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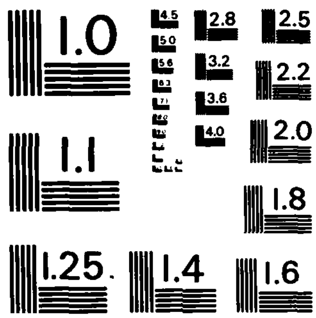

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AUTOMATED COMBAT ENGINEER OPERATIONS AND PLANNING SYSTEM (ACEOPS)

ENGINEER STUDIES CENTER
US ARMY

Prepared by
Engineer Studies Center
US Army Corps of Engineers

November 1984

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This study outlines the concepts and general specifications for an Automated Combat Engineer Operations and Planning System (ACEOPS). ACEOPS is compatible with the Army Command and Control Master Plan and consistent with the Command and Control Subordinate System architecture. ESC determined that: (1) it is feasible to automate essential engineer planning and operational activities; and (2) a system can be developed for use during both peacetime and wartime. Although the study focuses mainly on the automation needs of combat engineers

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In Europe, the automation concept could be applied throughout the Army. The relationship of the combat engineer system to other battlefield systems is discussed. Constraints on engineer system development imposed by total force automation plans and developments are identified and assessed. General functional requirements specifications are described for use as initial user requirements and to help structure early software development. The study also recommends actions which should be taken to ensure that engineer needs are considered in a timely and adequate manner in battlefield automation activities already under way. [illegible] battlefield automation, [illegible] Engineer ADP systems, [illegible] Engineer system specifications,

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AUTOMATED COMBAT ENGINEER OPERATIONS

AND PLANNING SYSTEM (ACEOPS)

Prepared by
Engineer Studies Center
US Army Corps of Engineers

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CONTENTS

ABSTRACT

This study outlines the concepts and general specifications for an Automated Combat Engineer Operations and Planning System (ACEOPS). ACEOPS is compatible with the Army Command and Control Master Plan and consistent with the Command and Control Subordinate System architecture. ESC determined that (1) it is feasible to automate essential engineer planning and operational activities, and (2) a system can be developed for use during both peacetime and wartime. Although the study focuses mainly on the automation needs of combat engineers in Europe, the automation concept could be applied throughout the Army. The relationship of the combat engineer system to other battlefield systems is discussed. Constraints on engineer system development imposed by total force automation plans and developments are identified and assessed. General functional requirements specifications are described for use as initial user requirements and to help structure early software development. The study also recommends actions which should be taken to ensure that engineer needs are considered in a timely and adequate manner in battlefield automation activities already under way.

LIST OF ABBREVIATIONS AND ACRONYMS

ABIC..................Army Battlefield Interface Concept
ABPS..................Automated Barrier Planning System
AC....................Access Terminal
ACAB..................air cavalry brigade
ACCS..................Army Command and Control System
ACCSDP................Army Command and Control System Development Plan
ACE...................Assistant Corps Engineer
ACEOPS................Automated Combat Engineer Operations and Planning System
ACR...................ACCS Capability Requirement
ACR...................armored cavalry regiment
AC^2MP..............Army Command and Control Master Plan
ADA...................air defense artillery
ADACS.................Air Defense Artillery Control System
ADC...................air defense control
$ADCSOPS-C^4$...........Assistant DCSOPS for Command, Control, Communications, and Computers
ADE...................Assistant Division Engineer
ADM...................atomic demolitions munitions
ADP...................automatic data processing
AFCENT................Allied Forces, Central Europe
AG....................Adjutant
AHS...................Academy of Health Services
AR....................Army Regulation
ASAS..................All Source Analysis System
ASIC..................All Source Intelligence Center
ATK...................antitank
AVLB..................armored vehicle launched bridge
avn...................aviation

BARREP................Barrier Report
BCR...................Battlefield Communication Review
bde...................brigade
BLACS.................Battalion Level Command and Control System
BLD...................battalion Level device
bn....................battalion
BR....................bridge

CAC...................Combined Arms Center
CACDA.................Combined Arms Combat Development Activity
CAME..................Corps Airspace Management Element
cav...................cavalry
CC(L).................close combat (light)
CC(M).................close combat (mechanized)
CCS^2.................Command and Control Subordinate System
CE....................communications-electronics
CENSEI................Center for Systems Engineering and Integration
CENTAG................Central Army Group

CERL..................United States Army Construction Engineering Research Laboratory
CEV...................combat engineer vehicle
C^4...................command, control, communications, and computer
CNR...................combat net radio
co....................company
COEA..................Cost and Operational Effectiveness Analysis
CONUS.................Continental United States
COPS..................Countermobility Operations Planning System
COSCOM................Corps Support Command
CP....................command post
CR....................Central Region
CRBA..................Central Region Barrier Agreement
CSS...................combat service support
CTOC..................Corps Tactical Operations Center

DA....................Department of the Army
DAME..................Division Airspace Management Element
DAMMS.................DA Movement Management System
DARCOM................United States Army Materiel Development and Readiness Command
DCP...................Development Concept Plan
DCSENGR...............Deputy Chief of Staff for Engineering
DCSOPS................Deputy Chief of Staff for Operations and Plans
div...................division
DP....................Development Plan
DPI...................data processing installation
DPU...................data processing unit
DTG...................date-time group
DTO...................Division Transportation Officer
DTOC..................Division Tactical Operations Center
DTSS..................Digital Topographic Support System

EAC...................echelons above corps
ELE...................element
engr..................engineer
ENGREP................Engineer Report
ENGSPOTREP............engineer spot report
ERP...................engineer reporting point
ESC...................United States Army Engineer Studies Center
ETL...................Engineer Topographic Laboratories

FASCAM................Family of Scatterable Mines
FAX...................Lightweight Digital Facsimile
FCZ...................forward combat zone
FDMD..................Fire Support Team Digital Message Device
FMC...................fully mission capable
FS....................fire support
FSC...................fire support control

FSE..................fire support element
FSO..................fire support officer
FY...................fiscal year

GDP..................General Defense Plan
GTSC.................German Territorial Southern Command

HAEMP................High Altitude Electromagnetic Pulse
HPIP.................Handheld Personnel Information Processor
HQDA.................Headquarters, Department of the Army

I/EW.................intelligence and electronic warfare
IOC..................initial operational capability

LNO..................liaison officer
LOA..................Letter of Agreement
LSD..................Large Screen Display
LT...................light

m....................meter
MACOM................major Army command
MC...................maneuver control
MCS..................Maneuver Control System
MI...................Military Intelligence
MISSREP..............Engineer Mission Coordination Sheet
MLC..................military load class
MOD..................Ministry of Defense
MOPP.................mission-oriented protective posture
MP...................Military Police
MV...................Military Vigilance
MVR..................maneuver

NATO.................North Atlantic Treaty Organization
NBC..................nuclear, biological, and chemical
NDI..................non-developmental item
NRI..................non-radio interface

O/H..................on hand
ops..................operations

plt..................platoon
PM...................project manager
PPBS.................planning, programming, and budgeting system
PSP..................prepositioned stock point

RACO..................Rear Area Combat Operations
RCZ...................rear combat zone
REGT..................regiment
RIVER BRIDGE REP.....River Bridge Report
ROC...................required operational capability

