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TITLE: THE APPLICATION OF COMPUTERS TO LEARNING IN THE COMMAND AND GENERAL STAFF COLLEGE - A FRONT END ANALYSIS: CGSC ANALYSIS (TASK A)

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THE APPLICATION OF COMPUTERS TO LEARNING IN THE COMMAND AND GENERAL STAFF COLLEGE- A FRONT END ANALYSIS STUDY: CGSC ANALYSIS (TASK A)

ABSTRACT

The U.S. Army Command and General Staff College (CGSC) is organized in five schools, one of which, Command and General Staff School (CGSS), is not formally established. These schools provide instruction to officers, noncommissioned officers, and civilians through 4 primary courses and approximately 20 shorter courses. The primary courses are CAS^3 (Combined Arms and Services Staff School) Phase I Nonresident Course, CAS^3 Phase II Resident Course, CGSOC (Command and General Staff Officers Course), and SAMS (School of Advanced Military Studies). The shorter courses are primarily provided through SPD (School for Professional Development). Task A analyzed the curricula of the primary courses in terms of organization and cognitive level with the goal of providing the project team sufficient understanding of the College to seriously address the issue of the application of computers to learning in Task G.

PREFACE

This report concerns one of the Army's most important institutions, the United States Army Command and General Staff College (CGSC), which is the font of tactical and operational knowledge for Army forces. This knowledge is a major force multiplier that holds potential enemies at bay, enhances deterrence, and thus moves us closer to a lasting peace.

The CGSC is a very complex organization that is undergoing major change brought about by computer technology. Further, the pace and scope of the change is faster and broader than in the past. The Army, educational technology, computer technology, and tactical doctrine are changing concurrently. CGSC must not only keep up but must also assist in the process because the College is an instrument of change for the Army. CGSC is the leader of the other Training and Doctrine Command (TRADOC) schools and centers, which directly affect almost every field grade officer in the Army. Finally, the College prescribes how the Army will fight and how its staffs will function.

This view of the CGSC was held by the Los Alamos project team and suggests that the actions to be initiated, based upon this report, are far reaching because they will influence the quality of our Army in the years to come. In this spirit, the study was conducted.

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THE APPLICATION OF COMPUTERS TO LEARNING IN THE COMMAND AND GENERAL STAFF COLLEGE- A FRONT END ANALYSIS STUDY:
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INTRODUCTION

The motivation for completing this task was to gather data on and analyze the U.S. Army Command and General Staff College (CGSC) in sufficient detail to promote informed judgments concerning the application of computers to learning (ACL) in the various curricula of the College. This task provided a basic understanding of the curricula of the College and analyzed the curricula in terms that were helpful to the project team. The project team used the materials provided by the College and also used personal interactions with faculty, staff, and students as a basis for preparing the analysis in this task.

The primary objective of this project was to provide the College a basis for integrating computers into College offices and curricula. Although the initial examination of computer usage in the curricula was undertaken in this task, the detailed ACL is presented in Task G. Task A provided the necessary background of the College to adequately recommend the application of computers to the College curricula that is provided in detail in Task G.

TASK DESCRIPTION

Goal

The goal of Task A is to analyze the CGSC curricula in terms of organizational structure, cognitive levels, and computer usage. This analysis will contribute to the Front End Analysis study of determining where computers can best be used within the College curricula by providing baseline data on the College.

Hypotheses

To facilitate and guide a sufficient understanding of CGSC, its curricula, and computer usage and to support valid conclusions and recommendations, a set of working hypotheses was created concerning the use of computers in the curricula at CGSC. The hypotheses were created in an iterative fashion, with new ideas being added and less useful ideas being discarded. The set that survived is stated below:

Hypothesis A-1. As CGSC school course levels progress from CAS^3 (Combined Arms and Services Staff School) Phase I Nonresident Course, to CAS^3 Phase II Resident Course, to CGSOC (Command and General Staff Officers Course), to SAMS (School of Advanced Military Studies), the overall cognitive skill level of the course being taught increases.

Hypothesis A-2. The cognitive level of the subcourses within each course at CGSC increases as one progresses from the beginning to the end of the course.

Hypothesis A-3. For each of the schools at CGSC, the cognitive level taught increases as the subcourse increases in importance, where importance is measured in number of hours.

Hypothesis A-4. Computers are not currently being used heavily at CGSC.

Hypothesis A-5. Potential exists for the integration of computers into the curricula of the CAS^3 Phase I Nonresident Course, CAS^3 Phase II Resident Course, CGSOC core curriculum, CGSOC electives, and SAMS courses.

Relationship of Task A to the Total Project

The completion of Task A was the initial step in the Front End Analysis of the curricula at CGSC. Gathering the CGSC curricula data and analyzing that data in terms of the cognitive levels employed and the use of computers in the CGSC facilitated the comparison of the knowledge, skills, and abilities (KSA) needed for command and staff tasks with the curricula of the schools of CGSC (Task F). Understanding the curricula of the schools of CGSC provided insight into the functional requirements for computers in the College and into identification

of possible future uses of computers in the curricula (Task G). This insight into the CGSC curricula and into current computer usage was a necessary prerequisite to providing meaningful recommendations for enhancing the College's ability to improve its educational functions.

Assumptions

We assumed that the data provided to us from CGSC were current and valid and that discussions with faculty, staff, and students provided information that was representative of the sentiments of these groups. For the purpose of analyzing the intraschool cognitive level trends for the CAS^3 Phase I Nonresident Course, the CAS^3 Phase II Resident Course, the CGSOC core curriculum, and the SAMS course, we assumed that the progression of these courses increases as the subcourse number increases.

METHODOLOGY

Data Sources

Preliminary telephone conversations with faculty and staff members at CGSC established the Department of Automated Command and Training Systems (DACTS) as the point of contact (POC) to support our collection efforts. DACTS helped us set up a number of visits to CGSC, which facilitated the collection of pertinent data and documentation that were essential to this study. The principal information sources that were identified and used in the subsequent analysis are listed in Appendix A.1.

The Database

To effectively use the data on learning objectives that were gathered from the College, a database was established using a database management system called REFLEX. This database allows a person to handle a collection of information in electronic form so that he can rearrange the order of items or search for a single piece of information. REFLEX tracks records in which the information is entered. Each record consists of a series of fields, identified with a "field name," and contains a particular item of information. A sample of one of the records that was used for this project follows:

P651 **Subcourse:** BATTLE ANALYSIS
Learning Objective: A02
Number of Hours: 24
Training Methods: 2C, 15S, 7PE1
Lessons: 01 02 03 04 05 06 07
Test Method: ORAL PRESENTATION
Cognitive Level: ANALYSIS
Task: PRESENT AN INFORMATION PAPER SUMMARIZING AN ORAL BRIEFING OF AN HISTORICAL MILITARY OPERATION

The field names are defined as follows:

The first number, P651, is the number assigned to that particular subcourse.

Subcourse refers to the title of the subcourse that is being taught. Entries should not be confused with the courses offered in the College. These entries are the next lower level of detail below course and are assigned a letter and number designator by the College.

Learning Objective is the number assigned to a particular task in a subcourse. Terminal objectives always end with 00, while enabling objectives end with nonzero numbers.

Number of Hours is the portion of the subcourse devoted to teaching a particular terminal objective in the classroom.

Training Methods refers to the way the subcourse is taught. There are several training methods that are used by the school. We used the following College-assigned codes:

C	=	Conference
D	=	Demonstration
F	=	Film
S	=	Seminar
TV	=	Television
PE1	=	Hardware-oriented exercise
PE2	=	Nonhardware-oriented exercise
PE3	=	Classroom-oriented exercise
SIM	=	Simulation
GS	=	Guest Speaker
E1, E2, or, E3	=	Formal examination
SP	=	Self-paced exam
NC	=	Noncontact (correspondence)

Lessons refers to the number assigned by the College to the lessons in the particular subcourse in the current record.

Test Method refers to how testing is administered for the lesson in the current record.

Cognitive Level refers to the level at which the lesson is being taught. CGSC instructors, using the CGSC Author's Handbook (1983), structure the curricula by learning objectives, each of which is taught at a particular cognitive level. This taxonomy of cognitive levels was first defined by Bloom (1956). He described the six levels to which information that can be taught is learned. The six cognitive levels follow:

> **Knowledge:** Knowledge is defined as the recalling of previously learned material and may involve the recall of a wide range of material from specific facts to complete theories, but all that is required is the recall of the appropriate information. Knowledge represents the lowest level of learning outcomes in the cognitive domain. Examples of instructional objectives at the knowledge level include knowing common terms, specific facts, methods and procedures, basic concepts, and principles.
>
> **Comprehension:** Comprehension is defined as the ability to grasp the meaning of material and may be shown by translating material from one form to another (words to numbers), by interpreting material (explaining or summarizing), and by estimating future trends (predicting consequences of effects). These learning outcomes go one step beyond the simple recall of material and represent the lowest level of understanding. Examples of instructional objectives at the comprehension level include understanding facts and principles, interpreting verbal material, interpreting charts and graphs, translating verbal material to mathematical formulas, and estimating future consequences implied in data.

Application: Application refers to the ability to use learned material in new and concrete situations and may include the application of such things as rules, methods, concepts, principles, laws, and theories. Learning outcomes in this area require a higher level of understanding than those under comprehension. Examples of instructional objectives for the application level include applying concepts and principles to new situations, applying laws and theories to practical situations, and demonstrating correct usage of a method or procedure.

Analysis: Analysis refers to the ability to break down material into its component parts so that its organizational structure may be understood and may include the identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved. Learning outcomes here represent a higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material. Examples of instructional objectives at the analysis level include recognizing unstated assumptions and logical fallacies in reasoning, distinguishing between facts and inferences, and evaluating the relevance of data.

Synthesis: Synthesis refers to the ability to put parts together to form a new whole and may involve the production of a unique communication (theme or speech), a plan of operations (research proposal), or a set of abstract relationship (scheme for classifying information). Learning outcomes in this area stress creative behaviors with major emphasis on the formulation of new patterns or structures. Examples of instructional objectives at the synthesis level include writing a creative story, proposing a plan for an experiment, and integrating learning from different areas into a plan for solving a problem.

Evaluation: Evaluation is concerned with the ability to judge the value of material (statement, novel, poem, research report) for a given purpose. The judgments are to be based on definite criteria, which may be internal (organization) or external criteria (relevance to the purpose). The student may determine the criteria or be given them. Learning outcomes in this area are highest in the cognitive hierarchy because they contain elements of all of the other defined criteria. Examples of instructional objectives at the evaluation level include judging the logical consistency of written material, judging the adequacy with which conclusions are supported by data, judging the value of a work by use of internal criteria, and judging the value of a work by use of external standards of excellence.

Task shows the particular terminal or enabling objective of the lesson that is being used in the current record.

All of the information for the database was taken directly from the POI (Program of Instruction) and other documentation that were made available to us. A separate database, which is illustrated in Appendix A.2, was created for each of the following courses: CAS^3 Phase I Nonresident Course, CAS^3 Phase II Resident Course, CGSOC core curriculum. CGSOC electives, and SAMS course.

An initial internal analysis was conducted by the project team to determine computer opportunities within each school. Its aim was to compile a realistic interpretation of where computers would be useful in the curricula. A sample of this analysis can be seen in Appendix A.2.

RESULTS

Naturalistic Observations

Naturalistic observations of faculty, staff, and students are documented in Appendix A.3. These observations took the form of discussions and interviews with various individuals at the College. Los Alamos project team members identified themselves, and the reason for the discussion was stated in each case. The observations were captured in the form of point papers identifying the individual, his position, and, as much as possible, statements that were made. A number of recurring themes concerning computer usage at CGSC were noted and listed below:

- Future computers used in the education process must be user friendly because there is not sufficient time within the curricula for the students and faculty to learn how to use the computers.
- Simulation or wargame usage at the College must be compatible with or ideally identical to what is used in the field army.
- The faculty must be well educated in the use of the computer system that is being used at the College.
- A breakdown exists between the field's perceived needs in officer education and the the College's perception of officer education needs.
- A large shortfall exists between what simulations in the classroom can provide and what they ought to provide to make them useful for education. There is no adequate simulation in use at the College today.
- When using simulations in the classroom, the important issue is not exact duplication of the supposed battlefield facts but growth of the ability of the student to develop good military judgment.
- A need exists for a common hardware and software set for use at the College. Much frustration exists in using computers because of the lack of compatibility among the offices and organizations at the College.
- Computer literacy at the College is very low.

