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Combat Service Support Control System Cost and Operational Effectiveness Analysis Analysis Plan

TRADOC Analysis Command-Operations Analysis Center
C3I Studies and Analysis Directorate
Fort Leavenworth, Kansas 66027-5200

Study Plan TRAC-SP-0293
March 1993

ANALYSIS PLAN

FOR

COMBAT SERVICE SUPPORT CONTROL SYSTEM

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This report describes the analysis procedures for the CSSCS COEA. It encompasses the operational, cost, sustainability, and training analyses and the approach to integrate them. The operational analysis includes a functional analysis (analyzing the alternatives against CSS command and control (C2) functional requirements), a performance analysis (utilizing the modeling tool "Modeler"), and an effectiveness analysis (using the Vector-In-Commander (VIC) model). The alternatives examined are the current manual operations as the base case, the command tactical information system (CTIS), and the objective CSSCS (version 5 of the common hardware and software system (CHS)).

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ANALYSIS PLAN

APPENDIX B

ANALYSIS PLAN
COMBAT SERVICE SUPPORT CONTROL SYSTEM
COST AND OPERATIONAL EFFECTIVENESS ANALYSIS

B-1. Purpose. The purpose of the analysis plan is to identify the methodology for conducting each of the subanalyses for the Combat Service Support Control System (CSSCS) Cost and Cperational Effectiveness Analysis (COEA). The sub-analyses are detailed in the annexes to this appendix. Annex I is the operational analysis plan, annex II is the cost analysis plan, annex III is the sustainability analysis plan, and annex IV is the training analysis plan. This appendix describes how the subanalyses will be integrated to provide the decisionmaker with a summation of the COEA results with recommendations and conclusions.

B-2. Scope. The scope of the COEA is to examine different CSS command and control (C2) systems for their impact on the Army from echelons above corps (EAC) to brigade levels.

B-3. Study issues. The issues as defined in the study plan are as follows. The essential elements of analysis (EEA) and methodology specifically addressing each issue are described in the subsequent annexes for each subanalysis.

a. Issue 1. What is the operational effectiveness of the base case and alternatives? The EEA are defined in annex I.

b. Issue 2. What is the cost impact of the base case and alternatives? The EEA to address this issue are defined in annex II.

c. Issue 3. What are the supportability and sustainability implications of the base case and alternatives? This EEA and methodology to address this issue are detailed in annex III.

d. Issue 4. What are the training implications of the base case and alternatives? The analysis approach responding to this issue is described in annex IV.

B-4. Alternatives. The alternatives as defined in the study plan are the base case (current manual system), alternative 1 (command tactical information system (CTIS)), and alternative 2 (objective CSSCS version 5 on common hardware/software (CHS)).

B-5. Methodology.

a. Overall approach.

(1) The COEA will be a total analysis incorporating both quantitative and qualitative analyses. Figure B-1 shows a breakout of the qualitative and quantitative analyses to be performed. Where possible, seminar reviews and subject-matter experts (SME) panels will be used to capture additional subtleties of the systems. This will ensure a more thorough and complete evaluation of the alternatives because the limitation of the models does not allow a full assessment of the impact of C2 systems through quantitative measures only.

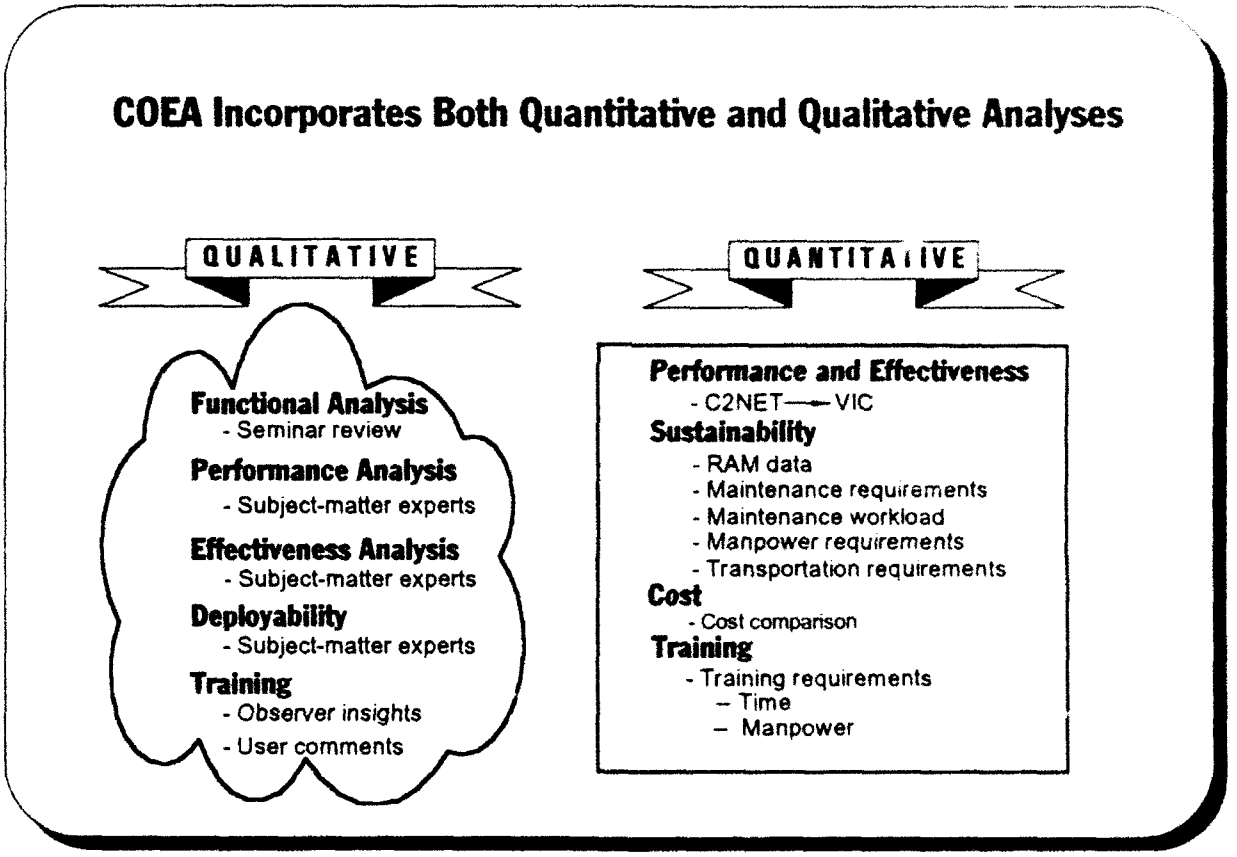

Figure B-1. Total analysis

(2) The overall methodology of the COEA is illustrated in figure B-2. A literature search was conducted to provide information on applicable measures of comparison and background information on the alternative systems (C2 and CSS). As a start, the documents cited in the study plan were perused. Other documents examined are noted in the analysis annexes.

(5) As shown in the figure, each of the analyses are independent, yet interdependent. The operational analysis will begin with the functional analysis to determine if the

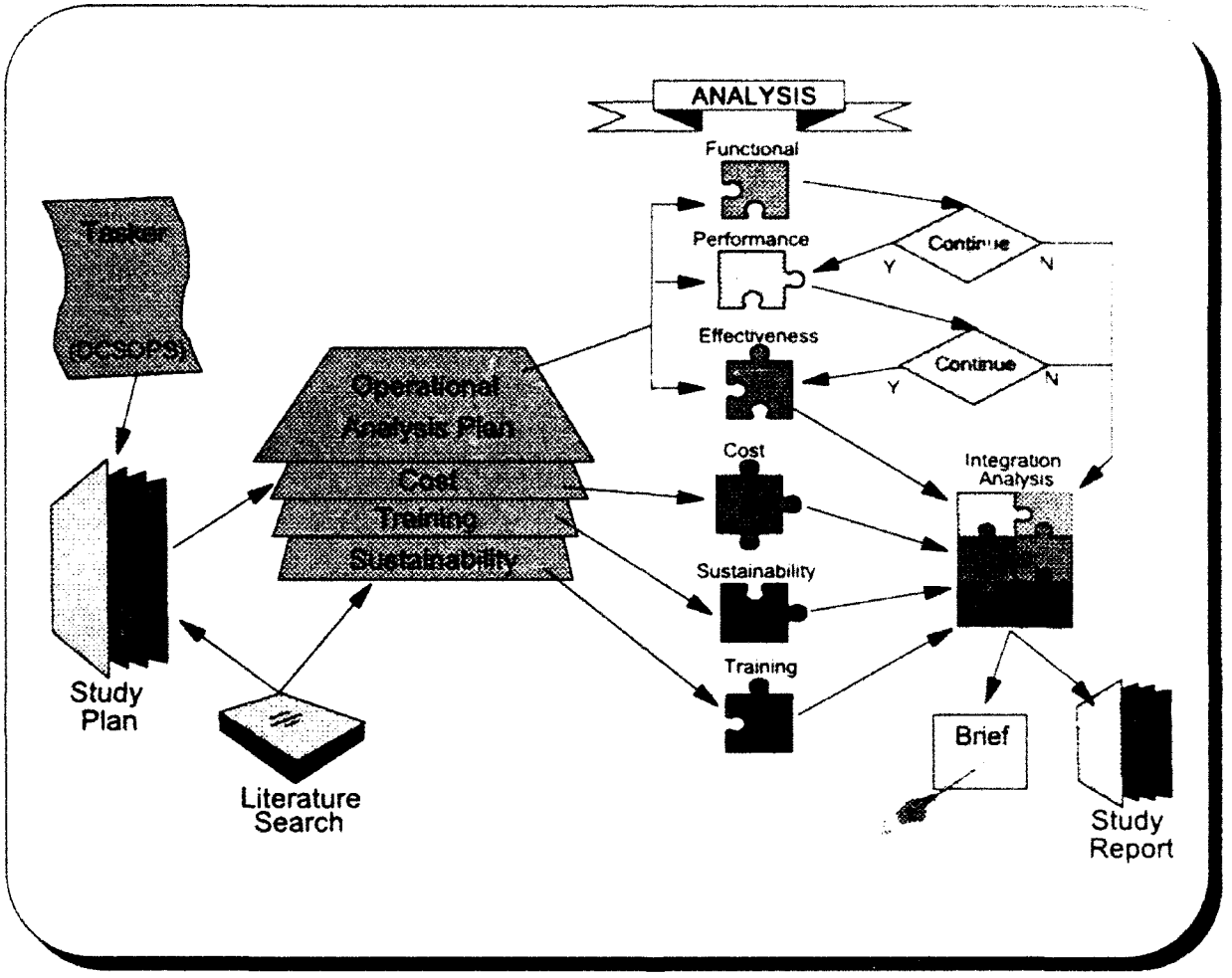

Figure B-2. Overall methodology

performance analysis is required. The effectiveness analysis will be conducted if there is a difference between alternatives in the performance analysis. If, for example, CTIS does not meet the functional requirements, then it will not be considered in the performance, effectiveness, cost, training, or sustainability analyses. However, the manual system will be used as the basis for comparison in each of the analyses regardless whether it meets the functional requirements or not. Once the analyses are complete, the study team will then integrate the findings and results.

efficiently assist the commander and staff in the decisionmaking process to determine if the alternatives meet the CSS requirements. If the alternative "passes" the functional analysis, then it will be examined in the process. In addition, recommendations and conclusions will be provided.

