conclusions of the HAWK Training Subsystem Effectiveness Analysis. First, there are problems in the training subsystem and training environment which manifest themselves as a proficiency decay among soldiers in HAWK units. Second, units are able to adequately train only a small percentage of MOS 16-series personnel. Therefore, a unit's capability to conduct effective combat operations is directly related to the attrition and endurance of its few proficient personnel.

8. Recommendations. The analysis team developed a broad range of specific recommendations. Generally, they recommended appropriate increases in certain institutional MOS-producing courses; review of training aids, training facilities, vehicle and personnel requirements at unit level; standardization of readiness evaluation criteria; and, command emphasis on apportionment of training resources (particularly time) and priorities. Application of these recommendations will produce a broad proficiency base in HAWK units which will enhance their effectiveness and capability to sustain combat operations.

9. Implementation. Commands responsible for implementing the results are:

- a. US Army Air Defense School
- b. 32D Army Air Defense Command (USAREUR)
- c. US Army Forces Command
- d. US Marine Corps

The study was briefed to all HAWK battalions and commands worldwide. The recommendations are in the process of being implemented.

10. DTIC Accession Numbers.

ADB954473L Volume I  
ADB954474L Volume II  
ADB954475L Volume III



STUDY F

1. Study Title. Unit Replacement System Analysis -  
Extension (URSA II)

2. Sponsoring Organization and Point of Contact.

Office of the Deputy Chief of Staff for Personnel  
Human Resources Development Directorate  
Manning Task Force (DAPE-ZXB)  
Washington, DC 20310

MAJ David Tye

3. Performing Organization and Principal Author.

US Army Concepts Analysis Agency  
8120 Woodmont Avenue  
Bethesda, Maryland 20814

MAJ Charles B. Torres

4. Problem. The study was conducted to assess several unit rotation plans in terms of benefit resource impact and affect on individual soldiers.

5. Approach. The study examined each alternative rotation plan as it would operate in a steady state condition. Deterministic models were developed to assess the manpower increases required for each alternative and a stochastic simulation was used to ascertain the impact of unit rotation policies on individual soldiers.

6. Results. Results of the study include impacts on unit manning and end-strength, increases in stability, and impact on individuals in areas such as promotion, Continental United States turn-around time, and assignment patterns.

7. Conclusions. The study concluded that all proposed unit rotation alternatives were feasible and that no proposed alternative would have an adverse affect on individuals. It also pointed out that all proposed rotation alternatives would require an increase in unit manning and overall end-strength, with a concomitant increase in payroll cost.

8. Recommendations. The study made no direct recommendations; however, suggestions were informally offered to the



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sponsoring organization and inferences were derived from study results.

9. Implementation. The feasibility of the current implementation of Project COHORT was affirmed by this study.

10. DTIC Accession Number. Not yet received.



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