SAAS..................Standard Army Ammunition System
SAMS..................Standard Army Maintenance System
SARSS.................Standard Army Retail Supply System
sep...................separate
SHORAD C^2............Short-Range Air Defense Command and Control System
SIDPERS...............Standardized Installation/Division Personnel System
sig...................signal
SIG OFF...............signal officer
SOP...................standard operating procedure
spt...................support
sqd...................squad
sqn...................squadron
SSC...................Service Support Center
SSD...................Small Screen Display
SST...................single subscriber terminal
STANAG................Standardization Agreement

tac...................tactical
TAC...................Tactical Air Command
TAC...................Tactical Command Post
TACCS.................Tactical Army CSS Computer System
TACFIRE...............Tactical Fire Direction System
TAMMIS................Theater Army Medical Management Information System
TB....................Technical Bulletin
TCS...................tactical computer system
TCT...................tactical computer terminal
T&E...................test and evaluation
TO....................total obstacles
TOC...................Tactical Operations Center
TOE...................Table of Organization and Equipment
TRADOC................United States Army Training and Doctrine Command
TRTS..................Tactical Record Traffic System
TSM...................TRADOC System Manager

ULLS..................Unit Level Logistics System
USACE.................United States Army Corps of Engineers
USAES.................United States Army Engineer School
USAREUR...............United States Army, Europe

VFMED.................Variable Format Entry Device

WBK...................Wehrbereicheskommando

AUTOMATED COMBAT ENGINEER OPERATIONS AND PLANNING SYSTEM (ACEOPS)

I. INTRODUCTION

1. Purpose. This paper outlines the concepts supporting and gives the general specifications for an Automated Combat Engineer Operations and Planning System (ACEOPS). ACEOPS will:

a. Improve the planning methods and command and control structure used by combat engineers in the forward combat zone (FCZ).

b. Assure timely provision of the combat engineer input and support essential to tactical decisions and operations.

2. Scope. The ACEOPS concept development was constrained by the approved Army tactical (corps and below) command and control structure and architecture: special emphasis was given to the countermobility operations task. A fairly detailed draft functional requirements specification document was prepared for standard information transfer and reporting needs. Hardware and software capability requirements were identified, but specific brands, models, configurations, or developers were not evaluated or recommended.

3. Background.

a. In 1974, the US Army, Europe (USAREUR) Automated Barrier Planning System (ABPS) began operating at V and VII Corps data processing installations (DPIs). The ABPS, a static bookkeeping system, was designed to expedite the peacetime countermobility (barrier) planning process by automating the laborious data tabulation and report preparation processes. The ABPS has been marginally successful, but because of its system and operating environment requirements, does not and cannot meet current countermobility planning needs within USAREUR. Accordingly, in January 1983, the USAREUR Deputy Chief of Staff for Engineering (DCSENGR) asked the US Army Engineer Studies Center (ESC) to help determine the specifications for and feasibility of creating a dynamic Countermobility Operations Planning System (COPS). COPS would be designed both for peacetime planning and for controlling wartime obstacle plan execution.

b. The Deputy Commander, US Army Corps of Engineers (USACE), approved the USAREUR DCSENGR's request, and tasked ESC to begin the project in February 1983. While conducting background research for the study plan, ESC's study team discovered that the COPS concept was an integral part of a larger, Army-wide issue that needed to be considered if the USAREUR DCSENGR's needs were to be met. This larger issue involves tactical command, control, communications, and computer (C^4); the team's consideration of C^4 expanded the scope of the analysis, although the focus remained countermobility operations.

4. Assumptions. This report assumes that:

a. The development of automated systems to support USAREUR engineer construction management and design analysis is and will continue to be done by the US Army Construction Engineering Research Laboratory (CERL) and others. These systems will be applied mainly to those engineer activities in the rear combat zone (RCZ) that are under the control of echelons above corps (EAC); thus, they are considered "nontactical" for the purposes of this analysis. SIGNIFICANCE: Nontactical applications were not addressed by this analysis.

b. The development of automated systems in USAREUR is governed by Department of the Army Headquarters (DAHQ) policy and guidance given in the Army Regulation (AR) 18 series, related regulations and technical bulletins, and approved Army-wide automation plans. SIGNIFICANCE: Army guidance establishes feasible courses of action.

5. Objectives. The objectives of this analysis were to:

a. Identify data and information processes engineer commanders and their staffs use in the FCZ during peacetime and wartime that can be improved by exploiting computers, communications, and related technologies.

b. Develop general specifications for the potential ACEOPS applications.

c. Prepare a draft functional requirements specification for identified ACEOPS applications.

d. Describe the Command and Control Subordinate System (CCS^2) concept as it relates to the engineer functional area.

e. Describe an echeloned ACEOPS structure compatible with the CCS^2 concept, including interfaces, network linkages, and minimum node capabilities for the engineer functional area.

f. Identify and evaluate courses of action which the USAREUR DCSENGR could pursue to obtain ACEOPS capability.

6. Approach.

a. Literature search. An extensive literature search was conducted to identify documents relevant to the study purpose and scope. Pertinent reports, regulations, and plans from sources in USAREUR, DA, major Army commands (MACOMs), and contractors were acquired and reviewed.

b. User questionnaire. A questionnaire was developed and administered to engineer planners in HQ USAREUR, V Corps, and VII Corps. The questionnaire sought user opinions about COPS specifically, and battlefield automation needs in general. The questionnaire was followed up by a field trip to USAREUR; during the trip, combat engineer automation needs were discussed with HQ USAREUR, the V and VII Corps representatives, and others.

c. Interviews. Points of contact at Army organizations in the United States involved with battlefield automation planning and developmental activities were interviewed at various times throughout the project. Interviews were repeated, as necessary, to keep abreast of the latest automation developments.

d. Participation in CCS^2 activities. Study team members participated in CCS^2 working groups at the Combined Arms Center (CAC), Fort Leavenworth, and at the United States Army Engineer School (USAES), Fort Belvoir, during the course of the study. The main purpose for the participation was to ascertain how and to what extent the needs of combat engineers in USAREUR were being considered in the CCS^2 concept.

II. FINDINGS

7. ACEOPS Feasibility. Existing and developmental automation technology provides seemingly unlimited opportunities for USAREUR to enhance both its peacetime and wartime planning and the way in which it executes combat engineer functions. It is entirely possible to automate essential planning and operations activities; however, what can be achieved in the way of combat engineer automated systems depends on the total force's automation needs on the battlefield.

a. The ACEOPS requirements for wartime conditions are the most demanding. Thus, the specifications developed to meet wartime needs are expected to result in a system that is flexible enough to satisfy peacetime requirements. For that reason, this analysis emphasized automation concepts and plans for the battlefield.

b. The capabilities and characteristics of state-of-the-art hardware and software make it possible to provide automation resources (or access to these resources) at all echelons in the force. The more significant capabilities and characteristics from an ACEOPS perspective include:

(1) Relatively small, portable, reliable, and easily linked hardware devices. These would ensure timely information exchanges, and give engineer units computation and analysis capability.

(2) Distributed data bases and innovative data base management systems.

(3) Multiple display and output methods, including video graphics and text, hardcopy graphics and text, and electronic mail.

(4) Simple operator techniques (minimal training).

(5) Multiple interface and power source options.

c. Tailoring ACEOPS (or an ACEOPS subsystem for USAREUR, such as COPS) to engineer forces now deployed with the V and VII Corps would improve peacetime planning. It would not, however, be desirable from a wartime standpoint, since augmentation units would not be equipped or trained to use the system. For this reason, ESC decided the most desirable approach would be to design ACEOPS so its requirements were the same or similar to those of the Army-wide engineer systems now being developed.