ANNEX I

to

APPENDIX B

OPERATIONAL ANALYSIS PLAN

Annex I
to
APPENDIX B

OPERATIONAL ANALYSIS PLAN

B-I-1. Purpose. The purpose of this plan is to outline the operational analysis effort required for the CSSCS COEA. The COEA supports a Milestone III decision review in the second quarter of fiscal year (FY) 1994.

B-I-2. Related studies.

a. TRADOC Analysis Command-Operations and Analysis Center (TRAC-OAC) "All Source Analysis System (ASAS) COEA", Command, Control, Communitctaions, and Intelligence Studies and Analysis Directorate (C3I SAD), Fort Leavenworth, KS, 1992.

b. TRAC-OAC, "Maneuver Control System (MCS)COEA", C3I SAD, Fort Leavenworth, KS, 1992.

c. Combined Arms Support Command (CASCOM), "CSSCS Abbreviated Analysis", November 1990.

B-I-3. Scope. The focus of the study will be to provide a COEA of CSSCS. The operational analysis will include a functional analysis, performance analysis, and force effectiveness analysis. The performance and effectiveness portions of the operational analysis will examine the alternative CSS C2 systems at corps to brigade levels using corps-level models. The analysis will provide insights to the effect of the alternative systems across the whole Army. These insights will be used to make recommendations on the preferred alternative from an operational effectiveness perspective.

a. Limitations.

(1) SMEs will be used to collect C2 performance data; where such data are not available, system specifications will be used.

(2) Split-based operations for CSS will not be represented in the study.

b. Assumptions.

(1) All other Battlefield Functional Area (BFA) components of the Army Tactical Command and Control System (ATCCS) will be portrayed in their objective state.

(2) Communications systems and their capabilities are assumed constant across alternatives.

(3) All objective ATCCS components perform to specifications, and SME can accurately predict that performance.

(4) The Blue force structure and equipment will remain valid for the projected timeframe of the study.

B-I-4. Alternatives.

a. Base case. The base case consists of the current manual CSS procedures and any currently fielded systems such as the Standard Army Management Information System (STAMIS). This base case is established for analytical purposes. As such, the other ATCCS components are in their objective state to maximize constancy among and between the base case and alternatives.

b. Alternative 1. This alternative consists of the CTIS automated system which imports U.S. Army, Navy, and Air Force information for both peacetime and wartime use. It is currently operational in the Alaskan Command. The Army subsystem, developed by the 6th Infantry Division (ID) (Light), is a decision and executive support system fielded from divisions to battalion-level elements in the 6th ID (Light). Again for consistency, the other ATCCS components (forward area air defense command and control and intelligence (FAAD-C2I), maneuver control system (MCS), advanced field artillery tactical data system (AFATDS), and all-source analysis system (ASAS) are portrayed in this alternative in their objective state.

c. Alternative 2. This alternative represents the objective CSSCS (version 5) on CHS. STAMIS is still represented since CSSCS does not replace it; CSSCS utilizes the input from the different STAMIS. All ATCCS components will be depicted in their objective state with computerized interface.

B-I-5. Essential elements of analysis. The following EEA address the study issue: "What is the operational effectiveness of the base case and each alternative?".

a. EEA 1. To what extent do the base case and alternatives meet the CSS functional requirements?

b. EEA 2. What are the performance characteristics of the base case and alternatives?

c. EEA 3. What is the system-level effectiveness of the base case and alternatives?

d. EEA 4. What is the force-level effectiveness of the base case and alternatives?

e. EEA 5. To what extent do the base case and alternatives support the performance of the other ATCCS components?

f. EEA 6. What are the performance drivers?

B-I-6. Environmental and threat consideration.

a. Scenario. The scenario used in the study will be Northeast Asia (NEA) 1.0 low-resolution scenario. NEA 1.0 depicts a Blue force conducting combat operations using AirLand Battle (ALB) doctrine in a mid intensity conflict. It provides a graphic and narrative description of the geographical setting and military means of fighting in the Pacific Command (PACOM) Combined Forces Command Theater of Operations. The Blue force is a U.S. corps designed to fight a nonlinear battle with an Army of Excellence (AOE) 1999 corps force structure and weapons systems. The Blue corps consists of a U.S. mechanized division, U.S. armored division, mechanized division (allied nation), U.S. armored cavalry regiment, ranger regiment (allied nation), and a U.S. air assault division.

b. Threat. The Red force is a regional threat force with a 2004 force structure, weapon systems, and munitions. The Red force is composed of elements of the North Korean Army (NKA). Ground forces relevant to this scenario were controlled under two army group headquarters with each having two forward deployed infantry corps; one mechanized infantry corps; and national-level artillery, engineer, and missile assets. In addition to these two army groups, there are operational and strategic exploitation forces consisting of two mechanized corps, one armored corps, and four follow-on reserve corps used to replenish forward fighting units' strength.

B-I-7. Methodology. The methodology consists of three independent, yet mutually supporting, activities: functional analysis, performance analysis, and force effectiveness analysis.

a. Models/tools.

(1) Modeler. Modeler is a Petri net modeling tool used to develop the command and control network (C2NET) performance model. A Petri net approach provides a graphic representation and analysis of concurrent processes. It graphically represents the flow of information, whether occurring sequentially or simultaneously. The information itself is not modeled.

(2) C2NET. C2NET is a C2 performance model describing primarily the C2 force-level process at corps, division, and

brigade headquarters elements. C2NET represents each of the five BFAs from a C2 perspective. For the CSS BFA, the C2 functions of the forward support battalion (FSB), main support battalion (MSB), division support command (DISCOM) and corps support command (COSCOM) are also portrayed. The actual supply process is not modeled in C2NET. Tasks performed by each of the staff elements are modeled in terms of frequency, duration, number of staff members, phase of battle, and time to discard. In addition, the tasks are prioritized.

(3) Vector-In-Commander (VIC). VIC is a force-on-force model to be used in the effectiveness analysis with incorporated inputs from C2NET. VIC is a deterministic, two-sided simulation of combat in a combined arms environment representing land and air forces at the Army corps level with resolution at battalion level. C2 in VIC consists of sets of tactical decision rules (TDRs) which describe the decisionmaking process and various model time delays that would affect movement, fire support, and resupply.

b. Measures of performance (MOP). The following is a listing of MOP which will be used to compare alternatives in the performance analysis and assist in answering the EEA. Additional MOP may be used as deemed appropriate. All MOP used in the study will be documented in the final report.

(1) Number of messages processed/time. This is defined as the number of messages (CSS reports) processed by time. (The relevant time slices will be determined after examination of the flow of the battle.) It is expected that more messages will be processed by enhanced CSS systems.

(2) Number of messages in queue/time. This is defined as the number of messages (CSS reports) in the queue awaiting processing by time (relevant time slices to be determined after examination of the flow of the battle). It is expected that fewer messages will be awaiting processing by enhanced CSS systems.

(3) Number of messages not processed. This is defined as the number of messages (CSS reports) which arrived in the queue, but were not processed. It is expected that the use of a CSS C2 system will decrease the number of reports not processed.

(4) Message processing time. This is defined as the time from which a unit sends a report requesting supplies to the time that a resupply transportation mission has been issued. This is an indication of how fast the system can respond to a request. It is expected that use of the CSS C2 system will increase the response time of the system.

(5) Message queue delay time. This is the length of time a message spends in a queue before it is processed.

(6) Number of personnel to process messages. It is expected that fewer personnel would be required to process messages due to an automated CSS C2 system.

(7) Time to perform course of action (COA) analysis. It is expected that an automated CSS C2 system will provide more accurate, timely information, decreasing the time required to perform a COA analysis.

(8) Time to develop logistics annex to operations order/fragmentary order (OPORD/FRAGO). It is expected that an automated CSS C2 system will provide more accurate, timely information, decreasing the time required to develop a logistics annex.

c. Measures of effectiveness. The following is a listing of MOE which will be used in the effectiveness analysis to answer the EEA in this study. All MOE used in the study will be documented in the final report.

(1) Command and control measures of effectiveness (C2MOE).

(a) Logistics support response time (by major units and by classes III, V, and IX). It is expected that better, more timely CSS information will result in a higher demand satisfaction.

(b) Differences of key units' actual versus perceived supply status.

(c) Time and number of units below critical resupply levels (by major units, critical items, and key decision points).

(d) Number of requests for resources. It is expected that a more effective CSS system will result in fewer resource requests due to enhanced demand forecasting capability.

(e) Supply levels at request time versus time of receipt.

(2) Force-level MOE (FLMOE).

(a) Time to mission (objectives) accomplishment. This is the elapsed time from start to end of a stated mission as defined by the commander's intent for each division/corps. It is expected that better, more timely CSS information will result in the force completing missions and achieving objectives quicker.

(b) Fractional loss exchange ratio (FLER). FLER is a measurement of relative losses of the opposing forces. It is expected that better and more timely CSS information will result in a higher FLER.

(c) System exchange ratio (SER). This is defined as the ratio of Red systems lost to Blue systems lost. The particular ratios to use in the analysis will be determined by examining the flow of battle. The focus of the analysis will be upon critical events.