School Organizational Analysis

Figures 1 through 4 show the hierarchical task analysis for each of the four schools examined. The learning hierarchy produced by a learning task analysis displays a pattern of progressively more difficult intellectual skills. These skills are enabling objectives for a given target objective (which is also an intellectual skill) (Gagne and Briggs, 1974).

The organization of CAS^3 Phase I Nonresident Course is displayed in Fig. 1. The arrows indicate which lessons are prerequisites to other lessons. For example, Quantitative Skills should be taken before Budget but not necessarily before Historical division of Staff. For CAS^3 Phase I, which is a Nonresident Course, the catalog states that the lessons may be taken in any order that the student desires. This chart is not designed to tell the student what order in which to study the lessons but only to serve as an indication of internal organization. The lessons are logically related by subject matter; and, therefore, the chart is useful from a curriculum viewpoint.

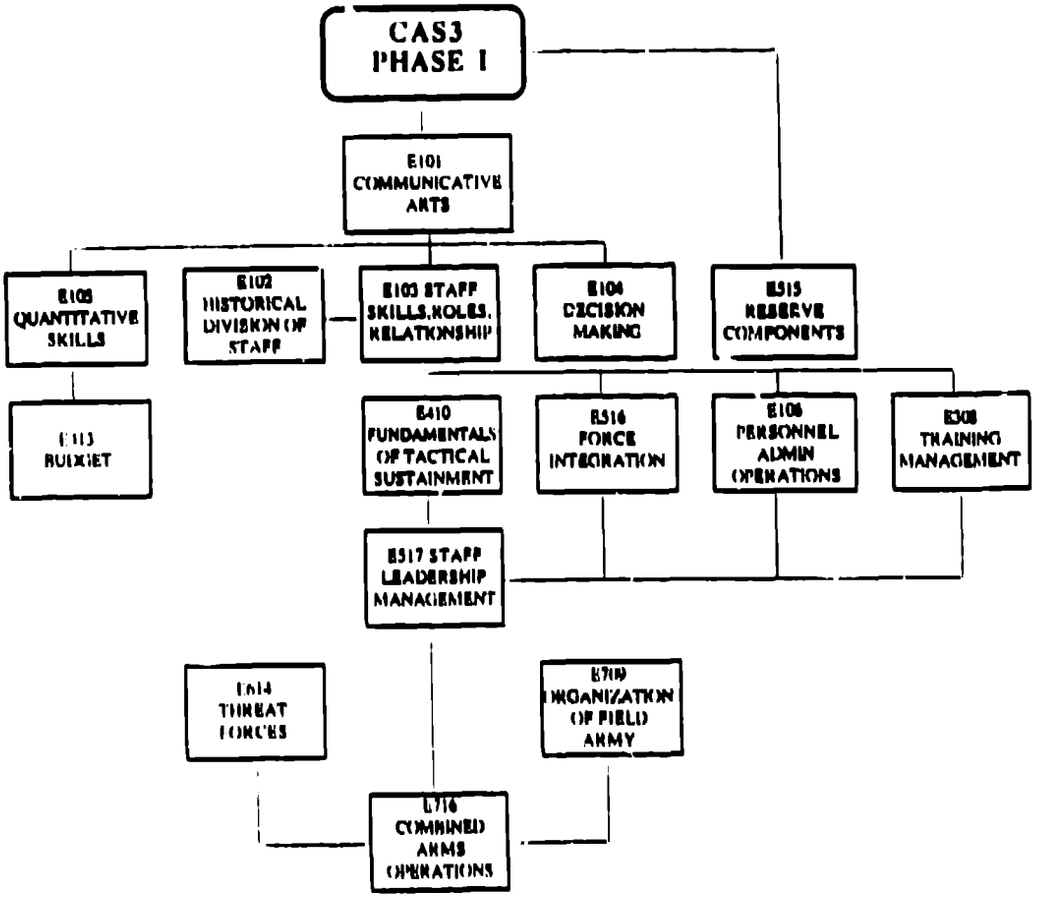

Fig. 1. Organization of CAS3 Phase I subcourses.

The organizational chart of CAS^3 Phase II Resident Course is displayed in Fig. 2 and indicates the CAS^3 resident lessons that are taught at the College. This curriculum is divided into six subcourses, which include staff techniques followed by realistic staff problems in training, planning, logistics, budgeting, mobilization, and deployment for combat and a European exercise.

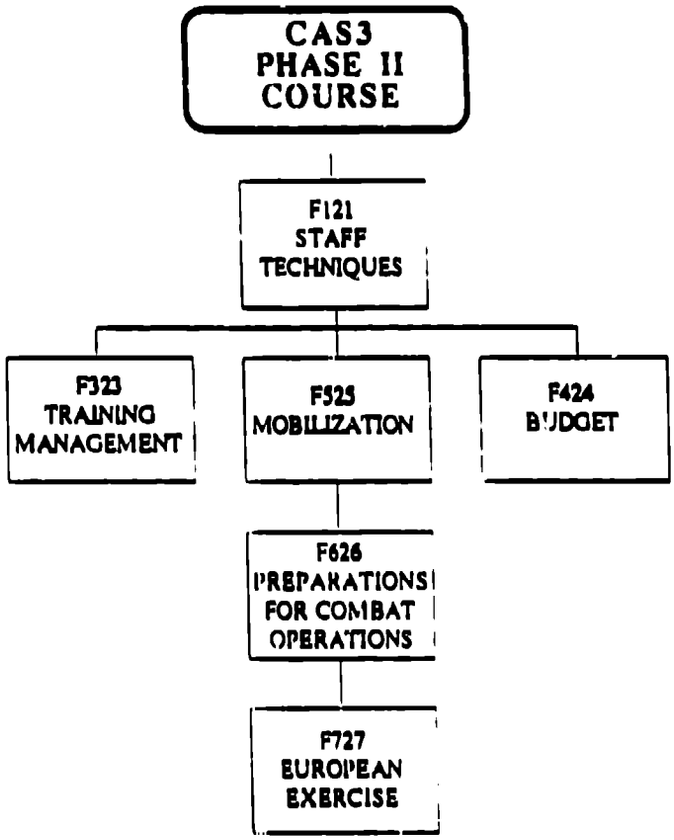

Fig. 2. Organization of CAS3 Phase II course.

Figure 3 is the organizational chart for the CGSOC core curriculum. This chart represents the resident and Nonresident Course curricula. The core curriculum is divided into five sections: Combat Studies, Army Tactics, Sustainment, Joint and Combined Operations, and Army Leadership.

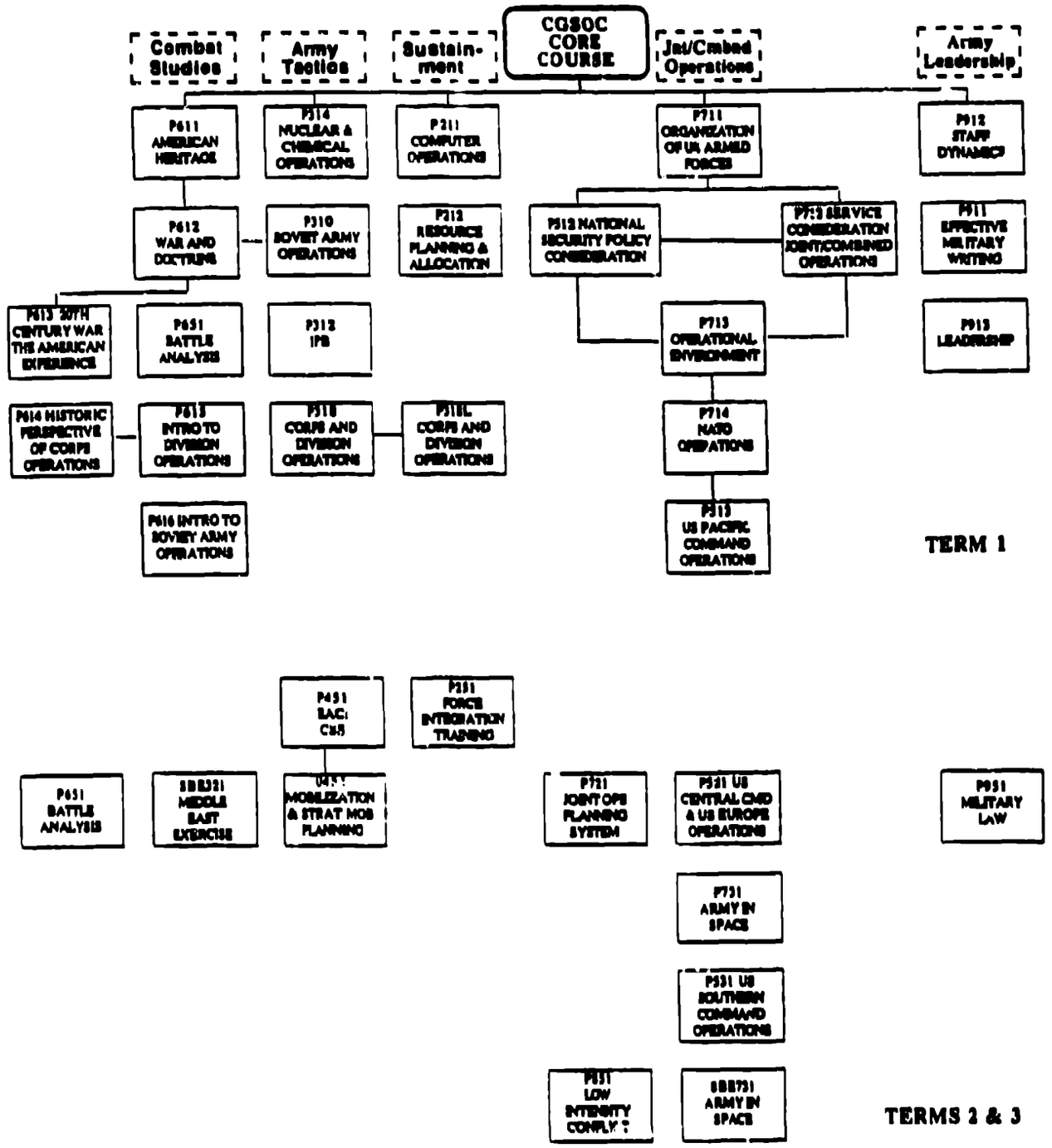

Fig. 3. Organization of CGSOC core course.

SAMS organization is displayed in Fig. 4. The SAMS curriculum consists of seven sequential sections, which allow students to develop a pattern of thought and a base of evidence requisite to refining their tactical and operational judgment.

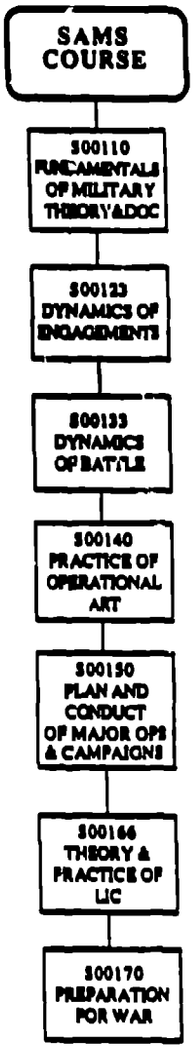

Fig. 4. Organization of SAMS course.

Interschool Cognitive Level Changes

Hypothesis A-1 states that as a CGSC course level progresses, the overall skill level being taught by the course increases. To test this hypothesis, we analyzed the cognitive levels of the terminal objectives taught in CAS^3 Phase I Nonresident Course, CAS^3 Phase II Resident Course, CGSOC core curriculum, CGSOC electives, and SAMS. Two weighting schemes were initially used to aid in the analysis. These schemes are shown in Table I and labeled "actual values" and "weighted values."