8. ACEOPS in Perspective. The automation of engineer functional activities is included in Army-wide plans and concepts for C^4. Many organizations are involved in developing C^4 plans and concepts at HQDA, MACOM, and subordinate levels. ESC interviewed key action officers, reviewed the plans and conceptual systems (and field test results of these systems), and found that:

a. The combat engineer C^4 must be consistent with the approved CCS^2 concept. The CCS^2 concept establishes the structure and architecture for the tactical portion (corps and below) of the Army Command and Control Master Plan (AC^2MP).[1] It focuses on the information flow to and from the maneuver commander on the battlefield (within a given hierarchical structure), and emphasizes the use of automation to improve decisions. The combat engineer mission area is included in the CCS^2 concept. (See Annex A for a more detailed discussion of CCS^2 and AC^2MP.)

b. The CCS^2 architecture and development program is flexible enough to allow the use of the latest technological advances in meeting engineer mission area needs. The concept requires input (either manual or automated)

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[1]Department of the Army, Office of the Chief of Staff, Army, Office of the Deputy Chief of Staff for Operations and Plans, The Army Command and Control Master Plan (AC^2MP) (U), Washington, D. C., 1979 (SECRET) (hereafter referred to as AC^2MP).

from each of the mission areas supporting the force commander. The functional commander (e.g., the engineer) also is generally free to develop whatever he needs for functional staff and command purposes, provided basic CCS^2 concept characteristics are maintained. Such basic characteristics include hardware and software compatibility, interoperability, and standardization.

c. Significant progress has been made in the development of CCS^2. Recently, tactical computer systems (TCSs) and tactical computer terminals (TCTs) were tested in USAREUR units--a key step in the development of the CCS^2 maneuver control system. Based on test results, initial procurement was approved. Current estimates call for a full CCS^2 by 1990.

(1) Besides maneuver control, major CCS^2 components are air defense, fire control, combat service support, and intelligence and electronic warfare. Engineers are included mainly in maneuver control and intelligence and electronic warfare. Unfortunately, engineer needs (i.e., specifications and requirements) do not appear to have been adequately considered in developments to date, although the US Army Training and Doctrine Command (TRADOC) is attempting to rectify that situation.

(2) ESC's work on ACEOPS is expected to help the USAES and others involved with developing comprehensive engineer functional requirements that will update the AC^2MP and CCS^2.

d. Engineer commanders and staffs must be able to provide data to and receive data from the major functional areas of CCS^2. This can be done by integrating ACEOPS with the functional controls via the SIGMA concept (the force level control integrator at each maneuver echelon). Those now developing engineer systems therefore must consider CCS^2 interface requirements at each echelon in the force hierarchy.

e. The AC^2MP addresses system interfaces. The Army Battlefield Interface Concept (ABIC) defines requirements for automated system interoperability with CCS^2 functional areas and EAC. Efforts are underway to identify and develop interfaces within CCS^2, between CCS^2 and allied systems, and between Army and other service or national systems. An interface also is being developed between the CCS^2 force level maneuver control system (i.e., SIGMA) and the allied systems, called HERO and WAVELL. Interfaces required at EAC between Army systems and others, such as the Central Army Group (CENTAG) or Allied Forces, Central Europe (AFCENT), are within ABIC's scope. Thus, it is extremely important that combat engineers be included in the CCS^2 concept as it evolves, so engineer requirements are considered when user interface requirements are developed.

9. USAREUR Combat Engineer Applications. In general, engineers at all levels within USAREUR want to improve the timeliness and quality of the information they input to the tactical decisions made by engineers and supported commanders. Rapid advances in small computer technology provide the means to improve not only the timeliness and quality of input, but also the form of the input and the decision process itself. When ESC talked with representatives from V Corps, VII Corps, and HQ USAREUR and analyzed the responses to its questionnaire, it found that combat engineer automation needs can be roughly grouped as standard or nonstandard, peacetime or wartime, and computation or reporting (information transfer).

a. Standard automation needs are those dictated by procedures, policies, and regulations established by CENTAG, USAREUR, or the Corps. (Annex B describes the principal standard requirements, with the exception of those systems associated with engineer topographic and terrain analysis activities.)

In the standard applications, computers mainly facilitate data base management and information transfer functions. Typically, the focus is on standard data definitions and formats, common displays, specific update and reporting times, information transfer networks, and compatible hardware and software.

(1) Standard engineer systems rely on processed information rather than raw technical data. Processed information is developed at the various echelons in the engineer structure by mostly nonstandard processes. These can be either manual or automated and, in most cases, were not developed with standard system specifications in mind. Thus, to achieve a force-wide ACEOPS, these nonstandard processes must be adjusted to ensure uniform definitions, data fields, identifiers, and other system parameters. Uniformity is best achieved by directive from the highest applicable controlling headquarters (e.g, USAREUR, CENTAG) and requires a degree of compromise, cooperation, and concession from all concerned. Once approved, force-wide systems can be used to justify the procurement of necessary hardware and software resources.

(2) Because they are primarily reporting systems, standard application networks depend on communications to input and transfer information among nodes. Demands on secure, available communication methods will be great because of the many users expected on the modern battlefield. For this reason, the developers of force-wide systems will be pressured to minimize the need for extensive networks, so wartime communication resources are not overloaded. Hence, standard engineer systems provide the force commander with only the minimum essential engineer information. But engineer commanders and staffs must have additional information, and the capability to analyze that information at all levels. Thus, engineers need local, largely nonstandard systems. The entire question of engineer communication support requirements

is now being addressed by the USAES as part of a TRADOC-wide analysis of battlefield communications requirements.

b. All engineer elements within USAREUR told ESC they needed local, hands-on computational resources. Those needs are based mainly on peacetime planning and decisionmaking requirements. The types of desired applications vary widely, reflecting the concerns of the local commanders or staffs. (Annex C gives a more in-depth discussion of local applications.)

(1) Local commanders most frequently expressed a need for computational assistance to evaluate alternative courses of action and to perform sensitivity analyses of various planning options. Computer support is needed to answer the many "what if" questions involved in the analysis of barrier material haul capability, the impact of changes in task priorities on engineer resource allocations, and the effects of various manpower/equipment/sequence combinations on mission completion, etc.

(2) Other local needs include ways to rapidly and accurately input, sort, and output data to meet the information requirements of personnel, operations, and logistics elements. This implies a capability to build and update data bases and to generate reports. In addition to report generation, most engineer unit headquarters wanted a local word processing capability.

c. During wartime, the responsiveness of combat engineer systems to the data and information needs of the force commander is the main concern. During peacetime, effective response time can be a matter of days or weeks; during wartime it is a matter of minutes. In wartime, the force commander must be able to get status information and engineer estimates of the situation very quickly.

(1) Planned computer-based force-level maneuver control systems (the SIGMA concept) require specific input from supporting engineers. Therefore, V and VII Corps engineers must be able to interface with the maneuver control network. Systems developed and data bases constructed for engineers must directly consider the network and interface requirements of the force-level control systems; these systems are being developed by CONUS MACOMs and HQDA for Army-wide implementation. In the context of these development activities, engineer automation requirements can and should be included for concurrent development. The USAES is the interface between combat engineers and system developers.

(2) The availability and reliability of communications may preclude a true engineer network with automated interfaces, particularly in wartime. It may be necessary in some instances to gain access through terminals belonging to the supported maneuver force. The questions surrounding available communication resources during peacetime and wartime are also being addressed at the HQDA and CONUS MACOM level.