(d) Blue and Red losses (casualities and systems).

d. Qualitative measures. These represent different aspects of the battle which do not lend themselves to quantitative assessment. They provide an additional means of measuring the effectiveness of each alternative.

(1) Situation awareness. This is a comparison of a headquarters' perception of its subordinates' logistical status versus the subordinates' actual logistical status.

(2) Common picture of the battlefield. This is a comparison of a logistics unit's perception of the current battlefield situation.

(3) Synchronization. This is a measure of a supporting unit's ability to arrange logistical activities to support combat operations. This will be evaluated in terms of time delays for supply requests, maintenance requests, personnel requests, and time to accomplish reconstitution.

(4) Battle tempo. This measures the impact of logistics on the ability of a unit to maintain its desired pace of the battle.

e. Method of analysis (MOA).

(1) Functional analysis. This will compare the capabilities of the alternatives (manual, CTIS, and CSSCS) to CSS functional requirements.

(a) The requirements will be extracted from the following CSSCS documents: required operational capability (ROC), functional requirements document 3 (FRD 3), draft FRD 4, critical operational issues and criteria (COIC), test and evaluation master plan (TEMP), user interface requirements (UIRs), and system segment specifications. The requirements will be constructed so as not to reflect bias toward CSSCS. They will be stated as CSS requirements, not system-specific requirements. Additionally, the requirements will be separated into critical

versus secondary requirements. TRAC-OAC will construct the requirements list in coordination with CASCOM.

(b) A seminar review panel of SME will assess the capability of the alternatives to meet the requirements. CASCOM will provide the SME for the manual system and CSSCS, 6th ID (Light) will provide SME for the CTIS alternative, and TRAC-OAC will preside over the panel. The panel will use a "stoplight" approach (red, amber, green) to assess each alternative against each requirement. "Red" will indicate that the alternative does not meet the requirement, "amber" will indicate that the alternative meets the requirement minimally, and "green" will indicate that the alternative fully meets the requirement. Where "red" or "amber" is given an alternative, a caveat will be made in the analysis to describe what prevents the alternative from meeting the requirement or if minor enhancements could be made to the alternative system to meet the requirement.

(c) The overall assessment of the alternative will be made by TRAC-OAC. If the CTIS or CSSCS alternative receives "red" on any critical requirement and there is no ability to meet the requirment with minimal enhancements, then the alternative will be considered having "failed" the functional analysis. In this event, the alternative will not be considered further in the COEA analyses. The alternative will not be analyzed for its performance, force effectiveness, training, cost, nor sustainability implications. However, the manual system will be examined in the performance and effectiveness analyses regardless of its evaluation in the functional analysis. This is to maintain a base case with which to compare alternatives.

(2) Performance analysis. This analysis will be conducted for the alternatives passing the functional analysis to determine their impact on C2 performance.

(a) CASCOM will construct a CSS task laydown to describe the C2 tasks performed at the headquarters elements and supply points for all echelons from corps to brigade, inclusively. These tasks will be modeled in the C2NET performance model to include the frequency, duration, number of staff members required, time to discard, and phase of battle for each task. Frequency and duration times will be represented with a triangular distribution (minimum time, most likely time, and maximum time) to reflect all situations. An SME panel representing each alternative system will provide these data items.

(b) C2NET will then be run to capture data that reflect the actual performance of the systems under examination. A minimum of five runs per alternative, each having a different initial random number seed, will be performed to acquire

sufficient data points to determine mean performance statistics. System-level MOP will be compared across the alternatives. If differences between the base case and alternatives are not apparent, a decision will be made as to the necessity of the force effectiveness analysis.

(3) Force effectiveness analysis. The contribution to combat effectiveness will be determined using the VIC force effectiveness model and the NEA 1.0 scenario. The effectiveness approach is illustrated in figure B-I-1 and described below.

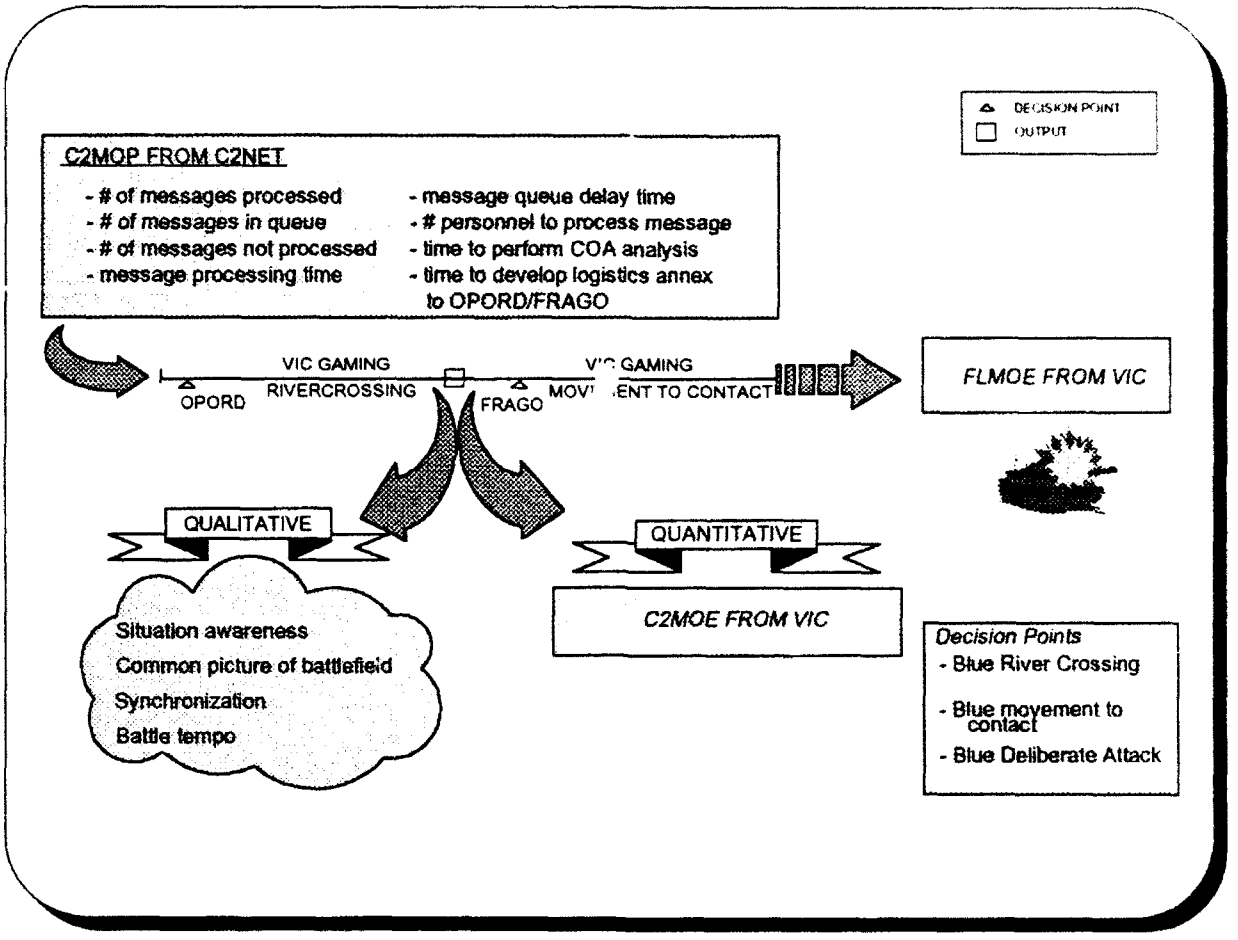

Figure B-I-1. Effectiveness analysis approach

(a) For each alternative, MOP from the performance analysis and off-line decisionmaking results will be used as input to the VIC model to represent the unique capabilities of the system. The study team will examine the scenario at each of the following decision points: Blue river crossing, Blue movement to contact, Blue deliberate attack, and Blue reconstitution ability. At each decision point, the study team, in coordination with CASCOM and the TRAC Scenario and Wargaming

Center (SWC) will select a COA based on analysis of VIC output and off-line assessments. VIC will then be run again to ensure that the resulting effects of the decision are properly portrayed to best represent the alternative.

(b) This procedure will continue until the first three decision points and their resulting effects have been gamed for each alternative. The final decision point (ability of Blue to reconstitute at the end of the gamed scenario) will be examined off-line; reconstitution will not be gamed in VIC. The overall comparison among alternatives and their contribution to force effectiveness will be based on the C2MOE, FLMOE, and qualitative measures.

B-I-8. Decision criteria. The results of this process will be a list of the study alternatives, in priority order, in accordance with the combination of the analysis results and the importance placed on those analyses by the Study Advisory Group (SAG). This will identify the preferred alternative from an operational analysis perspective.

B-I-9. Resource support requirements. The following are the resource requirements for the operational analysis.

a. Office of the Deputy Chief of Staff for Intelligence (ODCSI).

(1) Validate threat data and assumptions.

(2) Participate in SAG.

b. Commander, TRAC.

(1) Provide guidance and oversight to the operational analysis.

(2) Certify the final report.

c. TRAC-Operations Directorate (TOD).

(1) Provide production and quality oversight.

(2) Review the final report for technical adequacy and forward for Commander, TRAC, certification.

(3) Participate in in-progress reviews (IPRs) as required.

d. TRAC-OAC.

(1) Director, OAC, to establish and chair all IPRs.

(2) C3I SAD.

(a) Manage the conduct of the study.

(b) Develop and coordinate the operational analysis plan.

(c) Determine the functional requirements that will be used in the functional analysis and coordinate it with CASCOM for accuracy and adequacy.

(d) Model the CSS task laydown and alternatives in C2NET.

(e) Conduct the functional, performance, and effectiveness analyses and answer EEA pertaining to issue 1.

(f) Prepare and present all presentations relating to the operational analysis.

(g) Prepare the final report chapter and all associated appendixes.

(3) Production Analysis Directorate (PAD).

(a) Perform all VIC runs in support of the effectiveness analysis and support the analysis of those runs.

(b) Coordinate with study team, SWC, CASCOM, the Combined Arms Command's Threats Directorate (CAC-Threats), as required, for model representation of alternatives and study scenario certification.

(c) Coordinate with TRAC-OAC Model Directorate (MD) for model enhancements.

(d) Participate in IPRs, as required.

(4) MD.

(a) Perform all VIC model enhancements for the effectiveness analysis.