TABLE I. Weighting Values for Cognitive Levels

Cognitive Level	Actual Values	Weighting Values
Knowledge	1	1
Comprehension	2	2
Application	3	4
Analysis	4	8
Synthesis	5	16
Evaluation	6	32

Figure 5 illustrates that either weighting scheme gives approximately the same shaped histogram of average cognitive level versus CGSC course. We chose to use the "weighted value" scheme because the complexity of course material approximately doubles as one increases from one cognitive level to the next. Figure 5 shows that as the CGSC course level increases, the cognitive level monotonically increases. Hypothesis A-1 is accepted.

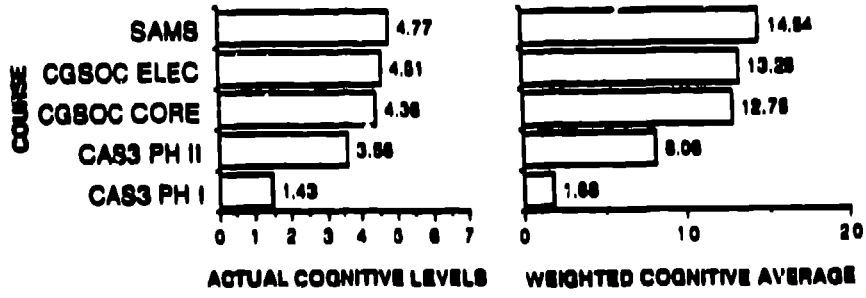

Fig. 5. Actual and weighted cognitive levels for CGSC courses.

Intraschool Cognitive Level Trends

Hypothesis A-2 states that as each of the CGSC courses progresses, the cognitive level of each subcourse increases. This issue must be discussed separately for each course of the CGSC. The courses examined were CAS^3 Phase I Nonresident Course, CAS^3 Phase II Resident Course, CGSOC core curriculum, and SAMS. As stated in the section entitled Assumptions, the assumption was made that progress in the course was indicated by an increase in the subcourse number. That fact was true for all the courses except those in the CGSOC core curriculum. In the CGSOC case, we found that there were four distinct subcourse orderings, one for each academic division. However, by examining the College catalog, we found that the preferred sequence of the subcourses is that of the numerical order of the subcourses. That order was used in this analysis.

TABLE II. Weighted Cognitive Levels for CGSC Courses

	Terminal Objective						Weighted
Course	K	C	A	AN	S	E	Cognitive Level
CAS^3 Phase I	47	1	11	1	0	0	1.68
CAS^3 Phase II	2	2	15	2	11	0	8.06
CGSOC Core	10	34	25	21	32	21	12.75
CGSOC Electives	1	6	12	13	82	2	13.28
SAMS	0	1	0	3	22	0	14.54

To perform this analysis, a table of data showing the weighted cognitive levels of the subcourses for each course and a plot of that data for the subcourses of each course were prepared. Table III and Fig. 6 show results of the weighted cognitive levels for the subcourses of CAS^3 Phase I Nonresident Course.

TABLE III. Weighted Cognitive Levels for CAS[3] Phase I

Subcourse	Terminal Objective K	C	A	AN	S	E	Weighted Cognitive Level
E101	0	0	3	0	0	0	4.00
E102	3	0	0	0	0	0	1.00
E103	3	0	0	0	0	0	1.00
E104	4	0	1	0	0	0	1.60
E105	0	0	5	0	0	0	4.00
E106	1	0	0	0	0	0	1.00
E308	6	0	0	0	0	0	1.00
E410	10	0	0	0	0	0	1.00
E413	0	0	1	0	0	0	4.00
E515	2	0	0	0	0	0	1.00
E516	3	1	0	1	0	0	2.60
E517	0	0	1	0	0	0	4.00
E614	3	0	0	0	0	0	1.00
E709	8	0	0	0	0	0	1.00
E716	4	0	0	0	0	0	1.00

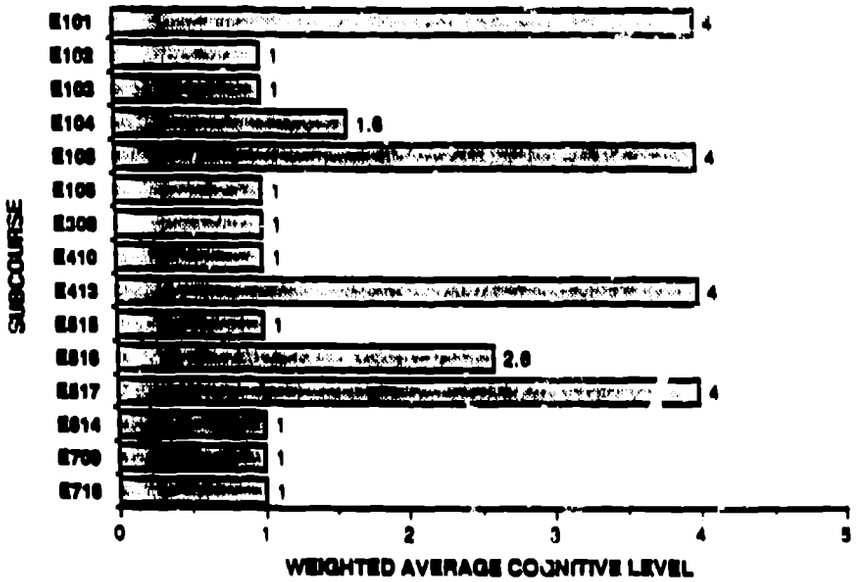

Fig. 6. Weighted average cognitive levels for subcourses of CAS3 Phase I Nonresident Course.

We see that there is no apparent relationship between the weighted cognitive levels of the subcourse and their sequence in the CAS^3 Nonresident Course. Table IV and Fig. 7 show the weighted cognitive levels for the subcourses of CAS^3 Phase II Resident Course. One could argue from Table IV that for CAS^3 Phase II Resident Course that there is an increase in weighted cognitive level as the course progresses because the lowest weighted cognitive level corresponds to the first subcourse (F121) and the highest weighted cognitive level corresponds to the last subcourse (F727). However, in the intermediate subcourses, the weighted cognitive levels vary in no systematic manner.

Therefore, there is no apparent relationship between the weighted cognitive levels of the subcourses and their sequence in the resident CAS^3 course.

TABLE IV. Weighted C[illegible] Levels for CAS^3 Phase II

	Terminal Objective						Weighted
Subcourse	K	C	A	AN	S	E	Cognitive Level
F121	0	0	3	0	0	0	4.00
F323	0	1	1	0	3	0	10.80
F424	0	0	1	1	0	0	6.00
F525	0	1	2	0	2	0	8.40
F626	2	0	8	1	5	0	7.63
F727	0	0	0	0	1	0	16.00

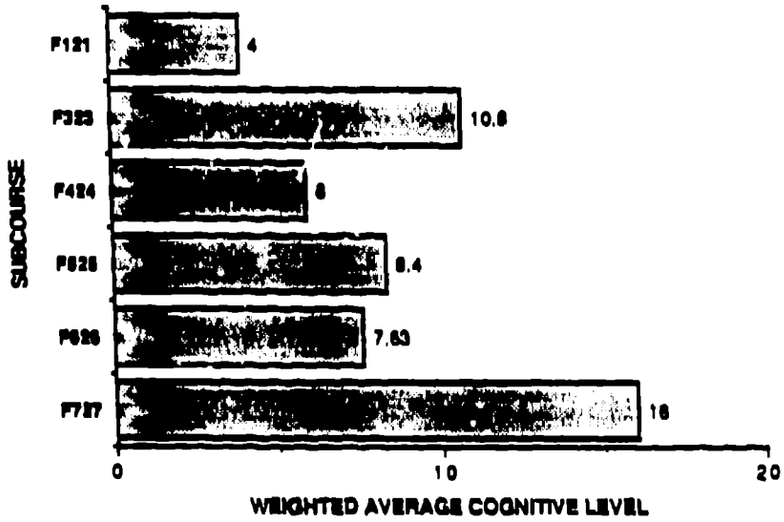

Fig. 7. Weighted average cognitive levels for CAS3 Phase II Resident Course.

Table V shows the weighted cognitive levels of the subcourses of CGSOC core curriculum. The lowest weighted cognitive level subcourses seem to be randomly distributed throughout the course. The academic disciplines were arranged according to the order in which they were taught. Fig. 8 displays the results. No relationship can be seen between increasing weighted cognitive levels and progression in the course.

TABLE V. Weighted Cognitive Level for CGSOC Core Curriculum

	Terminal Objective						Weighted
Subcourse	K	C	A	AN	S	E	Cognitive Level
P211	0	0	2	0	0	0	4.00
P212	2	5	10	1	0	1	4.84
P251	0	0	2	1	3	0	10.67
P310	1	4	0	0	0	0	1.80
P314	0	0	2	3	5	0	11.20
P318	2	5	3	2	14	4	13.07
P331	0	3	0	1	0	0	3.50
P451	0	0	0	1	3	5	24.00
P455	1	2	2	1	2	0	6.63
P512	0	2	0	1	0	6	22.67
P513	1	0	0	1	0	3	21.00
P551	0	1	0	1	0	0	96.00
P611	1	0	0	0	0	0	1.00
P612	0	0	0	2	1	0	10.67
P613	0	0	0	1	1	1	18.67
P614	0	0	0	1	0	0	8.00
P615	0	0	0	1	0	0	8.00
P616	0	0	0	1	0	0	8.00
P651	0	0	0	1	0	0	8.00
P711	0	3	0	0	0	0	2.00
P712	2	4	0	0	0	0	1.67
P851	0	0	0	2	1	0	16.00
P911	0	0	1	0	0	0	4.00
P912	0	0	1	0	0	0	4.00
P913	0	0	2	0	0	0	4.00
P951	0	4	0	0	0	0	2.00

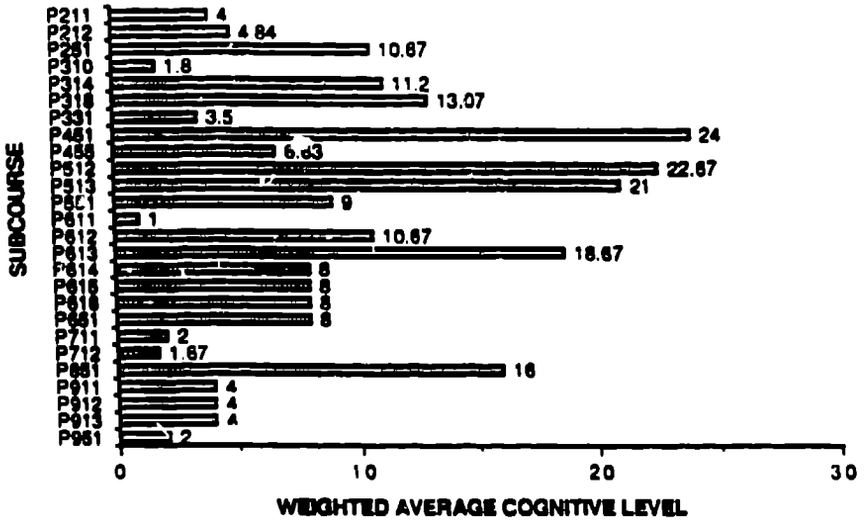

Fig. 8. Weighted average cognitive levels for CGSOC core curriculum.

An additional analysis was performed for CGSOC core curriculum subcourses as shown in Table VI and Fig. 9. These subcourses were grouped according to the academic disciplines (Management, Tactics, Combat Services Support, Strategic Studies, Applied Military History, Theatre Operations and Planning, Low Intensity Conflict, and Leadership and Profession of Arms) defined by the CGSC Catalog.