(3) Most engineers in USAREUR believe that the nature of status reporting in wartime calls for more intense use of distributed data bases, video displays (including formatted text, maps and overlays, and other graphics), and record transfer (i.e., electronic mail) of operations orders, mission changes, and many kinds of reports. These kinds of capabilities are within the current state-of-the-art of small computers and are included in CCS^2.

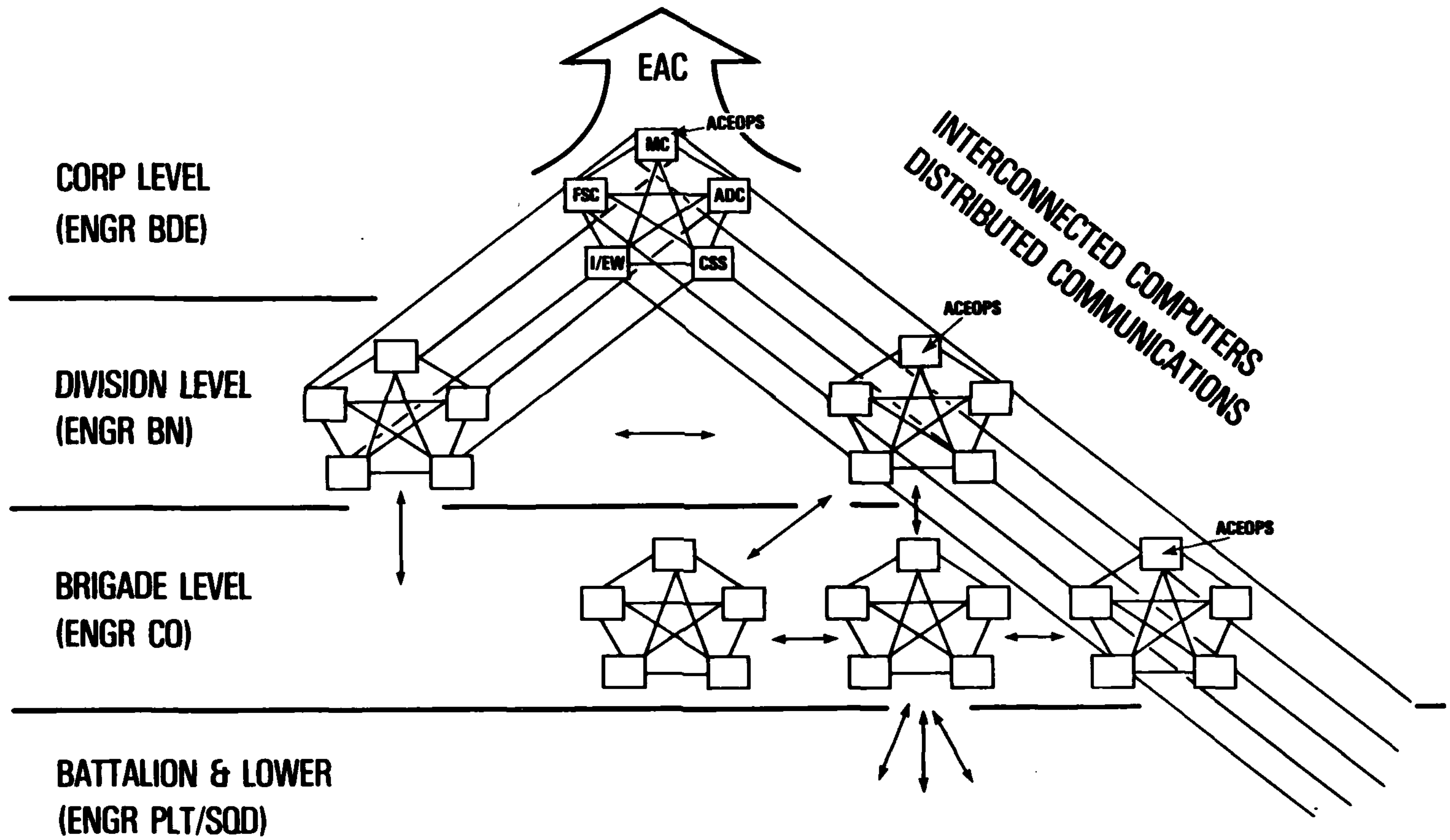
10. Conceptual ACEOPS. The ACEOPS will be a prototype engineer command and control system (in the broadest sense). It will be consistent with the CCS^2 concept. It should serve three purposes: First, it will give the

engineers the capability to process and analyze data for internal command and control purposes. Second, through an interface with the maneuver control system, it will be an element of the organization's command and control network, and will share selected information with other control systems. Third, it will produce key command-related information to support the force commander's decision process. ACEOPS will have the same characteristics as those specified in the CCS^2 and C^4 architecture, and as described in the AC^2MP. Both its hardware and software will be subject to Army-wide configuration management policies. The proposed ACEOPS will allow USAREUR engineers to enter the CCS^2 development process and bring user influence to bear on those responsible for AC^2MP execution.

a. The ACEOPS will interface directly with the CCS^2 maneuver control system via the SIGMA network; in fact, it is expected to be a maneuver control subsystem (see Figure 1). At engineer battalion level and higher, microcomputer-based terminals will provide input, output, and stand-alone computational capability. At engineer company level and lower, there may be input/output-only devices linked to the parent microcomputer terminal; standard communications also can be used (e.g., radios, wire, courier). In accordance with Army policy, the equipment specifications for all components will comply with established technical baselines.

b. Measures of performance for the ACEOPS will be comparable to other command and control systems and subsystems. That is, ACEOPS will be able to handle high volumes of information, distribute data rapidly and simultaneously to multiple nodes, process information, interoperate through standardization and linkage to ensure continuity of operations, and survive much the same as other tactical systems.

CCS²-- ACEOPS LINKAGE



*SOURCE: Department of the Army, US Army Training and Doctrine Command, US Army Combined Arms Combat Development Activity, Army Command and Control Master Plan Update With Mission Area Analysis (U), Fort Leavenworth, Kansas, December 1982 (SECRET) (hereafter referred to as CACDA AC^2MP Update).

Figure 1

c. Since the ACEOPS concept calls for microcomputer capability comparable to current TCT at battalion level--and possibly minicomputers similar to the TCS at brigade level--engineers could accommodate peacetime nonstandard analytic requirements. This capability would be constrained during peacetime only by the programming and computer skills of available personnel.

d. ESC did not consider the needs of engineer topographic elements when developing the ACEOPS proposal, since those elements interface directly with the intelligence and electronic warfare (I/EW) control system, not the maneuver control system. The Engineer Topographic Laboratories (ETL) also have a number of systems under development, principally the Digital Topographic Support System (DTSS), for topographic engineers. And as part of the ABIC, efforts are underway to establish an interface between DTSS and the I/EW's All Source Analysis System (ASAS). Ultimately, however, ACEOPS will interface with ASAS and DTSS through the SIGMA network.

e. The essential hardware and software characteristics already included in overall CCS^2 concepts should be adequate for ACEOPS. No special or unique requirements have been identified. Including ACEOPS in CCS^2, and involving combat engineers as full participants in developmental activities through the USAES, is the most practical way to assure that automated system capability is acquired by combat engineers. Such an approach is consistent with Army policy.