(b) Participate in IPRs, as required.

e. TRAC-Study and Analysis Center (SAC).

(1) Provide TRAC-OAC with Red and Blue weapons performance data for VIC, as required.

(2) Participate in IPRs, as required.

f. TRAC-Scenarios and Wargaming Center (SWC).

(1) Provide scenario support.

(2) Conduct certification review of study scenarios.

(3) Participate in IPRs, as required.

g. TRAC-Fort Lee (LEE).

(1) Provide support, as required, to TRAC-OAC when gaming the base case and alternatives

(2) Participate in IPRs, as required.

h. CAC-Threats.

(1) Assist TRAC-SAC in providing threat data and doctrine.

(2) Participate in the certification of study scenarios.

(3) Participate in IPRs, as required.

i. CASCOM.

(1) Provide a certified CSS task laydown for representation in C2NET.

(2) Provide certified base case and CSSCS performance data for modeling in C2NET.

(3) Validate the functional requirements for completeness, correctness, and adequate identification of critical versus secondary.

(4) Participate in IPRs, as required.

(5) Provide support, as required, for the effectiveness analysis to ensure doctrinal CSS representation in VIC.

j. U.S. Army Materiel Systems Analysis Agency (AMSAA).

(1) Obtain and certify all Blue and Red weapons performance data.

(2) Participate in IPRs, as required.

k. U.S. Army Operational Test and Evaluation Command (OPTEC).

(1) Provide any applicable testing data to be used in the performance analysis.

(2) Participate in SAGs/IPRs, as required.

l. 6th ID (Light).

(1) Provide points of contact (POC) to evaluate CTIS alternative against functional requirements.

(2) Provide CTIS performance data for modeling in C2NET.

(3) Participate in IPRs, as required.

ANNEX II

to

APPENDIX B

COST ANALYSIS PLAN

Annex II
to
APPENDIX B

COST ANALYSIS PLAN

B-II-1. Purpose. This analysis plan describes the cost analysis process and products envisioned for the CSSCS COEA. The cost analysis will address the pertinent cost issues which must be understood before a meaningful program decision can be rendered. Creating "exportable" budget data is not an objective of the COEA. Rather, the findings and conclusions emerging from the cost analysis will be relevant to "best approach" value decisions in a resource-constrained environment.

B-II-2. Scope.

a. Limitations.

(1) The cost analysis will be based on total Army requirements for the resources needed to make the CSS C2 system alternatives work.

(2) "Total Army" means National Guard and Reserve units as well as Active forces.

(3) This definition of scope encompasses all elements of hardware and software peculiar to the CSS C2 mission. ATCCS CHS elements will be included, as appropriate. The CSSCS alternative will include all non-sunk, evolutionary elements of hardware and software required to achieve the objective system. This means, for example, that the objective CSSCS will incorporate the non-sunk costs associated with versions 3 and 4 as well as the version 5 software system.

(4) The cost analysis will quantify the costs of any major secondary impacts resulting from fielding the COEA alternatives. These impacts (if any) will be based on the results of the COEA training and logistics subanalyses. Costs of this nature are generally nonprogrammatic and, therefore, not included in the life-cycle costs (LCC) of a program. Decision costs, on the other hand, are incomplete without them.

(5) The current TRADOC definition of decision costs excludes costs for military personnel. Military personnel impacts, however, can be an important resource consideration in program decisions. Any quantitative personnel impacts identified in the COEA's manpower analysis will, therefore, be included as additional information in the cost analysis documentation.

b. Ground rules and assumptions.

(1) Costs will be presented in the standard Director, Comptroller of the Army-P92(R) format.

(2) The cost base year is FY 1995.

(3) Costs will be presented in constant, current (inflated), and discounted dollars.

(4) All ATCCS components will be in place and operational as indicated in the current fielding schedules.

(5) The current CSS data collection and dissemination systems (e.g., STAMIS) will be treated as constants across the alternatives. That is, the CTIS and objective CSSCS will augment, not supplant, an existing system.

(6) Costs for procuring CSSCS primary support assets such as mobile shelters and command post vehicles will be included in the cost analysis. Existing Army assets will be considered inherited only to the extent that they can be proven "excess" and available to the CSSCS mission.

(7) Multi-use schemes (if any) will not be used to reduce the hardware costs of alternatives by prorating out costs against secondary missions. That is, the costs of CHS/CTIS/CSSCS hardware will be fully charged against their respective alternatives.

(8) Unit-level force structure is a constant for the cost analysis. This means that, although personnel may vary, a "wiring diagram" of CSS mission units is the same for all alternatives.

B-2-3. Methodology. This paragraph specifies the study EEA and provides a generalized view of the cost analysis strategy and outputs.

a. EEA. Issue 2 of the study plan requires an answer to the simple question, what do the alternatives cost? This question generates two straightforward EEA:

(1) EEA 5: What are the decision costs associated with the COEA alternatives?

(2) EEA 6: What resource elements drive the decision costs of alternatives; which ones create the decision cost differences?

b. Alternatives. The following general definitions of CSSCS COEA alternatives provide the framework for the analysis of decision costs.

(1) Base case. The base case is defined as the currently operational, predominantly manual, STAMIS and its functional subcomponents (e.g., SIDPERS, SARSS, SAMS, etc.).

(2) CTIS. The CTIS is an automated decision and executive support system with multiservice development roots. At the macro level, it can provide theater-level graphical and character-based situational data for commanders on a "near real time" basis. The Army component of CTIS was developed by the 6th ID (Light) with contractor and 11th Air Force support.

(3) CSSCS. The CSSCS is a system of hardware and software designed to automate the CSS functions performed under the STAMIS umbrella. It is comprised of movable/mobile shelters, plus the personnel and equipment required for CSS mission performance. Hardware components include an Intel-based x86 transportable computer unit (TCU) (desktop personal computer (PC)), a high-speed line printer, external mass storage device, external power supply, and a smart communication interface unit. Most of the hardware will be procured as a nondevelopmental item (NDI) under the management of the CHS Project Management Office. The CSSCS system evaluated in the COEA is the objective system (i.e., CSSCS version 5.0 software running on compatible CHS host devices). Software development and distribution is the responsibility of the Project Manager (PM)-CSSCS Office.

c. Method of analysis.

(1) The cost analysis will compare alternatives based on decision costs. These costs, as defined for TRADOC COEA, mean the total cost to the Army in deciding to choose one alternative versus another. The things which get counted in the "total cost to the Army" consist, in general, of the non-sunk costs of all assets (equipment, people) directly devoted to making the decision work. Sometimes this equates to the LCC, or programmatic costs, of a system of interest. More often than not, however, the LCC must be augmented/adjusted to get at the "real" cost of the decision.

(2) Decision costs for CSSCS will be based on the project manager's baseline cost estimate (BCE), which is the pertinent LCC document for this analysis. The specific LCC modifications required to yield decision costs are unique to each BCE and study. As such, they cannot be spelled out in absolute detail during the planning phase of an analysis. Based on TRAC-White Sands Missile Range's (WSMR) experience with a large number of cost analyses, the steps listed below are expected.

(a) Military personnel cost adjustment. The cost of military personnel in TRADOC COEA is considered "sunk" because the size of the resource is controlled by congressional decisions, rather than weapons program decisions. With that as a policy, military pay and allowance costs (cost element 5.08) will be excluded from the presentation of decision cost comparisons between the base case and alternatives. In recognition of the post-Cold War downsizing realities, however, military personnel costs will be treated in an excursion section of the cost analysis documentation.

(b) Training/logistics cost adjustments. Accurate training and logistics impacts accrued to the fielding of a new system should be included in the BCE for the system. Unfortunately, this kind of data is usually generated in TRADOC studies (e.g., the COEA) supporting the same decision milestone as the BCE. Because of the timing, augmenting the BCE to capture these impacts has become a function of the COEA via decision costing. The source of data to accomplish this step is the CSSCS COEA training and sustainability subanalyses. Significant impacts which may emerge from these analyses will be incorporated in the cost analysis to the maximum extent possible. The goal, however, is to capture the important impacts, not minor perturbations such as changes in TRADOC schools' course lengths.

(c) Service life adjustments. A goal of decision costing is to establish "fair" comparisons. This very often requires alternative costs to be modified so that they are compared over equivalent timeframes. The driver for the comparison period is the last year of operation for the system which "lives the longest." Costs are constructed and compared for each alternative from this endpoint year back to the current fiscal year. This usually means (at a minimum) extending the life (and costs) of the base case and adding base-case costs to the front end of other alternatives to accurately capture the cost of choosing one alternative over another. Figure B-II-1 shows the concept in graphical terms. In this example, the life of "System 'B'" extends the farthest into the future and serves as the anchor point for the end of the comparison period. Base case and "System 'A'" systems are operated past the end of their normal service lives and phased out on a schedule similar to "System 'B'." All categories of cost associated with these operational systems are, of course, included in the cost analysis. The need to apply this approach is valid for the CSSCS COEA.