TABLE VI. CGSOC Core Curriculum Terminal Objectives Group Discipline

Discipline	Terminal Objective K	C	A	AN	S	E	Weighted Cognitive Level
Management (P2xx)	2	5	14	2	3	1	6.17
Tactics (P3xx)	3	12	5	6	19	4	10.76
Combat Services Support (P4xx)	1	2	2	2	5	5	15.82
Strategic Studies (P5xx)	1	3	0	2	3	9	19.94
Applied Military History (P6xx)	1	0	0	6	3	1	11.73
Theatre Operations and Planning (P7xx)	2	8	0	0	0	0	1.80
Low Intensity Conflict (P8xx)	0	0	0	2	0	1	16.00
Leadership and Profession of Arms (P9xx)	0	4	4	0	0	0	3.00

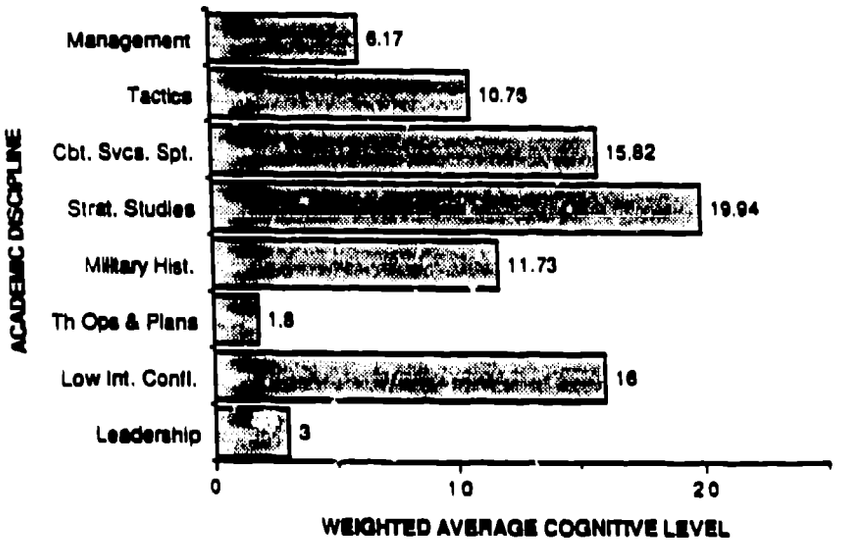

Fig. 9. Weighted average cognitive levels for academic disciplines for CGSOC core curriculum.

Table VII and Fig. 10 shows the weighted cognitive levels of the subcourses for SAMS. The four lowest weighted cognitive level subcourses are in the first five subcourses, and all subsequent subcourses have the same weighted cognitive level of 16. Therefore, for SAMS, weighted cognitive level seems to increase as the course progresses. Because the last 21 subcourses all have the same weighted cognitive level (16), a more accurate observation is that the weighted cognitive level of SAMS is nearly constant.

TABLE VII. Weighted Cognitive Levels for SAMS Subcourses

	Terminal Objective						Weighted
Subcourse	K	C	A	AN	S	E	Cognitive Level
S00101	0	1	0	0	0	0	2.00
S00102	0	0	0	1	0	0	8.00
S00110	0	0	0	1	0	0	8.00
S00111	0	0	0	0	1	0	16.00
S00120	0	0	0	1	0	0	8.00
S00121	0	0	0	0	1	0	16.00
S00122	0	0	0	0	1	0	16.00
S00123	0	0	0	0	1	0	16.00
S00124	0	0	0	0	1	0	16.00
S00125	0	0	0	0	1	0	16.00
S00130	0	0	0	0	1	0	16.00
S00131	0	0	0	0	1	0	16.00
S00132	0	0	0	0	1	0	16.00
S00133	0	0	0	0	1	0	16.00
S00140	0	0	0	0	1	0	16.00
S00141	0	0	0	0	1	0	16.00
S00150	0	0	0	0	1	0	16.00
S00151	0	0	0	0	1	0	16.00
S00152	0	0	0	0	1	0	16.00
S00153	0	0	0	0	1	0	16.00
S00154	0	0	0	0	1	0	16.00
S00155	0	0	0	0	1	0	16.00
S00160	0	0	0	0	1	0	16.00
S00161	0	0	0	0	1	0	16.00
S00170	0	0	0	0	1	0	16.00
S00171	0	0	0	0	1	0	16.00

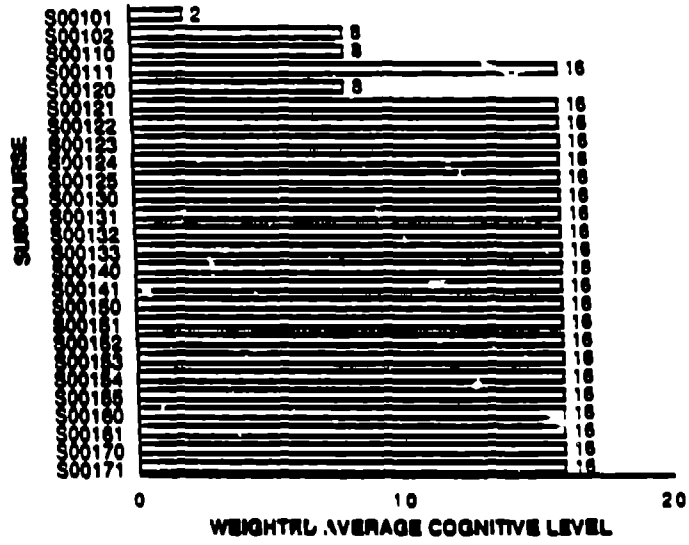

Fig. 10. Weighted average cognitive levels of subcourses for SAMS.

The analysis indicates that none of the courses examined displays a significant relationship between weighted cognitive level and course progression. Therefore, hypothesis A-2 is rejected.

Cognitive Level as a Function of Topic/Lesson Importance

Hypothesis A-3 states that for each of the courses in the CGSC, the cognitive level taught increases as the subcourses increase in importance. The importance of a subcourse is measured by the number of hours in that subcourse. The courses analyzed were CAS^3 Phase I Nonresident Course, CAS^3 Phase II Resident Course, CGSOC core curriculum, and SAMS. The subcourses of each course were ordered according to increasing number of hours of the subcourse. To properly examine hypothesis A-5, each course must be analyzed separately.

Table VIII and Fig. 11 show the weighted cognitive levels and number of hours for the subcourses of CAS^3 Phase I Nonresident Course. The lowest weighted cognitive levels (1) occur for the shortest and longest subcourses as well as for seven other subcourses scattered throughout the course. There is no apparent relationship between weighted cognitive levels and number of hours for CAS^3 Phase I Nonresident Course.

TABLE VIII. Weighted Cognitive Levels Ordered by Number of Subcourse Hours for CAS^3 Phase I Subcourses

Subcourse	Number of Hours	Weighted Cognitive Level
E106	2	1.00
E101	4	4.00
E516	4	2.60
E517	4	4.00
E413	5	4.00
E102	7	1.00
E308	7	1.00
E515	7	1.00
E103	8	1.00
E105	10	4.00
E709	10	1.00
E104	12	1.00
E410	12	1.00
E614	12	1.00
E716	36	1.00

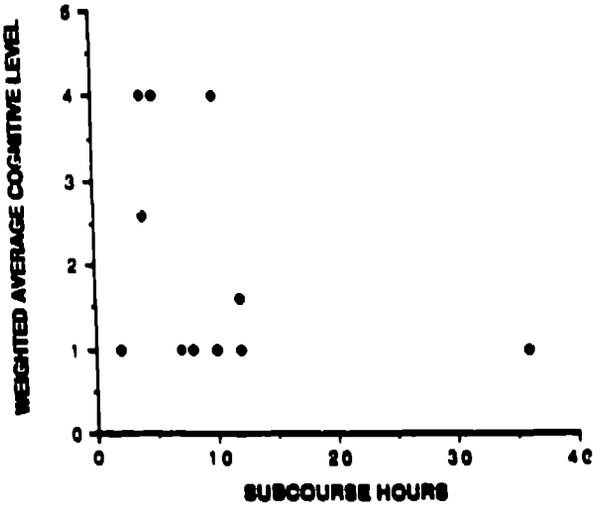

Fig. 11. Weighted average cognitive levels ordered by number of subcourse hours.

Table IX and Fig. 12 show the weighted cognitive level and number of the course for the subcourses of CAS^3 Phase II Resident Course. The longest subcourse has the same weighted cognitive level as the shortest, and the other subcourses show no pattern for weighted cognitive level as a function of subcourse length.

TABLE IX. Weighted Cognitive Levels Ordered by Number of Subcourse Hours for CAS^3 Phase II

Subcourse	Number of Hours	Weighted Cognitive Level
F525	33.5	8.40
F323	36.0	10.80
F424	37.0	6.00
F727	49.0	16.00
F121	57.0	4.00
F626	95.0	7.63

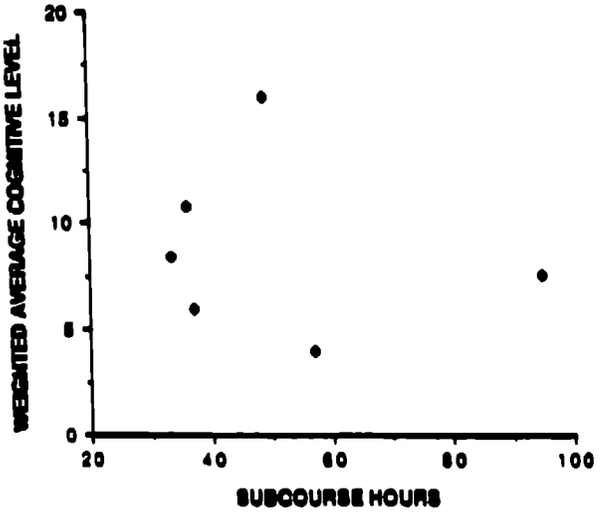

Fig. 12. Weighted average cognitive levels ordered by increasing number of hours for CAS3 Phase II Resident Course.

Table X and Fig. 13 show the weighted cognitive level and number of hours for the subcourses of the CGSOC core curriculum. The longest subcourse (146 hours) has a weighted cognitive level of 13.07, and the shortest subcourse (1 hour) has a weighted cognitive of 8.00. The other subcourses vary widely in their weighted cognitive level and show no apparent relationship between weighted cognitive level and number of subcourse hours.

TABLE X. Weighted Cognitive Levels of Subcourses Ordered by Number of Hours for the CGSOC Core Curriculum

Subcourse	Number of Hours	Weighted Cognitive Level
P615	1	8.00
P331	2	3.50
P611	2	1.00
P614	2	8.00
P616	2	8.00
P612	4	10.67
P711	4	2.00
P211	7	4.00
P531	9	16.00
P551	12	9.00
P911	12	4.00
P951	12	2.00
P451	14	24.00
P913	14	4.00
P912	16	4.00
P314	17	11.20
P455	18	6.63
P513	18	21.00
P721	18	2.00
P512	19	22.67
P310	21	1.80
P251	24	10.67
P651	25	8.00
P613	26	18.67
P712	28	1.67
P851	28	16.00
P212	38	4.84
P318	146	13.07

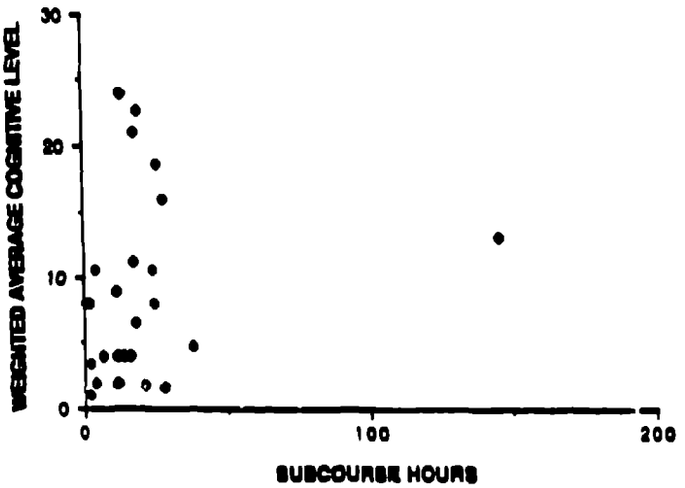

Fig. 13. Weighted average cognitve levels odered by increasing subcourse hours for CGSOC core curriculum.