III. SUMMARY AND RECOMMENDATIONS

11. Summary. The development and acquisition of automated systems to facilitate the execution of combat engineer tasks both in peacetime and wartime is feasible, desirable, and necessary. However, developing and resourcing a single-purpose system (such as COPS) for only a part of the combat engineer tactical mission area does not appear to be acceptable or practical.

a. There is intense and widespread interest at HQDA and in the combat and material development communities in using computers to help commanders on the tactical battlefield. In recent years, considerable resources have been committed to concept and hardware evaluation as well as to the analysis of processes which can be improved through automation. The concepts, architecture, and structure now approved for Army-wide tactical C^4 are described in the AC^2MP.

(1) The concepts and structure of CCS^2 require combat engineers to provide, either manually or through an automated system, certain key inputs to the force control process. These inputs are mainly combat engineering data for the CCS^2 maneuver control system and topographic engineering data for the I/EW's control systems. Development of engineer systems as part of the CCS^2 concept is consistent with Army policy and would ensure integrated development efforts toward a common goal.

(2) Within the TRADOC community, the USAES has initiated actions to assure consideration of combat engineer automation requirements as the CCS^2 concept evolves. The USAES has succeeded in having engineers included in the nondevelopmental item follow-on purchase for TCS- and TCT-type hardware, with an FY 87 initial operational capability (IOC). Although much remains to be

done, the USAES is actively participating in various AC^2MP implementation forums throughout the combat and material development communities.

(3) While hardware prospects are improving, little has been done to tailor software to combat engineer needs. The USAES is in the best position to interject engineer requirements as SIGMA and other CCS^2 software are developed.

b. The CCS^2 concept focus is on wartime systems. Both hardware and software developments are aimed at satisfying wartime criteria dictated by the needs of the force commander. The resulting systems and resources provided to functional participants, including engineers, are expected to be flexible enough to satisfy unique peacetime functional requirements that may not be included in the standard wartime system.

c. The likelihood that systems such as ACEOPS could be developed and resourced on a stand-alone basis, separate from CCS^2 developments, is not good. Such an endeavor would violate the criteria underlying the AC^2MP. Significant among these criteria are: standardization of hardware, software, and computer languages; systems interface and integration; communication resource allocation and control; and perhaps most readily apparent, affordability.

12. Recommendations. This analysis did not attempt to capture all of the details of the many efforts underway in AC^2MP implementation and battlefield automation programs. Given the rapid changes in the C^4 area of development, efforts to be more precise would be of doubtful value. Rather, the analysis focused on identifying those factors which must be considered if USAREUR combat engineer automation needs are to be met. This approach led to the following recommendations:

a. Combat engineer automation requirements should be met by exploiting the provisions of the AC^2MP and CCS^2 concept. The plan and concept have received HQDA approval; thus, they command the attention of the combat and material development communities, who are most likely to receive the resources and priority effort needed to achieve orderly and early system development. (It is expected that USAREUR engineers will be included in the TCS and TCT nondevelopmental item follow-on purchase, with an IOC of FY 87.) This course of action requires that:

(1) USAREUR combat engineer system functional requirements specifications be submitted to TRADOC (through the USAES) for inclusion in the system development process. This should be done now, since CCS^2 developments are well underway. Annex B can be used as is (or be further refined) for this purpose.

(2) USAREUR engineer representation be established immediately and maintained in the C^4 concept evaluation and development activities within the command to assure that engineer needs are considered.

(3) USAREUR and corps engineer staffs should maintain (or initiate, if necessary) frequent contact with the USAES to provide the inputs needed to ensure an appropriate basis-of-issue for hardware, and to influence overall ACEOPS developments. Conversely, the USAES must actively involve USAREUR and the corps in the ACEOPS development process.

b. Engineer automation requirements should be oriented toward wartime needs as part of combined arms battlefield automation initiatives, not toward independent engineer-unique systems. Given the state of battlefield automation developments, it is unlikely that independent systems will have sufficient justification to obtain the required approvals or development resources. Hardware procured and issued as part of battlefield systems such as SIGMA will have the capability and flexibilty to accommodate peacetime and specialized engineer automation needs.

c. CERL should be considered a prime candidate for ACEOPs software development. It has proposed a research and development program which includes the ACEOPs concepts and functions, and which, if adequately funded, can be completed in sync with other CCS^2 and AC^2MP developments.

LAST PAGE OF MAIN PAPER

ANNEX A

ARMY COMMAND AND CONTROL MASTER PLAN (AC^2MP)

ANNEX A

ARMY COMMAND AND CONTROL MASTER PLAN (AC^2MP)

1. Purpose. This annex summarizes the AC^2MP, highlighting those elements that establish a framework within which automated combat engineer systems can be developed. The intent is to acquaint the reader with the approved mechanism for the orderly development and integration of C^4 systems throughout the Army.

2. General. The AC^{2}MP provides Army-wide direction for command and control planning and systems development. The plan is a functional framework for expressing the Army Command and Control System (ACCS) architecture and describes, in detail, the tactical (corps and below) portion of the architecture. It delineates known deficiencies and identifies responsibilities and milestones for ACCS development. The plan is updated periodically to incorporate changes in threat, doctrine, tactics, and force structure. It is intended for use at all levels to ensure a coordinated effort in attaining ACCS objectives. The AC^{2}MP includes:

a. An ACCS architecture assessment. The ACCS architecture is described as sets of elements categorized according to each ACCS system element (e.g., communications, data collection and processing, intelligence surveillance and target acquisition, facilities, and command aids) across each CCS^2 battlefield functional area. These areas are: maneuver, fire support, air defense, intelligence, and combat service support. Known ACCS deficiencies identified by functional system program reviews, mission area analyses, and other DA analyses are summarized. These deficiencies form the basis for specific corrective actions described in a system development plan.

b. ACCS Capability Requirements (ACRs). An ACR is a validated command and control initiative to correct known deficiencies in the ACCS. The ACRs are developed (and periodically updated) to reflect statements of tactical requirements which must be met to ensure that command and control tasks in support of the modern battlefield are performed well. These ACRs are inputs to the system development plan.