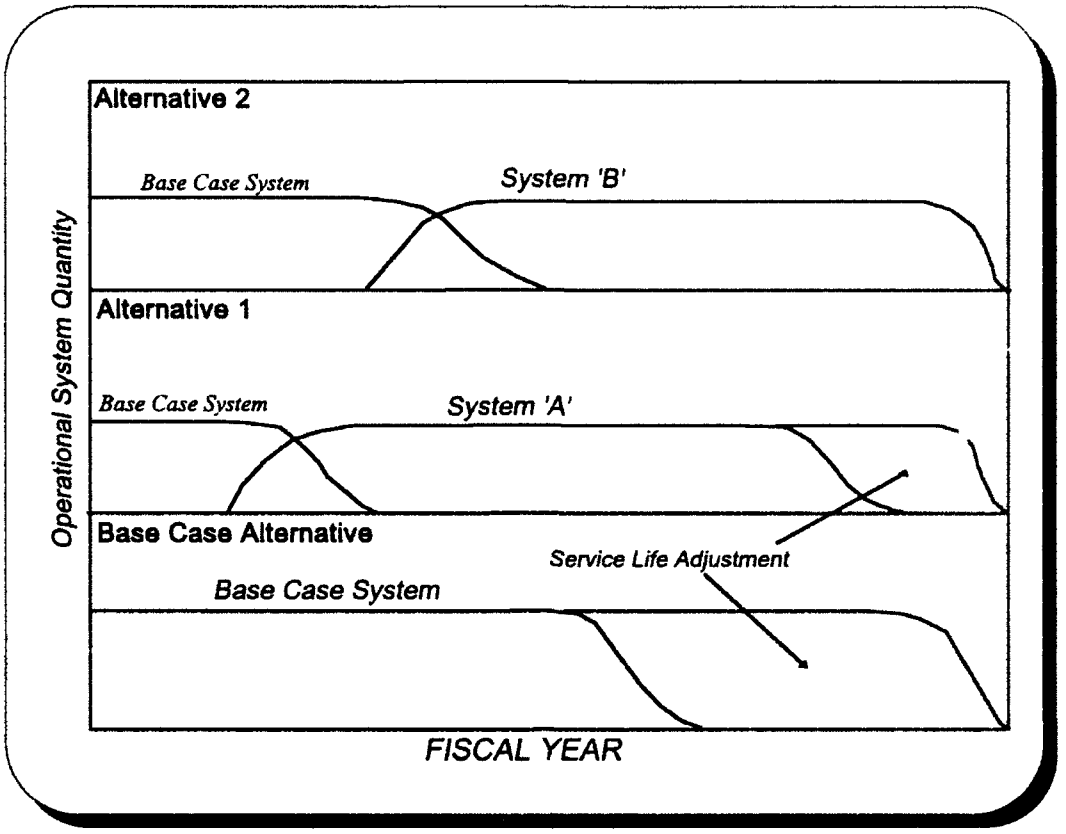

Figure B-II-1. Service Life Adjustment Concept

(3) There is no U.S. Army program office for CTIS and, therefore, no BCE. The development of decision costs for this system will require a joint TRAC/Program Evaluation Officer (PEO)-CSS effort with input from the 6th ID (Light) and 11th Air Force. The steps and probable players involved in this process are as follows.

(a) Step 1 (TRAC-LEE/TRAC-OAC). Obtain a technical description of the software and automatic data processing (ADP) equipment currently comprising the CTIS system from the 6th ID/11th Air Force.

(b) Step 2 (TRAC-LEE/TRAC-OAC). Analyze the CTIS system, based on the above inputs, to determine suitability for an Army CSSCS mission. This analysis should produce a specific list of the functional discrepancies between CTIS and CSSCS mission requirements.

(c) Step 3 (TRAC and PEO-CSS (PM-CHS/PM-CSSCS)). Develop a notional CTIS system in terms of the specific hardware and software needed to perform the CSSCS function in an Army-wide context.

(d) Step 4 (TRAC-WSMR). Develop and submit a cost tasking letter which identifies specific operating system and application software requirements and defines hardware quantities by CTIS component (e.g., PCUs, power supplies, interface devices, and the like).

(e) Step 5 (PEO-CSS (PM-CSSCS/PM-CHS/PM-Operations Tactical Data Systems (PTADS))). Develop life-cycle cost estimates (LCCE) for the CTIS, as defined by TRAC. This task does not require a BCE. Rather, the object is to produce LCCE in enough detail, and with compatible content, to allow for an analytical comparison with the other COEA alternatives. Divergence from BCE reporting format and level of depth will be acceptable.

(f) Step 6 (TRAC-WSMR). Using the data generated in step 5, build decision costs for the CTIS alternative. This step will entail the same adjustments as those described above for the CSSCS cost inputs. Although the details will vary, the concepts are the same.

(4) The cost analysis will be conducted at a sufficient level of detail to show how the costs are distributed over the Army's force structure. Quantitative results of the cost analysis will be presented largely in graphical form with tabular displays added, as appropriate. The accompanying narrative will expand upon, and clearly explain, the results contained in these displays.

(5) As indicated in the study plan, products will include a cost chapter consisting of concise explanations of pertinent results, executive summary input outlining the major findings and conclusions, and a cost appendix. The cost appendix will be the vehicle for providing backup input data, methodology details, and examples to explain the mechanics of any complex calculations.

B-2-4. Data sources. As implied in the previous discussion of methodology, the decision cost analysis will be based on data from sources both internal and external to TRAC. These data, and the expected source, are enumerated below.

a. LCC data for COEAs are developed under the auspices of the Army PEOs and the U.S. Army Materiel Command's (AMC) Program Management offices. LCC estimates and data for the CSSCS COEA alternatives will be generated by PEO CCS. It is expected that PM CSSCS will be the focal point and "clearinghouse" for LCC used in the decision cost analysis. In the absence of an Army program office for the CTIS, the development of CTIS LCC will require a cooperative PEO-CSS/TRADOC effort which will be led on the materiel developer side by PM CSSCS.

b. Force structure and logistics requirements data are necessary inputs for the development of LCC and decision costs. These data requirements are the responsibility of CASCOM and TRAC-LEE. Personnel requirements and major logistics impacts, in particular, will be an important input to TRAC-WSMR for the decision cost analysis.

c. Impacts on training resource requirements will be included in the decision cost analysis as the availability of quantifiable input allows. The source of this input will be the training subanalysis performed by TRAC-WSMR.

d. Data residing external to the TRAC command structure will be formally requested by TRAC-WSMR through the TRADOC Deputy Chief of Staff for Analysis (DCSA). Information exchange within TRAC will be less formal, but should be requested by TRAC-WSMR in writing if the policies of the owning organizations so dictate.

B-2-5. Schedule. A projected schedule of events from the present through the Milestone III decision review is provided below. The schedule focuses on significant nodes in the execution of the cost analysis methodology.

Study schedule	Due date
Formal, rigorous definition of CTIS complete	22 Feb 1993
Cost tasking letter to HQ, AMC	1 Mar 1993
All cost analysis input data at TRAC-WSMR	1 May 1993
Cost analysis documentation complete	mid-Jun 1993
Cost analysis certification	mid-Jun 1993
Analysis integration/Commander, TRAC brief	Jul 1993
SAG/Commander, CASCOM briefs	Aug 1993
Draft COEA to HQDA	Sep 1993
Army Systems Acquisition Review Council	Oct 1993

ANNEX III

to

APPENDIX B

SUPPORTABILITY AND SUSTAINABILITY ANALYSIS PLAN

Annex III
to
APPENDIX B

SUPPORTABILITY AND SUSTAINABILITY ANALYSIS (S&SA) PLAN

B-III-1. Purpose. This supportability and sustainability analysis (S&SA) is to provide insights into the support requirements of the CSSCS hardware and software components and the sustainability implications of fielding CSSCS. This S&SA is part of the COEA which supports a Milestone III decision review in the second quarter FY94.

B-III-2. Scope.

a. Limitations.

(1) Logistics impacts of the CSSCS alternative will be limited to the CSSCS node of ATCCS. Common ATCCS components necessary to integrate CSSCS into the objective ATCCS system will be considered for CSSCS only.

(2) Although the COEA will focus at corps level and below, the theater-level component of CSSCS will be considered to the maximum extent practicable since it is an integral part of CSSCS.

(3) System specifications will be used where SME or empirical data cannot be obtained. Surrogate data will be used where other data are lacking.

(4) If time permits and the effectiveness analysis conducted by TRAC-OAC is successful, CSS measures for supply and maintenance will be analyzed from VIC.

b. Assumptions.

(1) All CSSCS components will be uniformly fielded in accordance with the study alternative descriptions. There will be no "mixed fleet" of CSSCS component versions.

(2) The basic STAMIS represented in the base case will remain constant across the alternatives with the exception of the CSSCS interfaces.

(3) Physical characteristics of current CHS I will be representative of the objective CSSCS hardware.

(4) A detailed and usable description of CTIS can be obtained.

(5) Vulnerability of alternative systems to hostile threats will be the same for each alternative and will not be addressed in this analysis.

c. *Constraints.* Analysis of CTIS will be constrained to the level of detail available in its system description relative to that available for CSSCS.

B-III-3. Environmental and threat considerations.

a. The operational mode summary and mission profiles described in the CSSCS ROC will be used for this analysis.

b. Threats will not be assessed.

c. The NEA 1.0 corps force structure will be used for the corps analysis.

B-3-4. Methodology. This analysis will compute the support requirements for each alternative in the areas of maintenance and reliability, transportation, manpower, and miscellaneous factors. A comparative analysis will then be conducted among the alternatives and the alternatives will be ranked according to their supportability impacts. Since the base is present in all of the alternatives, base-case support requirements will "wash out" in the comparative analysis and, therefore, will not be determined. The base case will be a zero "cost" case in this analysis. In addition, an analysis of the corps/division CSS measures from the effectiveness modeling will be included if that information is available and deemed meaningful.

a. *Related studies.*

(1) Materiel Traffic Management Command Transportation Engineering Agency (MTMCTEA), "Initial Transportability Engineering Analysis for the Maneuver Control System (MCS) AN/TYQ-45", technical report #TR 92-V4-23, June 1992.

(2) MTMCTEA, "Interim Transportability Engineering Analysis for the Standardized Integrated Command Post System (SICPS)", technical report #TR 87-S4-19, August 1990.

(3) PM-CHS, "Integrated Logistic Support Plan (ILSP) for Common Hardware/Software", May 1992.

(4) PM CSSCS, "Integrated Logistic Support Plan for the Combat Service Support Control System (CSSCS)", January 1992.

(5) U.S. Army Logistics Center, "Abbreviated Analysis for the Combat Service Support Control System", September 1990.

(6) U.S. Army Logistics Center and Fort Lee (Prov), "Reliability and Maintainability Engineering Analysis for the Combat Service Support Control System (CSSCS) and Its Associated Army Command and Control System (ACCS) Common Hardware and Software (CHS)", March 1990 with revision 26 August 92.

b. EEA. The following EEA address issue #3, "What are the supportability and sustainability implications of the base case and alternatives?"

(1) EEA 9. What are the impacts on transportation to include transportation assets, transportability, and deployability?

(a) S&SA EEA 1: Transportation assets. What is the impact of the alternatives on the requirement for organic trucks/trailers?

(b) S&SA EEA 2: Transportability/deployability. What are the impacts on item transportability and force deployability associated with fielding each alternative on:

1. Intracontinental U.S. movement from home station (by rail or highway) to the port of embarkation (POE)?

2. Strategic intertheater movement of Army units (by C-141 and C-5 aircraft) from the POE to the port of debarkation (POD)?