Table XI and Fig. 14 show an additional analysis for CGSOC core curriculum where the subcourses were grouped according to academic disciplines defined by the CGSC Catalog. The discipline with the most hours (Tactics) shows a weighted cognitive level of 10.76, and the discipline with the least number of hours (low intensity conflict) shows a weighted cognitive level of 16.00. The other disciplines are scattered in no apparent pattern.

TABLE XI. Weighted Cognitive Levels Ordered by Increasing Number of Subcourse Hours for Academic Disciplines for CGSOC

Discipline	Number of Hours	Weighted Cognitive Level
Low Intensity Conflict (P8xx)	28	16.00
Combat Services Support (P4xx)	32	15.82
Theatre Operations and Planning (P7xx)	50	1.80
Leadership and Profession of Arms (P9xx)	54	3.00
Strategic Studies (P5xx)	58	19.94
Applied Military History (P6xx)	[illegible]	11.73
Management (P2xx)	69	6.07
Tactics (P3xx)	186	10.76

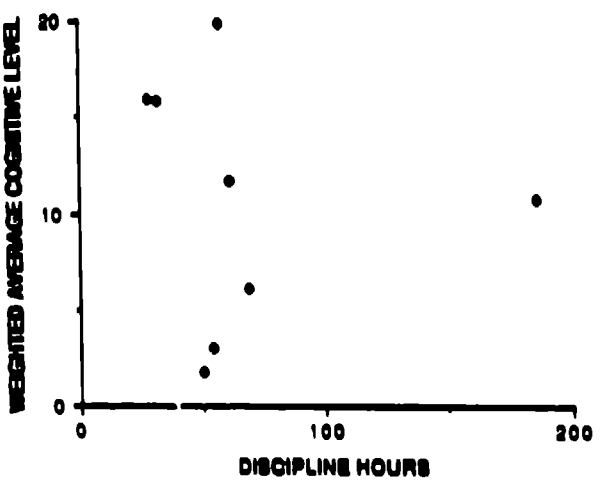

Fig. 14. Weighted average cognitive levels ordered by increasing number of discipline hours for CGSOC core curriculum.

Table XII shows the weighted cognitive level and number of hours for the subcourses of SAMS. The two longest and two shortest subcourses have the same weighted cognitive level (16). The four subcourses that do not have a weighted cognitive level of 16 are scattered throughout the distribution of subcourses. No apparent pattern exists.

The results for CAS^3 Phase, CAS^3 Phase II Resident Course, CGSOC core curriculum, and SAMS show no relationship between the importance of subcourse as measured by its length and the weighted cognitive level of he subcourse. Hypothesis A-3 is rejected.

TABLE XII. Weighted Cognitive Levels Ordered by Increasing Number of Subcourse Hours for SAMS

Subcourse	Number of Hours	Weighted Cognitive Level
S00125	4	16.00
S00122	8	16.00
S00101	16	2.00
S00123	16	16.00
S00120	20	8.00
S00130	28	16.00
S00124	32	16.00
S00170	36	16.00
S00121	40	16.00
S00155	40	16.00
S00131	56	16.00
S00153	56	16.00
S00150	60	16.00
S00154	64	16.00
S00160	68	16.00
S00171	72	16.00
S00152	80	16.00
S00132	88	16.00
S00133	96	16.00
S00140	120	16.00
S00151	120	16.00
S00110	132	8.00
S00161	136	16.00
S00102	180	8.00
S00111	265	16.00
S00141	280	16.00

Current Computer Usage at CGSC

Hypothesis A-4 states that computers are not currently being used heavily in the CGSC. Two sets of data bear on this issue. First, the CGSC POI states requirements for computers for various subcourses throughout the College. Second, naturalistic observations of the faculty, staff, and students indicate the current actual use of computers. Regarding the first set of data, Table XIII displays an abstract of POI showing the College's stated requirements for computers in the various subcourses throughout the College. Note that only 10 nonelective subcourses exist with stated requirements for computers, and only 13 electives have stated computer requirements. Regarding the second set of data, which are documented in Appendix A.3, faculty, staff, and students uniformly agreed that computer usage in all schools of CGSC is minimal. Many explained specific examples of what simulations and usage that computers could have in specific areas of the curricula. Hypothesis A-4 is accepted.

Computer Opportunities in CGSC

Hypothesis A-5 states that potential exists in the curricula of CAS^3 Phase II Resident Course, CGSOC core curricula, and SAMS for the integration of computers. The project team created a set of computer worksheets for these courses that shows its initial judgment concerning how computers might be integrated into the CGSC curricula. These judgments are presented in Appendix A.4. The scales used to measure the amount of usage and the computer opportunities that may exist in these curricula are shown on the first page of that exhibit. Caution must be exercised when viewing this analysis because it was completed prior to the development of the ACL hierarchy that is discussed later in this report and exploited in Task G. Appendix A.4 is included in this task only to illustrate that numerous potential opportunities exist in the curricula for the use of computers. Hypothesis A-5 is accepted.

TABLE XIII. CGSC Stated Needs for Computers in Education

Computer System	POI FILE	Remarks
Hazeltine w/printer	A737	Joint Forces Planning II
CORVUS Network	P211	Computer Operations
	P212	Resource Planning/Allocation
	P256	
	P315	
	P316	
	P721	Joint Contingency Planning
	A234	
	A251	Military Decision Making
	A256	Quantitative Methods in Pers & Log
	A257	High Level Programming (FORTRAN)
	A459	Log Spt of the Battlefield
CDC CYBER 730	P212	Resource Planning/Allocation
	P455	Mobilization
	SBE414	Korea Staff Battle Exercise
	A252	Fundamentals of Info Proc (BASIC)
	A253	High Level Programming (COBOL)
	A254	Information Systems Design
	A257	High Level Programming (FORTRAN)
	A456	Deployment: A Cmdrs Perspective
CDC Mainframe	A751	U.S. Interests in the Pacific
ARGOS w/printer	A727	Joint Forces Planning I
TI 733/785	P211	Computer Operations
EIDS	P831	

DISCUSSION/INTERPRETATION

Data from Task A are very interesting in terms of the implications for the overall recommendations of the study. Direct implications for the final recommendations are as follows:

- Significant opportunities exist for the CGSC to increase its computer usage within all the curricula studied in this project. As Appendices A.2 and A.3 showed us, there is a well-stated need for enhanced computer usage in each course. Some of the implications and the cost effectiveness of implementation will be discussed in Task G of this report. The detailed identification of computer opportunities in the curricula is also included in Task G.

- The weighted average cognitive level of instruction in the schools at the CGSC ranges from 1.68 to 14.54. These levels are not strikingly high, particularly because the faculty and staff have expressed the attitude that CGSC must concentrate on education at the higher cognitive levels and not on training and that the emphasis in the educational environment of the CGSC must be on how to improve the mental processes of graduates instead of just teaching facts. Considerable room for improvement exists. When computers are viewed as learning enhancers in the curricula, significant gains are possible in the cognitive levels of education for the officer corps of the U.S. Army.

CONCLUSIONS

When looking at the original hypotheses for Task A, the data indicate the following:

Hypothesis A-1. As CGSC school course level progress from CAS^3 Phase I Nonresident Course, to CAS^3 Phase II Resident Course, to CGSOC, to SAMS, the overall cognitive skill levels being taught increase.

Conclusion. ACCEPT
The overall cognitive skill levels taught at the CGSC increase as school course level progresses from CAS^3 Phase I Nonresident Course, to CAS^3 Phase II Resident Course, to CGSOC core curricula, to SAMS.

Hypothesis A-2. The cognitive level within each course at CGSC increases as one progresses from the beginning to the end of the course.

Conclusion. REJECT
There is no apparent relationship between the progression of any of the courses examined in CGSC and the cognitive level of the subcourses in the course.

Hypothesis A-3. For each of the schools at CGSC, the cognitive level taught increases as the subcourse increases in importance, where importance is measured in number of hours in the subcourse.

Conclusion. REJECT
When the importance of the subcourses is measured in their number of hours, there is no apparent relationship between their importance and their cognitive level.

Hypothesis A-4. Computers are not currently being used heavily at CGSC.

Conclusion. ACCEPT
There is very little use of computers in the curricula at CGSC.

Hypothesis A-5. Potential exists for the integration of computers into the curricula of the CAS^3 Phase II Resident Course, CGSOC core curricula, CGSOC electives, and SAMS courses.

Conclusion. ACCEPT
Numerous opportunities were identified in these curricula for the integration of computers for learning purposes.

APPENDIX A.1

DATABASE EXAMPLE

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: A02
Number of Hours:
Training Method:
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: USE A SPECIFIED PREPROGRAMMED APPLICATION LIBRARY (PAL) TO SOLVE A PROBLEM

Computer Usage:
Computer Opportunities:

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: A03
Number of Hours:
Training Method:
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: LOGOUT FROM COC COMPUTER SYSTEM

Computer Usage:
Computer Opportunities:

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: A05
Number of Hours:
Training Method:
Test method: NONE
Cognitive level: APPLICATION
Task: LOG OFF THE COC US/COTES MICROCOMPUTER

Computer Usage:
Computer Opportunities:

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: 800
Number of Hours:
Training Method:
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: USE THE CORVUS/COTES MICROCOMPUTER SYSTEM

Computer Usage:
Computer Opportunities:

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: 801
Number of Hours:
Training Method:
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: LOG ON AND INITIALIZE THE CORVUS/COTES MICROCOMPUTER

Computer Usage:
Computer Opportunities:

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: 803
Number of Hours:
Training Method:
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: PRINT A TEXT DOCUMENT

Computer Usage:
Computer Opportunities:

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: B04
Number of Hours:
Training Method:
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: SAVE A DOCUMENT TO THE FLOPPY DISK AND RETRIEVE A DOCUMENT FROM THE FLOPPY DISK USING THE CORVUS/COTES MICROCOMPTERS

Computer Usage:
Computer Opportunities:

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: A00
Number of Hours: 7
Training Method: 4C, 3PE3
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: USE THE CONTROL DATA CORPORATION (CDC) CENTRAL COMPUTER SYSTEM TO EXECUTE A PREPROGRAMMED APPLICATION LIBRARY (PAL) PROGRAM

Computer Usage: 5
Computer Opportunities: 5

P211 Subcourse: COMPUTER OPERATIONS
Learning objective: A01
Number of Hours:
Training Method:
Test method: GO/NO GO
Cognitive level: APPLICATION
Task: LOGIN CDC COMPUTER SYSTEM

Computer Usage:
Computer Opportunities:

APPENDIX A.2

NATURALISTIC OBSERVATIONS

Notes from a Conversation on 16 March 87 at Ft. Leavenworth with a CGSOC Student

"Simulations must play these roles:
- °Force on force
- °Close air support
- °Integration of combined arms
- °Joint coordination
- °Air defense
- °Navy interaction

"Need immediate feedback. It doesn't make sense to build a plan in hours and wait days to see how it plays out.

"Take the system that is used in CGSOC to the field.

"Maybe 4 out of 16 CGSOC students are computer literate.

"Corvus is foreboding and unfriendly.

"Use Zenith 248 for VG production during the simulation.

"There should be an administration portion and a battle drill portion of the simulation.

"To build the simulation, one should make field tactics experts work with the computer experts.

"Simulation must show ALB doctrinal effectiveness of AAH night raids against tanks.

"There is a bottleneck in perception of what is needed to train units or staffs somewhere between the Bars and the Stars. Better communication is required between the highest levels and the lowest in order to effectively use computer simulations."

Notes from a Conversation on 16 March 87 at Ft. Leavenworth with a CGSOC Student

"Must use off-the-shelf simulations because development takes so long.

"JANUS is the answer. Why doesn't the Army buy JANUS and pay Livermore to maintain the program at Leavenworth? This would let CGSOC get a good, rapidly fieldable system.