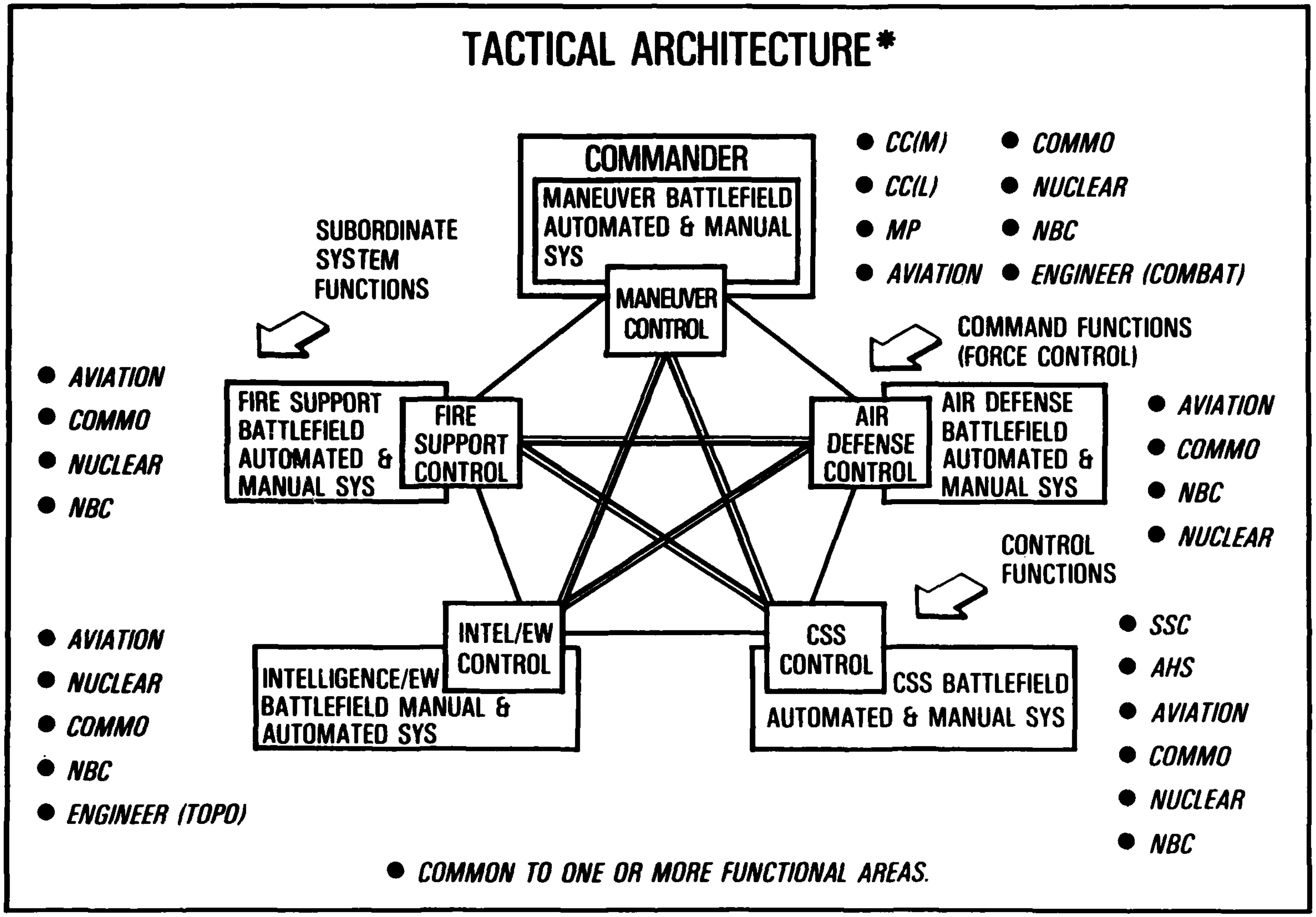
c. Army Command and Control System Development Plan (ACCSDP). This is the approved Army-wide plan jointly prepared by TRADOC and the US Army

Materiel Development and Readiness Command (DARCOM). It presents actions, responsibilities, and milestones for correcting known deficiencies at the tactical echelons of the ACCS architecture. Corrective actions are programmed against deficiencies resulting from ACCS assessments, ACRs, and action plans resulting from mission area analyses. The ACCSDP tasks combat and material developers, as well as ACR proponents.

d. ACCS Management Plan. The management plan describes the structure, responsibilities, and actions required to administer the complex implementation process involving the development and integration of the component systems of the ACCS architecture.

3. The Army Command and Control System. The ACCS is a system of system networks which supports commanders at all levels in commanding their forces, and which assists the staff at all levels in controlling their functions in support of the commanders. The ACCS supports all phases of war from premobilization to sustainment. The ACCS is the Army's all-encompassing, integrated system of automation and communications systems, procedures, and facilities. It integrates individual system networks at the sustaining base and at strategic, theater, and tactical echelons, and interfaces with other service and allied (e.g., NATO) systems. Recent efforts have concentrated on ACCS development at the tactical (corps and below) echelon.

a. Tactical architecture. The CCS^2 concept (see Figure A-1) is the approved Army tactical command and control structure and objective architecture for the tactical portion of the AC^2MP. It focuses on the information flow to and from the maneuver commander on the battlefield within a given hierarchical structure. Within each level (company through corps), the battlefield has been divided into the five functional areas: maneuver, fire



*SOURCE: CACDA AC^{2}MP Update.

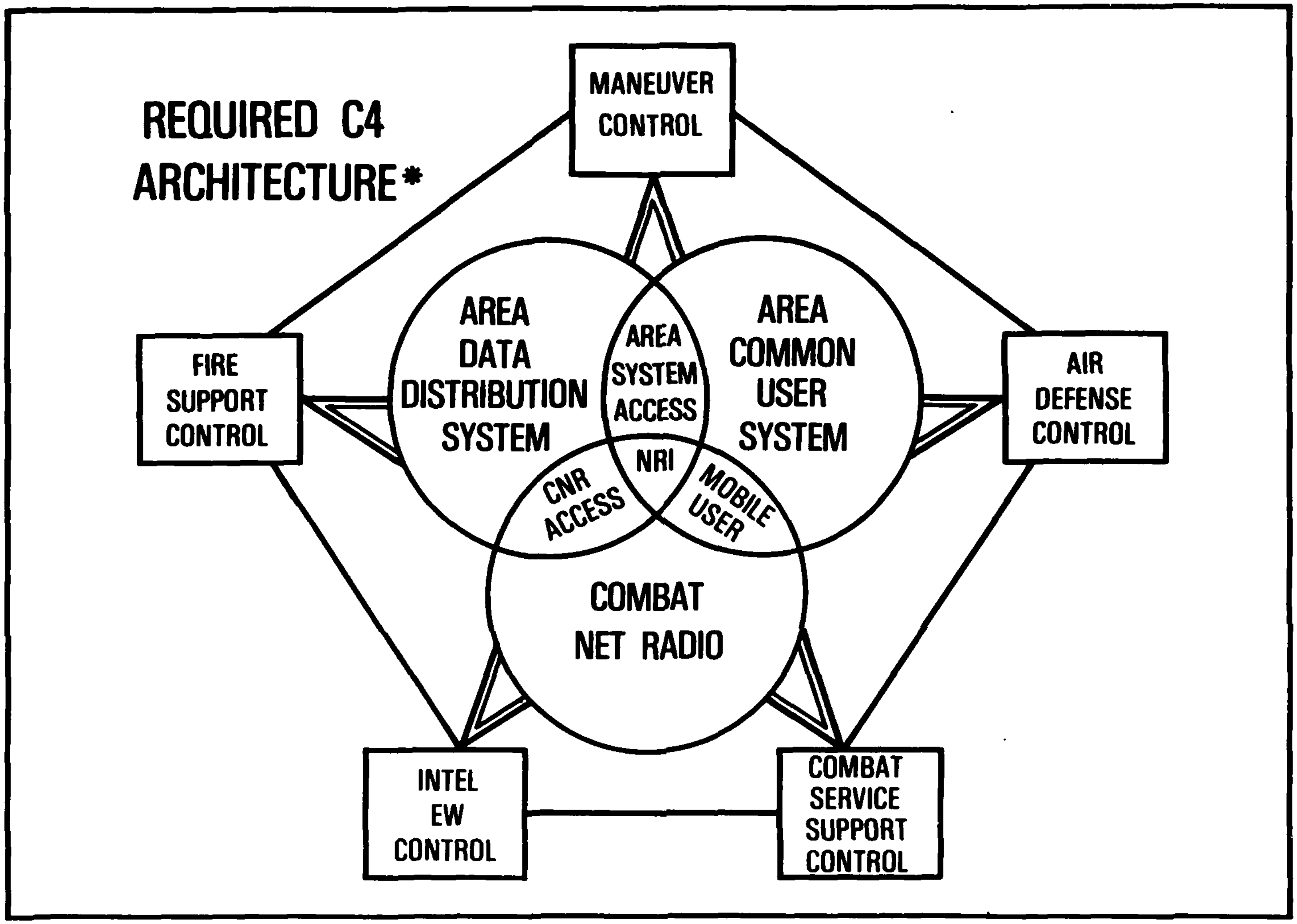
Figure A-1

support, air defense, combat service support, and intelligence and electronic warfare. All mission areas are included in these five nodes. Some mission areas are common to all nodes while others are not. Combat engineering, for example, is included mainly in the maneuver node. The CCS^2 concept includes the structure necessary to collect, process, and transmit among all elements information required for planning, directing, and executing at each echelon. Each of the five nodes has a control system that ties together any number of manual or automated mission area subsystems. The nodes are linked by a force control system called SIGMA. SIGMA is represented by the star and pentagram in Figure A-1.