3. Intratheater movement (by highway, rail, marine, and air) from POD forward?

(2) EEA 10. What are the impacts on maintenance to include identifying the maintenance concept; reliability, availability, and maintainability (RAM) characteristics; and maintenance workload?

(a) S&SA EEA 3: Maintenance concept. What is the maintenance concept for each alternative?

(b) S&SA EEA 4: Reliability/maintainability. What are the reliability and maintainability characteristics of the alternative systems at the subsystem level?

(c) S&SA EEA 5: Maintenance workload. What is the corps maintenance manhour (MMH) requirement for each alternative?

(d) S&SA EEA 6: Class IX (repair parts). What is the impact of the alternatives on requirements for initial stockage of spares?

(3) EEA 11. What are the manpower requirements?

(a) S&SA EEA 6: Maintenance manpower. What is the corps maintenance manpower requirement for each alternative?

(b) S&SA EEA 7: Other manpower. What is the corps requirement for additional nonmaintenance manpower for each alternative?

c. MOE. The following summarizes the MOP and MOE to be used in the analysis.

(1) MOP

(a) Transportation/deployment analysis.

1. Transportation mode (highway, rail, marine, and air) constraints.

2. Transportation restrictions (continental U.S. (CONUS) and outside CONUS (OCONUS)).

3. Transportation requirements and sufficiency of transportation assets for tactical (battlefield) movement.

4. Transport preparation time.

5. Deployment impacts measured in anticipated direction of change (increase, decrease, no change) on closure times, aircraft sorties, and strategic transportation asset requirements.

(b) Maintenance analysis.

1. Reliability of alternative systems.

a. Mean time between operational mission failure (MTBOMF).

b. Mean time between unscheduled maintenance action (MTBUMA).

2. Maintainability.

a. Maintenance ratio (MR) for each alternative at unit and direct support (DS) levels--measured in maintenance manhours per operating hour (MMH/HR).

b. Mean time to repair (MTTR) at unit and DS levels for each alternative.

c. MMH required for each alternative.

3. Other measures.

a. Recovery impacts. Anticipated limits of current unit recovery assets to recover the alternative systems.

b. Class IX/line replaceable unit (LRU) sparing cost.

c. Class III requirements.

(c) Manpower requirements.

1. Maintenance manpower requirements for each alternative.

2. Other manpower requirements for each alternative.

(2) MOE. The following MOE and the EEA they address are noted in table B-III-1.

(a) MOE A. Transportability rating: overall rating of negative, zero, or positive impact.

(b) MOE B. Deployability rating: overall rating of negative, zero, or positive impact.

(c) MOE C. Operational availability of alternative systems as calculated from RAM analysis.

(d) MOE D. Total manpower impact of each alternative based on total planned CSSCS fielding.

(e) MOE E. CSS Impact rating: overall rating from corps effectiveness gaming of negative, zero, or positive impact on available CSS measures.

Table B-III-1. Matrix of EEA and supporting MOE

	MOE A	MOE B	MOE C	MOE D	MOE E
EEA 9	X	X			X
EEA 10			X		X
EEA 11				X	X

d. Alternatives.

(1) Base case. Currently fielded systems such as STAMIS. The base-case STAMIS will be in their objective forms and since they will be constant throughout the alternatives, no analysis will be conducted on the STAMIS support requirements.

(a) Under this alternative, management of CSS information within the division and corps is primarily accomplished within specific functional areas, i.e.:

1. Personnel management. Standard installation/division personnel system (SIDPERS).

2. Materiel accountability. Standard property book system--Redesigned (SPBS-R).

3. Supply. Standard army retail supply system (SARSS).

4. Maintenance. Standard army maintenance system (SAMS).

5. Ammunition. Standard army ammunition system (SAAS).

6. Transportation movement. DA movements management system--Redesigned (DAMMS-R).

7. Medical. The Army medical management information system (TAMMIS).

(b) Each functional area collects, stores, and analyzes CSS data using personnel in separate units down to company level. Data elements are collected manually or by automated nonstandard processes, are passed by voice, message, or courier to higher units for use in planning, and are stored in the various CSS STAMIS. The STAMIS are not connected physically and cannot pass

information to or from each other. The CSS STAMISs are logically connected when a planner manually integrates information obtained from two or more of them.

(2) Alternative 1. CTIS (an automated decision support system currently operational in the Alaskan Command and 6th ID (Light)). Characteristics of the system are:

(a) Decentralized system using inexpensive NDI hardware/software (personal computer versus workstation level).

(b) CTIS-developed graphical geographic display software.

(c) User-defined data screens with near real-time synchronously updated data bases.

(d) Configurable into self-contained modular unit deployable packages (MUDPACs).

(3) Alternative 2. Objective CSSCS.

(a) CSSCS is an automated C2 system designed to collect data from the CSS STAMIS and produce usable and timely summary information that supports decisionmaking. CSSCS is a decision support tool. CSSCS will provide the CSS commander, CSS staff, and force-level commanders with near real-time logistical, medical, financial, and personnel C2 information that will accelerate the decisionmaking process.

(b) CSSCS will utilize NDI ATCCS CHS and unique CSSCS software to integrate the data maintained in the subordinate functional CSS STAMIS. The CSSCS hardware configuration is comprised of one of two computer systems housed in one of four standardized installation command post system (SICPS) variants. The CHS I components are:

1. Digital computer system (DCS), transportable.

- Transportable computer unit (TCU) (CP-2059(V)2/U): an HP 9000-series 375 computer.

- Printer (PT-546(V)2/U).

- Display unit (IP=1654(V)2/U): a super high-resolution color monitor.

- Uninterruptable power supply (PP-8282/U): an 800-watt 5-1/2 minute power supply.

- Mass storage expansion unit (MSEU) (MU-1039(v)2/U): an expansion box to house three full-height peripherals.

- Hard disk unit (HDU) (MU-1-13(V)2/U): can be housed in MSEU.

- TCU CD-ROM: can be housed in MSEU.

- Optical disk drive: can be housed in MSEU.

- Archive device (MU-1-12(V)2/U): cassette magnetic tape transport device; can be housed in MSEU.

- Adaptive programmable interface unit (APIU) (MD-1271B/U): a multichannel tactical communications interface device.

- Signal data converter (CV-4175/U): a fiber-optic transmitter/receiver to interface with Ethernet local area network (LAN).

2. DCS, lightweight.

- Lightweight computer unit (LCU) (CP-2112A(V)1/U) - 25 MHz 486 laptop with VGA liquid crystal display (LCD) screen.

- LCU HDU (MU-1056/U).

- Lightweight printer (PT-555/U).

- Tape backup unit (MU-1061/U).

- LCU CD ROM.

- Tactical communication interface module (TCIM): lightweight two-channel modem.

- External floppy disk drive (FDD) (MU-1058/U).

- Display unit, external (IP-1671/U): VGA color monitor.

- External power supply: 110-volt AC or 12-volt DC power supply.

3. SICPS (consists of four separate configurations which can be assembled into a wide variety of integrated command centers):

- Tent configuration: tent and transit cases; two-person, portable, and travels as restrained cargo.

- Rigid wall configuration: rigid wall shelter (RWS) with tent, mounted on a heavy high-mobility multipurpose wheeled vehicle (HMMWV) with a towed power system. All CSSCS hardware is rack-mounted within the shelter.

- 5-ton expandable van: 5-ton expandable van with rack-mounted configuration identical to RWS.

- XM1068: M577 tracked command post variant with rack-mounted configuration identical to RWS.

(c) In the division, CSSCS will be employed (as of 4 April 92) at:

1. Forward support battalion (FSB), support operations section: TCU in a 5-ton expandable van, SICPS variant.

2. Maneuver brigade S1/S4 section: LCU in XM1068 SICPS variant.

3. Division support command (DISCOM), S2/S3 section: TCU in a HMMWV with SICPS RWS. This device will provide the interface between the other ATCCS nodes and the CSSCS devices within the division.

4. Division materiel management center (DMMC): two TCUs and two LCUs in a 5-ton expandable van and tent SICPS variants. These devices will interface with the supply, maintenance, medical, and transportation STAMIS.

5. Main support battalion (MSB), support operations section: TCU in a 5-ton expandable van, SICPS variant. This device will interface with the supply, maintenance, medical, transportation, and personnel STAMIS.

6. Aviation maintenance company: LCU in a tent, SICPS variant.

7. Division staff, G1 and G4 sections: TCU in HMMWV with RWS and 5-ton expandable van, respectively. The division transportation officer (DTO) in the G4 section has an LCU and tent, SICPS.

(d) Combinations of TCUs, LCUs and SICPS variants are employed in the airborne, air assault, and light infantry divisions and in functional battalions (medical, supply, transportation, and maintenance).

(e) CSSCS in the corps is conceptually the same as that for the division in that it performs the same type of functions. However, due to force structure differences, the interfaces are

more complex. CSSCS devices are located at the corps G1/G4 sections, the corps materiel management center, the corps movement control center, medical brigades and groups, separate brigades, and armored cavalry regiments.

(f) At EAC, CSSCS devices are located in the theater army headquarters personnel and logistics sections; the theater army materiel management center; the theater army movement control agency; the personnel command; medical command; civil affairs company; petroleum group; and special ammunition brigade; air defense command; and theater army area command.

e. *Method of analysis.*

(1) Literature search. A literature search will be conducted using Defense Logistics Studies Information Exchange (DLSIE) and Defense Technical Information Center (DTIC).