"Picatinny nearly bought JANUS, but the Army stopped purchase at the last moment.

"TRADOC and the Army should be using the 1,000 students at Leavenworth to develop and validate doctrine while they are learning as students in the course. There are 64 student sections that could easily run 64 different solutions to a TRADOC problem. TRADOC could take the results and sift them for novel ways of fighting. Once in a while, a good idea will come along that

may revolutionize the way we fight. The cost to TRADOC is zero because the student must do these simulations anyway.

"There should be an accepted, independently judged simulation to validate doctrine and material development."

Notes from Conversation on 16 March 87 at Ft. Leavenworth with an Officer Who Was in CTAC and Was an Evaluator and Facilitator for MEEX

"Computer must minimize overhead...no more than 2 hrs. trainup per student. First/Battle BC takes 2 days to trainup.

"At present, computers hinder learning at CGSOC.

"Simulations must be fun, interesting, and challenging.

"Simulations must facilitate experience-based wisdom.

"Simulations must do the following:
- °Make students create a plan, then execute the plan, and then iterate it many times.
- °Staffs must integrate the plan.
- °Staffs must synchronize internally and have a synergistic relationship.
- °Keyed to a map, the terrain is critical. JANUS is excellent for this at corps and division.
- °The students' Intelligence Preparation of the Battlefield (IPB) must be overlaid onto the simulation map.
- °They must show the threat laydown.

"Students now focus on details but in future simulations must focus on the BIG PICTURE.
- °Depict culmination points in the simulation. Where would the plan die?
- °Depict branches and sequels of the plan. They must react to an unknown future.

"Simulations must provide a forum for the discussion of the results. A CPU cannot judge a right or wrong answer.

"Feedback during simulation is important because it keeps up the interest of the student, and mentors can point out obvious show-stoppers.

"Simulations must do the 'Close Battle,' that is, movement to contact, air interdiction, covering forces on the battlefield, defense in sector, defense of a battle position, intelligence reporting, logistics and sustainment, deliberate attack, deep battle, and rear battle.

"Simulations must keep all 16 students busy all the time.

"Simulation must run at real time through light speed.

"Must do a combined attack.

"Menu-driven.

"Critical that it is USER *FRIENDLY* in order not to waste time in trainup."

Notes from a Conversation on 16 March 87 at Ft. Leavenworth with a CTAC Faculty Member Who Administered the MEEX

"The M1 and Bradley combat-to-fire trainers are the best trainers in the Army.

"Because division and corps staffs are each different, simulators must be different for each staff; and these simulations change in time.

"There is a systemic Army problem called the OER system. Each officer who does his job well will get a report card that will end his career. Therefore, each division or corps staff officer must change something during his tour. This results in an Army that pays lip service to the idea of a standard doctrine, but no standardized staff or fighting doctrine exists in the Army. This isn't all bad because the Soviets cannot figure out how we fight either and thus cannot know how to fight us.

"CPU trainers can show students that you cannot get all the assets and supplies from Point A to Point B in a given time.

"Computers cannot teach terrain and weather.

"We must decide what the problems are before we fix anything.

"The field is not responsive to the school and vice versa.

"We must standardize doctrine."

Notes from a Conversation on 17 March 87 at Ft. Leavenworth with a Branch Chief in the Training Simulations System Managers Office

"Must teach CSS training.

"There is no difference between simulations in the field and in the school.

"Must play employment of helicopters.

"Must be a doctrine trainer and play the rules of engagement. But how do you teach rules of engagement?

"It is harder to use simulations to teach training points at CGSC than in the field.

"The principles of staff action are the same for people in the field and for those in the schools, so use the same simulations.

"Staff trainers are probably used more in the school than in the field.

"Training simulations have to be scenario-independent.

"Effects of terrain are crucial. All simulations try to incorporate terrain, but some do it better than others.

"Must play engineers in the simulations because commanders don't pay attention to them.

"Must play air defense in the simulations.

"There is a lot of high-level interest in low-intensity conflict and light infantry division tactics, and not much is being done in the simulations area. The rules of engagement change when fighting terrorists because there are not many targets. Also, movement tables are a lot different for units going across swamps, over snow, or on foot as light infantry is supposed to do.

"We plan to buy 500 VAX 8600 and Microvax II systems, and a CRAY purchase is planned.

"ARTBASS is the best simulator ever made!"

Notes from a Conversation on 17 March 87 at Ft. Leavenworth with a CTAC Faculty Member, Who Is Interested in Applying Simulations to the Tactics Portion of CGSC

"TRAC (TRADOC Analysis Center) has already sent or will soon send about two officers to each of the weapons labs.

"Simulations must distinguish between perceived truth of the players and ground truth.

"I see three modes of operation of simulations, all connected together:

- **Local mode** would be played on microcomputers. It would give fairly gross results, be deterministic in nature, and concentrate on combat with some CSS played. Here individual students would participate, and the emphasis is on development of individual experience.
- **Medium-scale mode** would be played on minicomputers. It would be formed into a large (4 to 12) stations for a like number of students to play simultaneously. It would play CSS well, would be faster than the local mode, and would play a sequence of actions that were put into the simulation by the players.
- **Large-scale mode** would be played on large mainframes. It probably would be stochastic in nature and may be run in batch or time sharing mode. Here large data tables would reside that would be called by players working in local or medium modes. As appropriate, portions of the simulation being run in local or medium mode would execute functions on the mainframe that are too large to be run on the micros or minis.

"There are really three battles that must be considered in any simulation or war game. These battles are the FLOT, DEEP, and REAR battles. Essentially, all simulations used today operate at the FLOT only. They calculate FLOT movement, attrition, and the like. However, I think that is only about a cube root of what really must be played. The reason is that what goes on in the rear and deep battles profoundly affects the FLOT. Students must understand this, and the school must insure that they understand this. To meet these learning objectives, simulations must play these three battles.

"I am developing a LOTUS 1-2-3 program that will use the attrition equations of the Quantitative Judgement Model developed by Trevor Depuy at HERO. I've taken the equations out of his book and asked people in places like AMC for their guesses about what the coefficients ought to be. We are trying to make it go now.

"The toughest thing to simulate is the Course of Action Analyzer because it requires feedback to the students that will allow them to evaluate the consequences of their actions.

"The essence of the College is warfighting. The essence of the warfighting is tactics. The essence of tactics is the P318 course. The P318 course in the only tactics course that all the CGSOC students are required to take. That is why it is crucial for the mission of the School that P318 be done well. If you can do simulations well for the P318 course, then you will have done simulations for KOREX, MEEX, AFEX, etc., by default. For this reason it's not essential that any of the exercises by computerized. The real essence of tactics is in P318.

"Using computer-driven simulations in the P318 course presents a scheduling problem. Right now, all class scheduling is done by a 'little old lady' using a stubby pencil. The simultaneous use of 32 or 64 simulations running in all the classrooms isn't possible.

"You must examine whether the cost of developing the software is prohibitive when transferring simulations from one system to a classroom environment.

"Today it takes 30 days to load up all the data needed to run one TACOPS exercise. Useful simulations for the P318 course cannot be that resource-intensive.

"Simulations must be so user friendly that they prompt you for everything

"Corvus and the COTES system are good examples of the wrong people doing the requirements for a CGSOC system. You must involve the teaching faculty and the tactics teaching faculty in designing the system. Otherwise, they won't believe in it and won't use it. It probably won't meet their needs."

Notes from a Conversation on 17 March 87 at Ft. Leavenworth with a CAL Faculty Member Responsible for Classroom Instruction and Research in Leadership

"Simulations must be user friendly.

"There must be very little if any trainup time needed to operate.

"The simulations must represent Army doctrine faithfully or else its credibility to the students will fail."

Notes from a Conversation on 17 March 87 at Ft. Leavenworth with the Chief of the Department of Automated Command and Training Systems

"The school and the field have fixed roles that are not the same and should not be switched. In the field, there are lots of interfaces that are dirty. Personalities of commanders and staff are much more important.

"Simulations for the school must have lots of toggle switches. It must be easy to change from a single student simulation to a classroom size exercise.

"A tough problem is that of building teamwork and communications in the school. Volleyball is used to do this in the CAS^3 course, and it takes about two weeks. Volleyball is a good vehicle for this purpose. I deliberately set up a 'me' vs 'them' when I taught CAS^3.

"There are two distinct types of simulations: training and analytic. The analytic simulations have been much more successful to date. I don't know why.

"We need an analytic model that works well in a training situation. We need to have an analytic simulation that runs quickly on a large number of Courses of Action Analyses. We must allow the students to fight a thousand battles.

"The college is producing good planners, but they don't know how to execute because they don't get to execute their plans enough.

"G1 simulation can be done.

"First Battle BC has the advantage of being played at many levels, but it plays terrain poorly and is extremely overhead intensive.

"TACOPS has about 100% overhead.

"Simulations must be user friendly.

"Judgement is the critical factor, not facts.

"I have heard that Zenith will offer its Zenith 248 through Heath outlets for about 15 to 20% above the government price.

"The Naval Regional Development Center (NRDC) in Norfolk publishes a monthly newspaper called 'Chips.' Their number is (804) 445-2114."

Notes from a Conversation on 17 March 87 at Ft. Leavenworth with an Officer in DACTS Who is the Resident Expert on TACOPS

"Playing interstaff relationships is often a problem with simulations.

"Doing the Course of Action Analysis is difficult and crucial in simulations.

"Most simulations cannot display the consequences of the course of action that students put in to discover where the problems are.

"It's important that simulations play doctrine and not procedures. Field SOPs must not be a part of the simulation for this reason. The faculty must ask the probing questions and motivate the students to find the 'why.'

"Another problem is that most people have a mental image of the simulation as being a literal representation of the staff, which should not be so. A simulation needs substaff units built in as informational calls to simulate the various staff functions.

"The use of decision graphics that allow students to analyze their actions is needed. I call them analytical graphics.

"TACOPS is a good simulation because it is easy to maintain.

"JESS and JTLS are excellent exercise drivers in real time.

"Simulations must be able to use a nonstandard unit or force; and they must play terrain, weather, threat, and changed organizations.

"The College must choose a staff trainer based on who is the expert, not on who has the most dominant personality at the time.

"AFEX goes away next academic year to be replaced by an operational level of wargame.

"I think that the school should move war gaming into the terminal phases of P316 and P318.

"Simulations should be able to run at 24:1 (exercise time to real time).

"There should be enough equipment to run 128 or 256 simultaneous classroom exercises."

Notes from on 17 March 87 at Ft. Leavenworth with an Officer in the Battle Combat Training Program (BCTP)

"BCTP is a TRADOC (General Vuono) initiative begun in September 1986.

"The BCTP charter is to take present simulations to the field for their use.
- °Phase I - Develop a seminar (not a seminar trainer) using CORBAN to drive it.
- °Phase II - Expand this simulation into a multi-echelon CPX driver.

"Our philosophy is to put today's technology into the field now.

"We are trainers, not educators.

"Emphasis is on the following:
- °Corps and staff plus major subordinate commanders and
- °Division and staff plus major subordinate commanders.

"We are trying to develop team building, and this program is unique.

"We are interested in AI and expert systems that may have application to training corps and divisions.

"We want one system to do the entire battle simulation.
- °There must be interfaces between tactical and training systems.
- °The enemy situation must be embedded in the simulation, and
- °Sensors must stimulate the operators through the simulation so that the players cannot tell the difference between real and simulation data.

"We will buy six systems, one for each corps (I, III, V, VII, XVIII) and one for BCTP at Leavenworth. Each system consists of 1 VAX 8600 and 13 Microvax IIs. There will be 39 workstations per system.

"A similar system for each division is anticipated. Each division and corps will have enough assets to run the simulations.

"We plan to adapt JESS as a division level CPX driver.

"We plan to develop modules to reduce the overhead. At present, the JESS overhead is about 160 people to run a 39 station exercise of 153 people.

"We will deliver a demonstration seminar in December 1987 and invite ARI as an observer.