(1) The force control system allows functional control systems to share information; it is responsive to the force commander (primarily through the maneuver control system) and has software, communications, and data distribution capability. It ties the five functional areas of the battlefield together and provides the commander with critical information for decisionmaking.

(2) The force level system, SIGMA, is closely associated with the functional control systems. It establishes the linkage which assures continuity of operations by enforcing standardization and interoperability, and by providing for distributed data bases and distributed data processing.

b. The CCS^2 architecture requires an extensive C^4 architecture. The general nature of the C^4 architecture needed to link the five functional control systems and their subsystems is shown by the overlapping circles in Figure A-2. Depending on the level in the battlefield command hierarchy, different capabilities (devices and/or systems) are used to fulfill the C^4 requirements.



*SOURCE: CACDA AC^{2}MP Update.

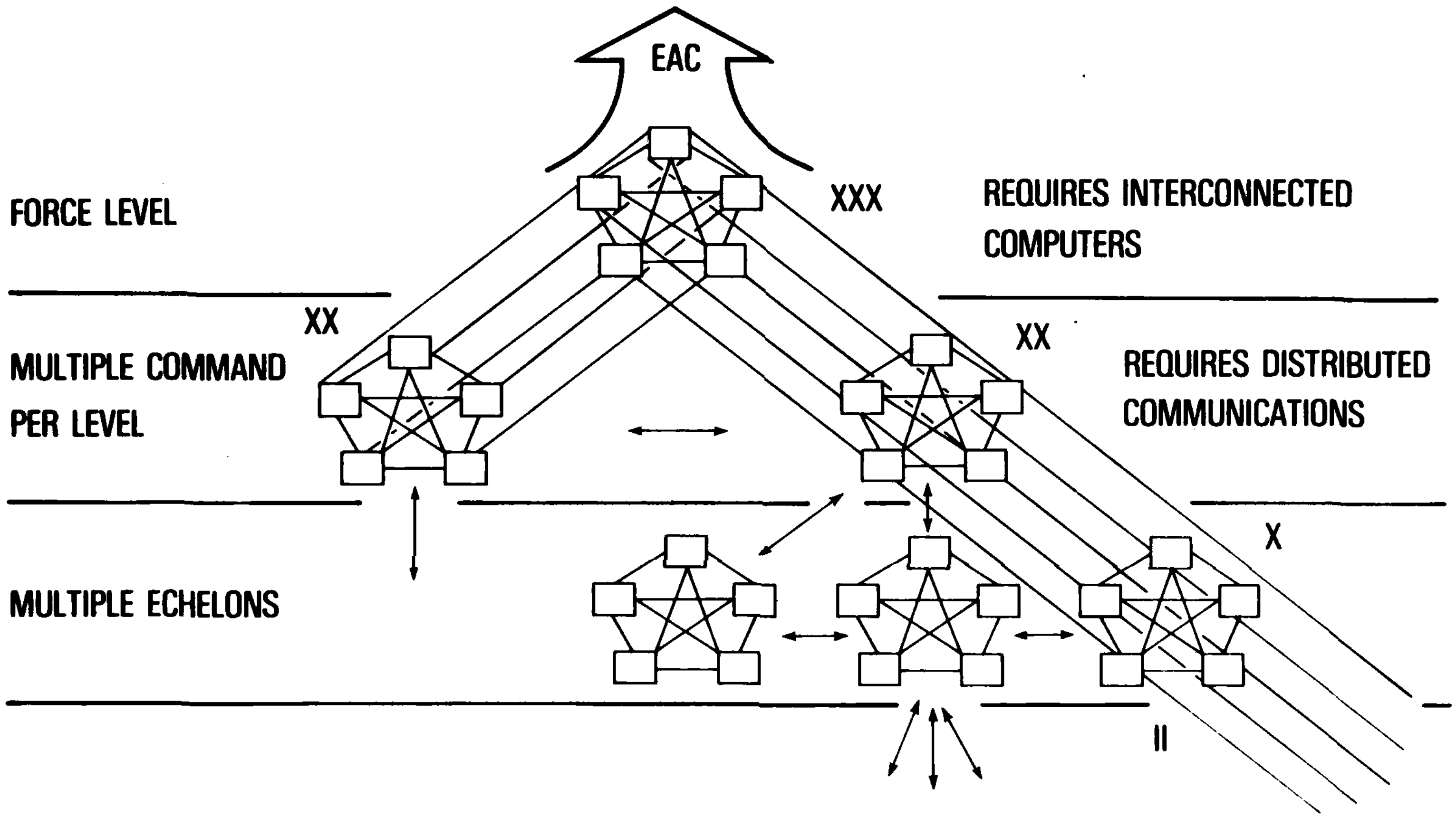
Figure A-2

(1) The total C^4 requirement is very complex. For every force level, there are multiple commands and multiple echelons all requiring distributed communications and interconnected computers. The geometric nature of the C^4 requirement generated by the CCS^2 architecture is depicted in Figure A-3. A structure has been proposed providing tactical units from corps to company level with an extensive combat net radio system, access to an automated switched common user system, a near-real-time data distribution system, and a mobile subscriber system. If system procurement remains on track, the basic structure will be achieved by 1987.

(2) The AC^2MP recognizes how critical C^4 support is and the extensive interoperability and interfacing challenges created by the CCS^2. These issues are being resolved by the ABIC. The ABIC defines interface requirements between automated systems at corps and below and for those joint, allied, and national systems that provide information to or exchange information with corps automated systems. ABIC results in an interface development schedule which is reviewed and updated annually. The latest review, in September 1983, included 99 different automated systems (Army = 67, Navy = 3, Air Force = 11, Marine = 6, National = 1, Allies = 11).

c. ACCS implementation. The ACCSDP and the ACCS Management Plan provide for a phased, controlled, and evolutionary transition from the current battlefield automation posture to a posture reflecting the ACCS objectives. The steps, tasks, milestones, and priorities are established, based on how critical the ACRs are and on a consideration of interface and interoperability requirements. The status of the implementation plan is frequently reviewed and updated to account for new requirements, resource availability, test and evaluation results, and changes in priority. Implementing the ACCS creates a significant management challenge.

CCS² ARCHITECTURE/C⁴ ARCHITECTURE*



*SOURCE: CACDA AC^{2}MP Update.