(2) A comparative analysis (figure B-III-1) among the alternatives will be conducted on the following areas:

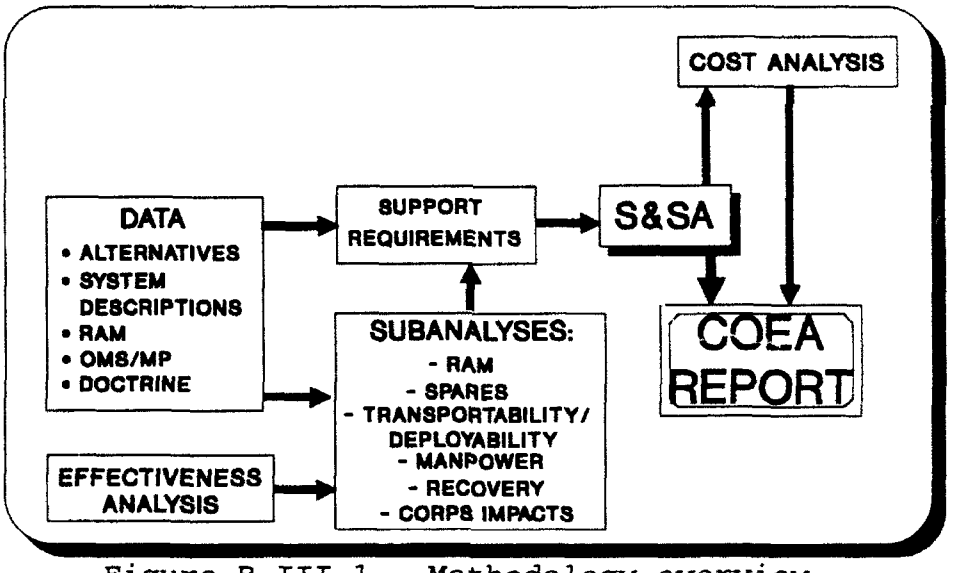

Figure B-III-1. Methodology overview.

(a) RAM.

(b) Recovery.

(c) Class IX initial stockage requirements.

(d) Maintenance requirements.

(e) Transportation impacts of making unit moves.

(f) Transportability and deployability.

(g) Manpower.

(h) Corps CSS impacts from the effectiveness gaming (if available and meaningful).

(3) Subanalysis requirements.

(a) RAM Subanalysis [TRADOC RAM cell, formerly at the Combined Arms Support Command (CASCOM), at the U.S. Army Quartermaster Center and School (USAQMC&S)]. The RAM analysis will examine RAM impacts for the specific alternative systems. The USAQMC&S RAM cell, in conjunction with AMSAA, will use the approved operational mission summary/mission profile (OMS/MP) and operational mission requirements from the CSSCS ROC, existing RAM data, and any additional observed data from the early unit test and evaluation (EUTE) conducted at Fort Hood in the first quarter FY 93 to perform a comparative analysis of the study alternatives.

(b) Recovery subanalysis [U.S. Army Ordnance Center and School (USAOC&S)]. Recovery requirements for units equipped with CSSCS will be assessed by SMEs to determine whether recovery assets presently existing can handle additional requirements.

(c) Class IX subanalysis [PM-CSSCS/Communications Electronics Command (CECOM), time and resources permitting]. The PM CSSCS will request CECOM to conduct an initial sparing analysis for CSSCS. CECOM will use the SESAME model to identify a dollar value of initial spares to meet a specific availability level.

(d) Manpower subanalysis [TRAC-Fort Ben Harrison (TRAC-FBHN)]. For each alternative, identify the additional manpower requirements for maintenance, operator/crew, and other.

(e) Transportability/deployability subanalysis [MTMCTEA].

1. Transportability. Determine the item transportability for the various components and configurations of the alternative systems and SICPS by highway, rail, marine, and air modes, as required. These will include explanations of restrictions to ship in CONUS as well as OCONUS. Determine the transportability within theater by helicopter.

2. Deployability. Assess the deployability implications (if any) of units equipped with alternative hardware in terms of the impact on standard deployment measures (e.g., closure times, equipment requirements, sorties and

POE/POD restrictions for deployment by surface, air, and sealift. This will be an SME, rather than analytical, assessment.

(f) Corps-level CSS impact subanalysis [TRAC-LEE]. TRAC-LEE will assess the impact on CSS measures (supply, maintenance, transportation) from the corps-level model VIC chosen by TRAC-OAC for the operational effectiveness analysis, if such measures exist and if the model can reasonably represent the effects of C2 on the measures.

(4) Models.

(a) VIC. TRAC-OAC will run VIC to support the CSSCS COEA. TRAC-LEE will use the results of the model runs to measure the CSS effects of the alternatives, if possible.

(b) SESAME. SESAME is a computer model designed for provisioning spares for newly fielded equipment. SESAME will compute the necessary stockage to achieve a specified operational availability (Ao). CECOM will manage and assist in the development of the support list allowance card (SLAC) decks and in the distribution of initial issue prescribed load list (PLL) and authorized stockage list (ASL) depot-level repairables (DLRs), LRUs for user systems.

(c) AUTOTRAN, TARGET, RAPIDSIM, AALPS. These models are available to and used by MTMCTEA to simulate the various aspects of unit transportability and deployment. Because the individual hardware components of CSSCS are relatively small and the system is sparsely distributed across the theater (total scheduled procurement is 1,381 units) and not concentrated in a specific type of unit, these models may or may not be used by MTMCTEA to support this analysis.

(5) Data requirements for CTIS, CSSCS, and SICPS hardware components.

(a) Predicted or observed RAM.

1. MTBOMF.

2. MTBUMA.

3. MTTR at unit and DS levels for unscheduled maintenance actions.

4. MR for unscheduled maintenance at the unit and DS levels.

5. Ao at the system level.

(b) Class III consumption data in gallons per hour for vehicles and generators.

(c) Transportability/deployability.

1. Overall height, length, and width in inches.

2. Single, tandem, and trailer axle load in pounds.

3. Center of gravity from ground, front axle, curb, front in inches.

4. Gross vehicle weight in pounds.

5. Sketches of each hardware component with dimensions in pounds.

(d) Spares. Initial stockage of spares (DLRs/LRUs) at unit, DS, and regional support centers (RSCs) in terms of the number of LRUs stocked and total cost.

(e) Recovery. Transportability requirements and limitations for a recovery operation for vehicle-mounted components.

(f) Manpower. The number of lines of code for CTIS- and CSSCS-unique software.

B-III-5. Decision criteria. The alternatives will be rank-ordered (table B-III-2) in each of the analysis areas in terms of magnitude and direction of impact. An overall ranking for each alternative relative to the "zero" base case will then be made, assuming equal weight for each factor. The preferred alternative from a supportability and sustainability standpoint is the alternative with the lowest supportability burden.

Table B-III-2. Ranking of alternatives

Analysis Element	CTIS	CSSCS
1. RAM & Ao Characteristics		
2. Maintenance requirements		
3. Recoverability		
4. Initial Stockage Class IX		
5. Manpower		
6. Transportation for unit moves		
7. Transportability/deployability		
8. Corps CSS impacts		
TOTAL		

B-3-6. Resource support requirements.

a. Support requirements.

(1) RAM Cell at USAQMC&S will perform RAM analyses and provide a written report to TRAC-LEE.

(2) USAOC&S will perform a recovery subanalysis and provide a written report to TRAC-LEE.

(3) PM CSSCS will request CECOM to perform a sparing sub-analysis and provide written results to TRAC-LEE.

(4) TRAC-FBHN will perform a manpower analysis and provide written results to TRAC-LEE.

(5) TRAC-LEE will:

(a) Write the S&SA analysis plan.

(b) Write the data requests and submit them through proper channels.

(c) Perform the corps-level analysis using results provided by TRAC-OAC.

(d) Determine the organic transportation requirements necessary to move CSSCS in unit displacements.

(e) Integrate the subanalyses, write, and brief the final S&SA report, as required.

(6) MTMCTEA will perform the transportability and deployability sub-analysis and provide a written report to TRAC-LEE.

(7) PM CSSCS/PM CHS will:

(a) Request sparing data from CECOM.

(b) Provide hardware and software descriptions to TRAC-LEE.

(8) TRAC-OAC will:

(a) Assist in developing the description and obtaining data for the CTIS alternative.

(b) Provide CSS data from the combat effectiveness modeling, as appropriate.

b. S&SA schedule.

Tasking	Date
Draft S&S analysis plan to study director	12 Feb 93
Data request submitted	22 Feb 93
All requested data received	19 Mar 93
MTMCTEA: transportability/ deployability subanalysis to TRAC-LEE	12 Apr 93
PM CSSCS/CECOM: class IX subanalysis to TRAC-LEE	12 Apr 93
RAM cell at USAQMC&S: RAM subanalysis to TRAC-LEE	12 Apr 93
USAOC&S: recovery subanalysis to TRAC-LEE	12 Apr 93
TRAC-FBHN: manpower subanalysis to TRAC-LEE	12 Apr 93

Tasking	Date
TRAC-OAC: effectiveness modeling results to TRAC-LEE	7 May 93
TRAC-LEE: S&SA analysis complete to TRAC-OAC	17 May 93
TRAC-LEE: draft S&SA report to TRAC-OAC	16 Jul 93

c. Manpower estimates.

Agency	PSY	Support/other
TRAC-LEE	0.5	S&SA analysis
TRAC-FBHN	0.3	Manpower subanalysis
TRAC-OAC	0.1	System description support
TRAC-SAC	0.1	Data support
MTMCTEA	0.1	Transportability/ deployability subanalysis
USAOC&S	0.1	Recovery subanalysis
AMSAA	0.1	RAM data support
RAM cell	0.1	RAM subanalysis
PM CSSCS	0.1	Data and system description support
PM CSSCS/CECOM	0.1	Class IX subanalysis
PM CHS	0.1	Data and system description support
CASCOM	0.2	Data and functional support
Total	1.9	

ANNEX IV

to

APPENDIX B

TRAINING ANALYIS PLAN

Annex IV
to
APPENDIX B

CSSCS TRAINING ANALYSIS PLAN

B-IV-1. Purposes. The purpose of the training analysis is:

a. To support the COEA by determining the training implications of two automated C2 systems.

b. To describe the study issue, what questions will be answered, the methodology for conducting the study, what data will be used, and what support will be required.

B-IV-2. Scope. The training analysis will project the changes in training requirements posed by adding CSSCS or CTIS into the force for the operators, maintainers, and supervisors.

a. Limitations.

(1) Projections will be based on the best estimate of what the systems will eventually be.

(2) The analysis will be based on information available during the study time period.

b. Assumptions.

(1) The operators, maintainers, and supervisors used for this study are representative of base-case users and the intended users of the alternatives.

(2) The tasks and system descriptions provided are reasonably accurate.

(3) All CSSCS training will be conducted in the unit with embedded training.

c. Constraints.

(1) Projected CTIS training requirements will be for the U.S. Army, only.

(2) CTIS analysis is dependent on timely acquisition of needed information from the 6th ID (Light) in Alaska.

B-IV-3. Environmental and threat consideration(s). Not applicable.

B-IV-4. Methodology.

a. Related studies.