"Ideas about simulations in CGSC:
- °Should be usable at the 15-person study group level. The section simulations would probably have to be staggered to allow access to the computers.
- °Students should be able to play out a complete course of action in one day. This may mean that the students must wait overnight for their results.

"It must be a fast, low-overhead, Course of Action Analyzer.
- °Students must be able to play 'What if?'
- °It's got to be exciting.
- °The simulations must illustrate the teaching points of the class, not the other way around, for example, sustainment. What if contaminated fuel were found? How would this affect the battle?

"Another charter has evolved: to form a Developmental Laboratory Coordination Center at Ft. Leavenworth. The purpose is to be a conduit for simulation technology transfer into the Army. I view ARI and, in particular EDDIC, as a conduit for technology into BCTP.

"General Vuono breathed life into BCTP.

"General Sullivan will get control of the simulation/computer world at CGSC; and eventually, we'll all speak with one voice."

<u>Notes from an ARTBASS Briefing on 18 March 87 at Ft. Leavenworth by a Civilian Employee from the CATA Training Simulations System Manager's Office</u>

"Singer Link is the contractor. ARTBASS runs on Perkin-Elmer computers. One ARTBASS system costs $2.5M.

"ARTBASS is primarily designed to train the Close Combat Battalion commander, his staff, and his company commanders. It plays CSS and combat in real time. There is no NBC play, but an NBC module is being developed. It plays helicopters poorly.

"No trainup time is needed because the people needed to operate the system go with it to field units. There are three vans that carry the equipment, including power and computers. The computers can be off-loaded into the unit's training room if wanted. About 10 operators go with

the system, and the goal is to train every close combat unit in the Army 3 times per year on ARTBASS.

"About 75% of the ARTEP skills of the battalion staff are played.

"The commander and the staff, including subordinate commanders, are forced to interact in a realistic way. OPORDs are generated by the staff in a realistic manner.

"Choosing courses of action and analyzing their consequences is done well. The staff and commanders are forced to recognize battle trends and think ahead to the future battle.

"ARTBASS plays day/night, weather, illuminations, maneuver, status reporting, administration and logistics, and road movements. The support personnel act as the threat players and supply the Red doctrine inputs during the play.

"After-action reviews can be done easily. The whole day's battle (8 hours) is taped and can be played back at eight times exercise time. The commanders' and staff's comments can be made during the replay. Uninteresting portions of the battle can be skipped or more rapidly passed over. A hard copy output of the entire battle is available but would probably be too cumbersome to be of any use.

"Thirteen ARTBASS systems are funded. These will go to Active Army, National Guard, and Reserve units.

"Sites where ARTBASS is located or being installed are CAC, III Corps, V Corps, VII Corps, XVIII Corps, I Corps, Eighth U.S. Army (Korea), 4ID, 101 Airborne Division, and Ft. Devins.

"There are four 50- by 100-km DMA-generated, fully digitized, terrain databases now available. They are Fort Irvin (NTC), Fulda Gap, Sinai, and Korea. Other areas of the world are being procured from DMA, but DMA is reluctant to release them. All the simulation play relies on rapid callup of the appropriate terrain and its display.

"Graphical display is remarkable! Less than 10 seconds are needed to completely redraw the map or to draw another view of the terrain from a different elevation and perspective. The commanders or staff can do a very realistic reconnaissance in a short time.

"The simulation uses the commanders and staff and cannot use substitutes easily because real time feedback among them all is required. However, ARTBASS is an excellent instrument to teach lieutenants to be future company commanders.

"Limitations that were identified by Mr. Bernard are as follows: there are a few bugs left in the software; it plays light infantry poorly, particularly in urban areas; there is no NBC; and helicopters are played poorly.

"The Israeli general asked if the system could display aerial photos or RPV data link information. It cannot.

"When asked what he would do differently if he could start over, he said: 'Make it run on a VAX and incorporate interactive videodisc capability into the system.'"

Notes from a Conversation on 18 March 87 at Ft. Leavenworth with Two Officers from the Combat Support Operations Division (CSOD) of CTAC

"One mission of CSOD is to have the CTAC responsibilities for simulations and automation.

"Throughout TRADOC, there are many people who talk about simulations--CAC, TRAC, CGSC. There is no single POC, and that is why that the oversight committee was formed. Eventually, there will be a single voice, or at least a consistent one. General Thurmond is working hard to unify TRADOC concerning simulations.

"The role of simulations and automation in the Center for Army Tactics is to reinforce the learning of tactics. We have about 180 hours of classroom contact with each CGSOC student and have the largest course in CGSOC.

"We'd like to automate as many of those 180 hours as possible. However, there are problems. There isn't enough space to put all 1,000 students on a computer simultaneously. There isn't enough hardware to do it, and there isn't the right kind of software. The Corvus and COTES systems are not useful to us. There are about 600 combat simulations out there, but not one of them is in the classroom.

"We want to take field training and bring it into the classroom.

"Simulations must be user friendly, must have low overhead support requirements, and must not use students as operators.

"BCTP is an expanding empire, interested in seminar trainers and not in testing, and teaches processes and letting students apply the process to their units.

"Students often get lost in the mechanics of the simulation or game and fail to understand the learning objectives,which is true even when the game is fun and interesting.

"We need more joint operations.

"First Battle BC is an excellent simulation for the field but it doesn't work in the classroom.

"We must leave humans in the loop. When the classroom judgement of a mentor is eliminated, we're on dangerous turf.

"We must have Course of Action Analyzers built into the simulations. We are about 20 to 30 years ahead of the Soviets in the use of simulations. The Soviet commander uses a Lanchester type calculation that gives results that must be followed because that is 'scientific.'

"Feedback to students must be continuous.

"School-wide student body exercises are a waste of time. Machines should be an aid in running the simulation off line. Let students exercise their minds with the aid of a simulation.

"There is a great variety of student skill levels here ranging from MDs through accomplished tacticians. We need one simulation for all students and another simulation for specialization in the electives that the combat students must take.

"Nobody wants Corvus. It's unfriendly; and even if it's turned into word processing equipment, there are no letter quality printers available for it.

"Every new demonstration simulation or training technique ought to be demonstrated at CGSC."

Notes from a Conversation on 17 March 1987 at Ft. Leavenworth with a CGSOC Student

"No, I don't own a PC, but I'd like to. I'd use it to write letters and papers for this course and for working at home.

"I'm not into computer games all that much and wouldn't use a PC for that.

"Computer use here is pretty poor. The 'intro' (P210) was OK, but there's no requirement or need to use them in the rest of the course. The system is too hard to learn in the first place, and I'd rather be home at night. It's probably OK for typing out class papers.

"The class is actually pretty good. Most of the instructors care about us and are very professional. It's not like the Advanced Course at all. We work hard and play hard. The real key is the discussion that the discussion leaders instigate.

"As far as organization is concerned, the emphasis is on tactics and sustainment. Everything is oriented to tactics. We go into all aspects of tactics and practice the various aspects of tactics leading up to the exercises. I thought the KOREX was pretty bad. They could have done a lot better to make the game go easier. All these exercises ought to be computerized."

Notes from a Conversation on 17 March 1987 at Ft. Leavenworth with a Student in the CGSOC Who Was the Chief of Staff in his Group for MEEX, Which Was Being Played on the Day of the Interview

"No, I do not use a computer because I don't own one. I just haven't found a computer to be high on my priority list. If I had one, I'd probably use it a lot. I'd use it to keep my bank books and for word processing.

"I think that CGSC is very overrated. I've done most of this stuff before, and it's mostly review. I'm not being challenged too much. After all, the whole purpose of CGSC is to punch my ticket. Most of the other students recognize that, and we get along well. There are a few 'springbutts,' but they're not too bad. Most of us take the course in stride.

"There just isn't any use of computers here. I think they could be used in the classrooms, but I've not thought about it too much. Whatever is used must be easy to learn and not require the whole cadre to run. It's got to be fun for the students, or else we'll see it as just another gimmick. We get a little cynical about all the new fangled stuff that has been promised to the Army, and what we really want to see is better leadership. That's what makes the job fun, working for somebody that cares about you.

"No, I'd probably not play war games in my spare time if the school gave me a computer to take home over the weekend. If it were a helicopter flying game, I might use it.

"I think the instructors do a good job keeping an unruly mob under control in the classroom. They are very professional and keep us busy. They keep us stimulated, but most of what we see has been taught before at the Advanced Course, for example. Mostly, we learn to get along as a group so that we can get the lessons done without wasting a lot of time. We've gotten good at that sort of teamwork."

Notes from a Conversation on 18 March 1987 at Ft. Leavenworth with a CGSOC Student

"No, I do not own a computer. If I owned one, I don't know what I would use it for. I really don't think I'll buy one.

"So far, CGSC has been a challenge. They are working me hard. Particularly, the electives that I've gotten this term are challenging, and I'm working my tail off. Almost every elective course has a term paper that I have to write and that takes a lot of time. It's difficult to say what I'd do if I were in charge because they keep me so busy that I haven't thought about it.

"We really don't use computers here. We had an introduction at the beginning of the course, but it didn't help. I've not used the Corvus since then. My wife types my papers for me on a typewriter, and I've not used the word processors.

"I think that computers will be all over the Army in a few years. I think that every orderly room and most combat major end items will have computers. But, I don't see a need for me to learn how to use them because the troops will have all the needed training. As I get promoted, I will get farther away from computers.

"Most of the classroom instruction is challenging, and I'm learning a lot. The instructors make us work very hard. Many of the officers don't take this course seriously enough and don't get enough out of it.

"The course organization is good. Most of what we need in later courses is presented in the earlier class. The sequencing is OK. We use the learning objectives, and they seem well organized. However, the grading is mostly subjective, so presentation of what you did is a bit more important. It's really difficult to get a low grade. Maybe that's why the course is so relaxed for most people.

"The electives are harder than the common curriculum courses. I find them a lot more interesting, and I'm learning a lot more from them."

Notes from a Conversation on 26 March 1987 at Los Alamos with a Recent CAS3 Student

"I think the CAS^3 course was a waste of time--my time. I had to go because it's a ticket that's got to be punched. I didn't want to be there, but I had to go. I didn't learn a single new thing. It was all a review of what I already knew.

"That was not true of the other students. We had 12 officers whose skills were very different. There were 3 of us that understood what was going on. We were called in after 3 weeks and told by the instructor that he'd be happy if we didn't do anything for the rest of the class. He wanted

us to try to get the others to learn the material. Up until then, I was working hard. Afterwards, I just enjoyed myself.

"The officers in my class were the following: one nurse, technically competent but not knowledgeable about the Army; one MI type who did 'spook' stuff and had not really been in the Army; a transportation guy who had been in Infantry (he was functionally illiterate); an FA type who thought he knew everything, but didn't; and about three armor officers--one of whom was OK, an aviator, and an engineer who was good. Only three of us knew anything, and it was amazing to see how slow the officer corps is.

"There seem to be three types of classes at CAS^3. The rebellious, the close knit class, and the class that never works together. My class was the kind that never worked together. I was the G-3 on the final exercise and had to tell a couple of the others to either leave the room or shut up because we had to get the briefings together. They left, and my course of action was briefed to Colonel Abrams who said it was great. We had a lot of infighting and cliques in my group.

"I don't see any place where computers could be used as the course is presently structured. You'd have to change the whole thing around and make the courses turn around a simulation or such to use computers on a large scale.

"I thought the whole course was a waste of my time. We worked so hard getting 95% of the material that the extra effort involved to get the extra 5% was not worth the trouble. A lot of officers seemed to act as if working hard not learning was important. They'd spend the weekends doing work that should have been done in class just because they thought they were supposed to or they just didn't use time wisely."

Notes from a Conversation on 23 February 1987 at Los Alamos with a 1985 CAS3 Student

"I own a computer and use it primarily for word processing and a little database management.

"I thought the CAS^3 course was a lot of work for what was taught. The content of the course was not important. The content was primarily how to do a staff study ,and I already knew that. However, three things were really taught:

- °How to get along with your study group members,
- °how to prepare a briefing, and
- °how to present a briefing.