(1) TRAC-WSMR, "Combat Service Support (CSS) Standard Army Management Information Systems (STAMIS) Tactical Army Combat Service Support Computer System (TACCS) Training Effectiveness Analysis (TEA) Update", TRAC-WSMR-TEA-91-022, June 1991.

(2) TRAC-WSMR, "Combat Service Support Control System (CSSCS) Training Impact Analysis (TIA)", ongoing study.

b. EEA. The training analysis will address study issue 4 of the COEA which includes the following EEA.

(1) What are the maintenance training requirements?

(2) What are the operator training requirements?

(3) What are the supervisory training requirements?

c. MOE. The study will compare the training requirements of the base case to those of alternative 1 (CTIS) and alternative 2 (CSSCS). The base-case training informaiton will be used as a basis of comparison. The specific training requirements and the specific information to be compared for each alternative and for each requirement are shown in table B-IV-1.

Table B-IV-1. Training requirements and analysis items to be compared

Requirement	Analysis Items (CSSCS and CTIS)
Personnel	Identify base-case users/operators. Identify who will operate, mairtain, and supervise CSSCS and CTIS.
Tasks/functions	Identify tasks currently performed by CSS C2 personnel. Compare current tasks performed to tasks required by CSSCS and CTIS.
Skills	Identify skills which current CSS C2 personnel already have that are also needed for CSSCS and CTIS. Identify skills needed for CSSCS and CTIS which current personnel do not have.
Potential training risks	Identify training required for current CSS C2 personnel to learn CSSCS and CTIS skills they do not currently have.

d. Alternatives.

(1) Base case. The base case consists of the current manual CSS procedures and any currently fielded systems such as STAMIS. This base case is established for analytical purposes. As such, the other ATCCS components are in their objective state to maximize constancy between the base case and alternatives.

(2) Alternative 1. This alternative consists of the CTIS which imports U.S. Army, Navy, and Air Force information for both peacetime and wartime use. It is currently operational in the Alaskan Command. The Army subsystem, developed by the 6th ID (Light), is a decision and executive support system fielded from division- to battalion-level elements in the 6th ID (Light). Again for consistency, the other ATCCS components (FAADC2, MCS, AFATDS, and ASAS) are portrayed in this alternative in their objective states.

(3) Alternative 2. This alternative represents the objective CSSCS (version 5) on CHS. STAMIS is still represented (as CSSCS does not replace it); CSSCS utilizes the input from the different STAMIS. All ATCCS components will be depicted in their objective states with computerized interface. This alternative will identify the utility of CSSCS.

e. Method of analysis. The base-case training requirements data, (to be used as a basis of comparison), will be obtained from a previous TRAC-WSMR study which was a training effectiveness analysis (TEA) of the STAMIS-TACCS (see reference 1) and from an ongoing, more in-depth, CSSCS training impact analysis (reference 2). Data used to describe the alternatives will be obtained from existing system and training documentation, SME input, and surveys and/or interviews of projected users and maintainers. Table B-IV-2 shows the types of data and data sources which will be used in this analysis. The projected training requirements for the operator, supervisor, and maintainer of each alternative will be compared to those of the base case.

B-IV-5. Decision criteria. Differences in operator, supervisor, and maintainer training requirements between the base case and those projected for each alternative will be assessed in terms of additions, deletions, or "no change" for each type of requirement. Any changes in training requirements associated with each alternative will be identified.

Table B-IV-2. Analysis items and data sources

Analysis Item	Data Source Base Case	Data Source CSSCS	Data Source CTIS
Identify base-case users/ operators. Identify who will operate, maintain, and supervise CSSCS and CTIS.	STAMIS-TACCS TEA data on actual users	CSSCS TIA data	CTIS SME interviews, demonstrations, and observations of system
Identify tasks currently performed by CSS C2 personnel. Compare current tasks performed to tasks required by CSSCS and CTIS.	Base-case task list, STAMIS-TACCS TEA job survey data	CSSCS task list, CSSCS TIA intended user interview data	CTIS task list, SME interviews, written-system documentation, written training documentation
Identify skills which current CSS C2 personnel already have that are also needed for CSSCS and CTIS. Identify skills needed for CSSCS and CTIS which current personnel do not have.	STAMIS-TACCS TEA job survey data, base-case task list	CSSCS task list, CSSCS TIA intended user interview data, observations of system	CTIS task list, observation of system operation, SME interviews
Identify training required for current CSS C2 personnel to learn CSSCS and CTIS skills they do not currently have.	STAMIS/TACCS TEA data, base-case user interviews, task lists	Task lists, intended user interview data	Task lists, SME interviews, observation of system operation

B-IV-6. Resource support requirements. Resources required are shown for each agency in PSY. TRAC-WSMR travel requirements shall not exceed $5K.

Agency	PSY (est)	Support/Other
TRAC-WSMR	1.0	Training analysis
PM-CSSCS	0.1	CSSCS written documentation
Alaskan Command	0.1	CTIS written documentation
Alaskan Command	0.1	CTIS SME support
Total	1.3	

APPENDIX C

LIST OF ACRONYMS

APPENDIX C

LIST OF ACRONYMS

AALPS	model used by MTMCTEA
ACCS	Army command and control system
ADP	automatic data processing
AFATDS	advanced field artillery tactical data system
ALB	AirLand Battle
AMC	U.S. Army Material Command
AMSSA	U.S. Army Material Systems Analysis Agency
Ao	operational availability
AOE	Army of Excellence
APIU	adaptive programmable interface unit
ASARC	Army Studies and Review Committee
ASL	authorized stockage list
ATCCS	Army tactical command and control system
AUTOTRAN	model used by MTMCTEA
BCE	baseline cost estimate
BFA	battlefield functional area
C2	command and control
C2MOE	command and control measures of effectiveness
C2NET	Command and Control Network (model)
C3I SAD	Command, Control, Communications, and Intelligence Studies and Analysis Directorate
CAC	Combined Arms Command
CASCOM	Combined Arms Support Command
CECOM	Communications Electronics Command
CD	combat developments
CHS	common hardware/software
COA	course of action
COEA	cost and operational effectiveness analysis
COIC	Critical Operational Issues and Criteria (document)
CONUS	continental United States
COSCOM	Corps Support Command
CSS	combat service support
CSSCS	combat service support control system
CTIS	command tactical information system
DAMMS-R	DA Movements Management System - Redesigned
DCA-P92(R)	Director, Comptroller of the Army
DCS	Deputy Chief of Staff
DCSA	Deputy Chief of Staff for Analysis
DISCOM	division support command
DLR	depot-level repairables

DLSIE	Defense Logistics Studies Information Exchange
DMMC	division materiel management center
DS	direct support
DTIC	Defense Technical Information Center
DTO	division transportation officer
EAC	echelons above corps
EEA	essential elements of analysis
EUTE	early unit test and evaluation
FAADC2I	Forward Area Air Defense Command, Control, and Intelligence
FDD	floppy disk drive
FLER	fractional loss exchange ratio
FLMOE	force-level MOE
FRAGO	fragmentary order
FRD	Functional Requirements Document (document)
FSB	forward support battalion
FY	fiscal year
HDU	hard disk unit
HMMWV	high-mobility multipurpose wheeled vehicle
hq	headquarters
ID	Infantry Division
ILSP	Integrated Logistic Support Plan (document)
IPR	in-progress review
LAN	local area network
LCC	life-cycle cost
LCCE	life-cycle cost estimate
LCD	liquid crystal display
LCU	lightweight computer unit
LRU	line replaceable unit
MCS	maneuver control system
MD	Model Directorate (TRAC-OAC)
MMH	maintenance manhour
MMH/HR	maintenance manhour per operating hour
MOA	method of analysis
MOE	measures of effectiveness
MOP	measures of performance
MR	maintenance ratio
MSB	main support battalion
MSEU	mass storage expansion unit
MTBOMF	mean time between operational mission failure
MTBUMA	mean time between unscheduled maintenance action
MTMCTEA	Military Traffic Management Command Transportation Engineering Agency
MTTR	mean time to repair
MUDPAC	modular unit deployable packages

NDI	nondevelopmental item
NEA	Northeast Asia
OCONUS	outside continental United States
OMS/MP	operational mission summary/mission profile
OPORD	operations order
PAD	Production Analysis Directorate (TRAC-OAC)
PC	personal computer
PCU	portable computer unit
PEO-CSS	Program Executive Office - Combat Service Support
PLL	prescribed load list
PM-CHS	Program Manager - Common Hardware/Software
PM-CSSCS	Program Manager - Combat Service Support Control System
POC	point of contact
POD	port of debarkation
POE	port of embarkation
PSY	professional staff years
RAM	reliability, availability, and maintain ability
RAPIDSIM	model used by MTMCTEA
ROC	Required Operational Capability (document)
ROM	read only memory
RSC	regional support centers
RWS	rigid wall shelter
S&SA	supportability and sustainability analysis
SAAS	Standard Army Ammunition System
SAG	Study advisory group
SAMS	standard Army maintenance system
SARSS	standard Army retail supply system
SER	system exchange ratio
SESAME	model used by CECOM
SICPS	Standardized Integrated Command Post System
SIDPERS	Standard Installation/Division Personnel System
SLAC	support list allowance card
SME	subject-matter expert
SPBS-R	Standard Property Book System - Redesigned
STAMIS	Standard Army Management Information System
SWC	Scenarios and Wargaming Center
TAMMIS	The Army Medical Management Information System
TARGET	model used by MTMCTEA
TCIM	Tactical communication interface module
TCU	tactical computer unit
TDR	tactical decision rules
TEA	training effectiveness analysis
TEMP	Test and Evaluation Master Plan (document)
TR	technical report

TRAC-FBHN	TRADOC Analysis Command - Fort Benjamin Harrison
TRAC-OAC	TRADOC Analysis Command - Operational Analysis Center
TRAC-WSMR	TRADOC Analysis Command - White Sands Missile Range
TRADOC	Training and Doctrine Command
UIR	user interface requirements
USAOC&S	United States Army Ordinance Center and School
USAQMC&S	United States Army Quartermaster Center and School
VIC	Vector-In-Commander (model)

APPENDIX D

ANALYSIS PLAN DISTRIBUTION LIST

APPENDIX D

ANALYSIS PLAN DISTRIBUTION LIST

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