"We did that over and over. At first, the class spent too much time deciding what would be in a briefing, but we soon learned that we had to prepare the briefing and learned not to waste too much time discussing it. The other thing was that it really didn't matter what the issues of the briefing were as long as we could defend our point of view.

"Computers in the course were almost absent. We were each issued an HP-41 programmable calculator that we used in the final logistics exercise, but there were no other computers that we used or needed.

"I don't think that computers would be useful the way the course is now structured. You can't teach briefing techniques very well with a computer.

"When we got out of class, I didn't feel like working a computer simulation at home. I don't think many would feel like it either.

"Classrooms were set up so that the objectives of the course were met. The small-size class and room were good for teaching us briefings.

"I had already had most of the course material, so I didn't learn a lot of new material. The course was a good review of staff functions. We weren't forced to think deeply."

APPENDIX A.3

COMPUTER OPPORTUNITIES

Guidelines for Computer Usage and Opportunities Questionnaire

Two scales are used to show the amount of computer usage in a subcourse and the opportunities for computer usage in a subcourse. The values of each scale can range from 1 to 5. The meaning of the values follows.

Computer Usage Scale

1 - Subcourse does not use computers.
2 - Subcourse uses computers very little.
3 - Subcourse uses computers some.
4 - Subcourse uses computers a lot.
5 - Subcourse uses computers extensively.

Computer Opportunities Scale

1 - Subcourse has no potential for computer usage.
2 - Subcourse has little potential for computer usage.
3 - Subcourse has some potential for computer usage.
4 - Subcourse has a lot of potential for computer usage.
5 - Subcourse has a very great potential for computer usage.

Please enter your judgement of the computer opportunities and be prepared to discuss it on 20 March 1987.

[Iteration of 13 March 1987]

CAS³ Computer Usage and Opportunities

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
Phase I				
E101	4	1	4	**Communicative Arts.**
E102	7	1	5	**Historical Development of Staffs.**
E103	8	1	4	**Staff Skills, Roles and Relationships.**
E104	12	1	4	**Military Decisionmaking.**
E105	10	1	5	**Quantitative Skills.**
E106	2	1	3	**Personnel Service Support.**
E308	7	1	4	**Training Management.**
E410	12	1	4	**Fundamentals of Tactical Sustainment.**
E413	5	1	5	**Budget.**
E515	7	1	4	**Reserve Components/ Mobilization.**
E516	4	1	4	**Force Integration.**
E517	4	1	3	**Staff Leadership and Management.**
E614	12	1	3	**Introduction to Threat Forces.**
E709	10	1	5	**Organization of the Army in the Field.**
E716	36	1	3	**Combined Arms Operations.**

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
Phase II				
F121	57	1	5	**Staff Techniques.** Computers could be used to facilitate the preparation and learning of staff products commonly used. Mathematical modeling on computers could be well used.
F323	36	1	3	**Training Mangement.** Computer models for training management could be used.
F424	37	1	5	**Budget.** The use of a spreadsheet for preparation of budgets is a natural.
F525	33.5	1	3	**Mobilization.** Use of computers to assist in preparation of mobilization plans would assist students in learning the required principles.
F625	95	1	3	**Preparation for Combat Operations.** Computers could be used to facilitate the preparation of estimates and plans that students need.
F727	49	1	5	**European Exercise.** A computer-driven simulation of the exercise would give the students the chance to practice procedures and decision making.

CGSOC Computer Usage and Opportunities Questionnaire Summary

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
P211	7	5	5	**Computer Operations.** Already uses computers to teach fundamentals.
P212	38	1	5	**Resource Planning and Allocation.** Could use to teach cost analysis and other aspects of planning/allocation.
P251	24	1	5	**Force Integration and Training.** Could use simulations to simulate and evaluate training strategies and plans.
P310	20	1	3	**Soviet Army Operations.** Could be used to graphically show how Soviets maneuver units and other Soviet doctrines.
P312	4	1	4	**Intelligence Preparation of the Battlefield.** Computer-generated templates and simulations of battlefield variables.
P314	16	1	5	**Nuclear, Biological, and Chemical Operations.** Computer simulations of NBC operations and their consequences.
P318	146	1	5	**Combat Operations.** Computers could be used to interact with students and groups of students to simulate and demonstrate the consequences of student decisions relating to combat. Army and Air Force Airland Battle doctrine could be simulated in particular scenarios. Nuclear targeting could be taught with students seeing the the simulation.
P331	2	1	2	**Emergency Action Procedures.** Secret-Noform course too short to be effectively computerized.
SBE321	23	1	5	**Middle East Exercise.** Great opportunity for a large-scale, integrated, class-wide exercise to be computer-driven.

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
P318(L)	40	1	5	**Combat Operations Sustainment.** Student use of logistics simulations could be effectively used to explore the consequences of decisions. Organization of CSS could be could be taught.
P451	14	1	5	**Echelons Above Corps - Combat Service Support (EAC).** Simulations of the CSS aspects of EAC could be used effectively to teach students the principles involved.
P455	18	1	3	**Mobilization and Strategic Mobility Planning.** Computer-generated graphics of historical lessons in mobilization and the current principles of strategic mobilization could be used to effectively instruct students.
SBE414(L)	21	1	5	**Korean Staff Battle Exercise.** See notes for SBE321, Middle East Exercise.
P512	10	1	3	**Strategic Studies and U.S. Defense Policy.** Simulations might be used as aids to the students in presenting their talking papers.
P513	16	1	3	**Communist Powers and NE Asia.** Computer graphics could be used in the development and display of ideas during oral presentations.
P521	9			**U.S. Central Command/European Command Operations.**
P531	9	1	3	**U.S. Southern Command Operations.** Computer graphics could be used in the development and display of ideas during oral presentations.
P551	—	1	3	**Regional Assessments.** A computer simulation capable of developing an analysis for any of the regions of interest could be developed.

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
P611	2	1	1	**American Heritage.** Not appropriate for computers.
P612	2	1	1	**War and Doctrine.** Not appropriate for computers.
P613	26	1	3	**20th Century War: The American Experience.** Computer simulations and graphical diplays would add realism and clarity to the course material.
P614	2	1	3	**Introduction to Corps Operations.** The Lorraine Campaign of 1944 might be simulated by computer to enhance display and clarity.
P615	1	1	3	**Introduction to Division Operations.** The Lorraine Campaign of 1944 might be simulated by computer to enhance display and clarity.
P616	2	1	3	**Introduction to Soviet Army Operations.** Computers could be used to enhance display and clarity.
P651	25	1	5	**Battle Analysis.** A computer simulation of the U.S. VII Corps in the European Theater of Operation during World War II could be used to systematically develop tools for battle analysis. Variations on the theme could be run to play "what if?"
P711	4	1	3	**Organization of the U.S. Armed Forces.** Traditional CBI might be used here.
P712	9	1	5	**Service Considerations for Joint and Combined Planning.** Here is one place to introduce the use of simulations.
P713	18	?		**Operational Environment.**
P714	20	?		**NATO Operations.**

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
P721	18	1	5	**Joint Operations Planning System (JOPS).** Instruction and practice on the JOPS could be computerized.
SBE 731	22	1	5	**African Exercise.** This is a class-wide exercise that must be computerized. Students would be able to examine the consequences of their actions and decisions.
P851	28	1	5	**Low Intensity Conflict (LIC).** A scenario-driven simulation of an LIC situation could be used to teach the principals of LIC and to facilitate the practical exercise.
P911	12	1	3	**Effective Military Writing.** At the lowest cognitive levels, this course could be entirely taught using CBI.
P912	8	1	3	**Staff Dynamics.** CBI could be used to teach the fundamentals.
P913	14	1	5	**Leadership.** Computer simulations using videodiscs could be used to demonstrate numerous leadership and ethical situations in an interactive way.
P951	12	1	3	**Military Law.** CBI could be used to reinforce military law and to simulate various situations related to military law.
P952	—	1	1	**Leadership.** Numerous oral presentations are given by the students explaining various aspects of leadership.

SAMS Computer Usage and Opportunities Questionnaire Summary

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
Core				
SOO101	16	1	1	**Introduction and Conclusion.** Not appropriate for computerization.
SOO102	180	1	1	**Field Exercise Participation.** Not appropriate for computerization.
SOO110	132	1	5	**Fundamentals of Military Theory and Doctrine.** Although the POI does not provide sufficient detail to know what is being taught, computer simulations could be used to provide students opportunities to practice wargaming. This may be formal or informal.
SOO111	264	1	3	**Individual Study of Military Theory and Doctrine.** Students could use computer simulations and models of military and doctrine to learn how to think about war. Various theories of war could be modeled and students could adjust the model parameters to help them develop creative potential.
SOO120	20	1	3	**Dynamics of Small Unit Actions.** Not enough information known.
SOO121	40	1	3	**Individual Study of Small Unit Actions.** Students could use computer simulations and models of small units to develop their individual philosophy of small unit actions.
SOO122	8	1	5	**Soviet Combined Arms Laboratory.** Computer-generated modeling of Soviet Combined Arms would provide a dynamic, easily changed scenario that would allow students to learn Soviet Combined Arms interactively.

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
SOOO123	16	1	5	**Company Engagement Exercise.** The exercise could be set up on a computer to more rapidly expand the students' understanding of the company engagement.
SOO124	32	1	5	**Battalion Engagement Laboratory.** By using a computer simulation, many more iterations of the battalion engagement could be run with many more variations. Students would be stimulated to expand their understanding more effectively.
SOO125	4	1	5	**Brigade Decision Exercise.** This fast paced exercise could be computerized to more effectively stress students.
SOO130	28	1	5	**Corps and Division Operations.** See SOO131 below.
SOO131	56	1	5	**Individual Study of Corps and Division Operations.** Computers could provide simulations and models of corps and division operations as a tool to facilitate individual creative development of the students' understanding of these operations.
SOO132	88	2	5	**Division Operation Exercise.** The TACOPS program could be rebuilt to allow company or fire unit level resolution as needed and aggregation at any higher level in a much more robust form to speed up the game play and to facilitate students' appreciation of the consequences of their decisions.
SOO133	96	2	5	**Corps Operation Exercise.** See comments for SOO132 above.
SOO140	120	1	5	**Campaign Studies.** See SOO141 below.

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
SOO141	280	1	5	**Individual Study of Campaigns.** Interactive computer simulations and models of various historical campaigns could significantly improve students' ability to make decisions and appreciate their consequences.
SOO150	60	1	5	**Large Unit Operations.** See SOO151 below.
SOO151	120	1	5	**Individual Study of Large Unit Operations.** The comments of SOO141 above applied to large unit operations are appropriate here.
SOO152	80	1	1	**Field Army Exercise (SWA).** Not appropriate for computers.
SOO153	56	1	1	**Joint and Service Headquarters Visits.** Not appropriate for computers.
SOO154	64	1	1	**Army Group Exercise.** Not appropriate for computers.
SOO155	40	1	1	**Contingency Planning Exercise.** Not appropriate for computers.
SOO160	68	1	3	**Low Intensity Conflict.** See SOO161 below.
SOO161	136	1	3	**Individual Study of Low Intensity Conflict.** The comments of SOO141 above applied to low intensity conflict are appropriate here.
SOO170	36	1	3	**Preparation for War.** See SOO171 below.
SOO171	72	1	3	**Individual Study on Preparation for War.** The comments of SOO141 above applied to preparation for war are appropriate here.
SOO180	4	1	1	**Comprehensive Oral Examination.**

Subcourse Number	Number of Hours	Computer Used? (1-5)	Computer Opportunities (1-5)	Subcourse Title/Comments
Research				
SRO110	8	1	1	**Research Seminar.**
SRO111	72	1	1	**Individual Research and Monograph Preparation.**
SRO112	8	1	1	**Research Methodology.**
Military Classics Colloquia				
SCO110	30	1	1	**Military Classics Seminars.**
SCO111	60	1	1	**Independent Study.**

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