Figure A-3

4. ACCS Management Plan. A coordinated effort by virtually the entire Army is required to successfully implement the ACCS. The management approach exploits the existing Army management structure to gain broad consensus and support throughout the Army. Figure A-4 depicts a top-level view of the ACCS management structure.

a. Major implementation actions. The assignment of responsibility for major ACCS implementation actions is shown in Figure A-5. HQDA is the ACCS program manager, TRADOC is the ACCS system architect, and DARCOM is the ACCS systems engineer. The ACCS Management Plan identifies specific implementation task responsibilities of these and other organizations, and establishes a master schedule for task accomplishment. Key roles are:

(1) HQDA. The Deputy Chief of Staff for Operations and Plans (DCSOPS) exercises general staff responsibility for the ACCS. The Assistant DCSOPS for Command, Control, Communications, and Computers (ADCSOPS-C^4) is responsible for managing and coordinating the ACCS program. This task entails coordinating policy; establishing ACCS priorities; ensuring that planning, programming, and budgeting system (PPBS) actions are accomplished; supervising the overall accomplishment and status of implementation actions; and administering the activities of the ACCS Council established by AR 15-21.[1]

(2) TRADOC. TRADOC is the lead combat developer for the component systems that comprise the ACCS. In addition, TRADOC, with the Combined Arms Combat Development Activity (CACDA) as executive agent, is designated the ACCS architect. This job includes modifying the ACCS architecture for significant changes in programs, priorities, or the threat; expanding the scope of

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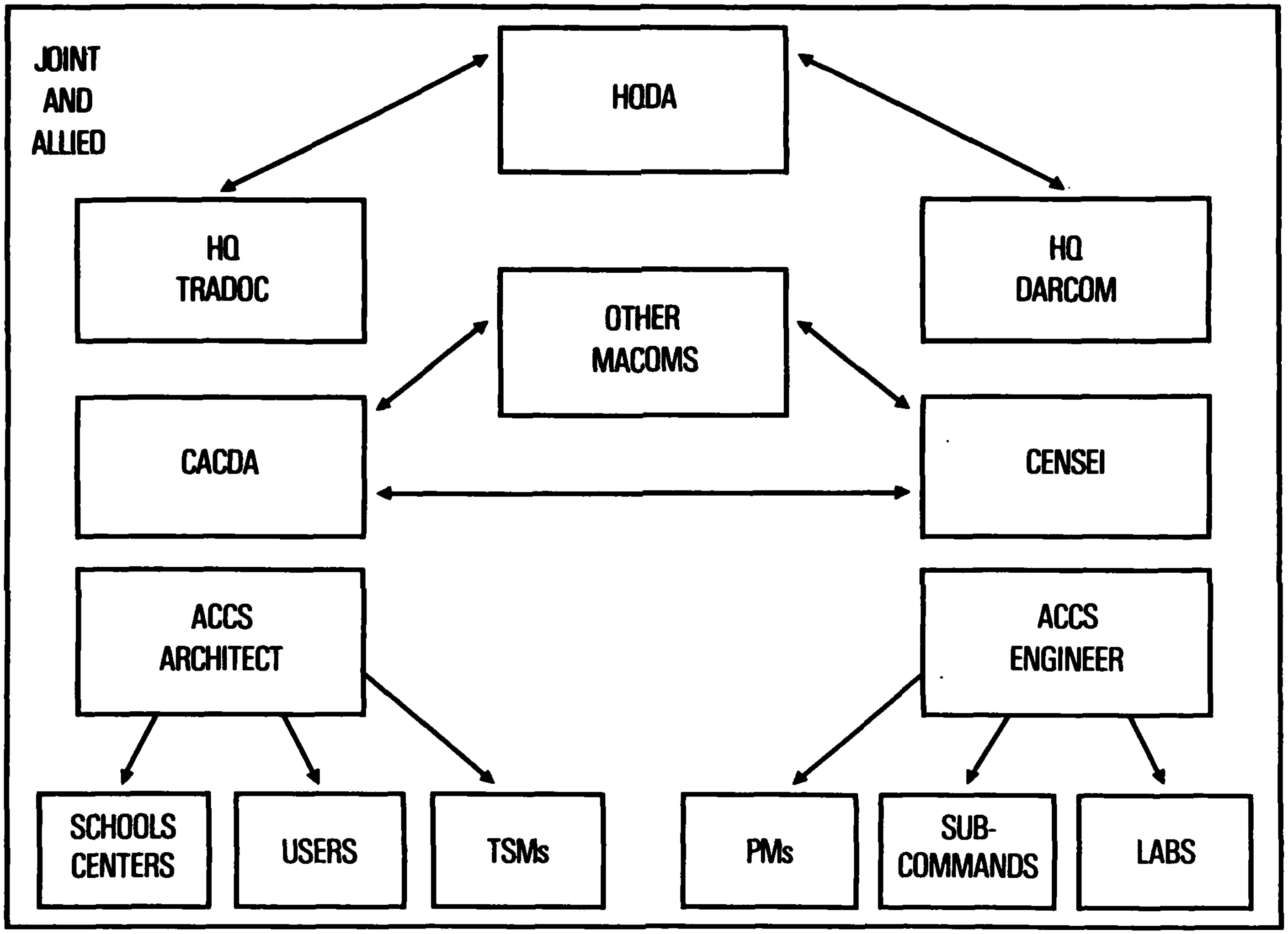
[1] Department of the Army, Headquarters, AR 15-21, Army Command and Control Council, Washington, D. C., 4 May 1977 (UNCLASSIFIED).

ACCS MANAGEMENT STRUCTURE*



*SOURCE: CACDA AC^{2}MP Update.

Figure A-4

ALLOCATION OF ACCS IMPLEMENTATION ACTIONS[a]

ACCS Implementation Actions	Command Responsibilities[b]		
	HQDA	TRADOC	DARCOM
Management			
ACCS Planning	P	S	S
ACCS Programming and Budgeting	P	S	S
ACCS Program Direction (includes interoperability management)	P	S	S
Joint/NATO Interoperability Standards	P	S	S
System Architecture			
Maintain the Architecture	A	P	S
ACCS Operational Testing Concepts	A	P	S
Interoperability Concepts and Requirements	A	P	S
System Engineering			
ACCS Specification (includes interoperability specification)	A	S	P
Combat Development			
Component Systems LOA, ROC, COEA, etc.	A	P[c]	S
ACCS Doctrine, Development Plan (training, doctrine, force structure)	A	P[c]	S
Material Development			
Component Systems DP, DCP, Specification, etc.	A	S	P[c]
ACCS Development Plan (material)	A	S	P[c]
Test and Evaluation (T&E)			
Development Test		S	P[d]
Force Development T&E	S	P[d]	S
Operational T&E	P[d]	S	

NOTE: P = Prepare/Implement; S = Support; A = Approve

[a]SOURCE: CACDA AC^{2}MP Update.
[b]Other MACOMs support these actions, as appropriate.
[c]Other MACOMs have assigned combat and material development responsibilities.
[d]Other MACOMs may have T&E responsibilities.

Figure A-5

the architecture as needed to encompass additional command and control systems; developing interoperability concepts and requirements documentation; and planning or participating in ACCS operational and force development testing and experimentation. To accomplish these tasks, TRADOC is given authority over other Army combat development activities and user representatives. In addition, TRADOC develops, consolidates, and updates the combat-development-related sections of the AC^2MP.

(3) DARCOM. DARCOM is the lead material developer for the acquisition of ACCS component systems. DARCOM, with the Center for Systems Engineering and Integration (CENSEI) as the executive agent, is the ACCS systems engineer. In this role, DARCOM develops ACCS specifications and supervises adherence to established standards. This job includes designing interoperability standards, implementating component ACCS systems, and doing ACCS developmental tests and experimentation. DARCOM develops and updates the ACCS material-development-related sections of the AC^2MP.

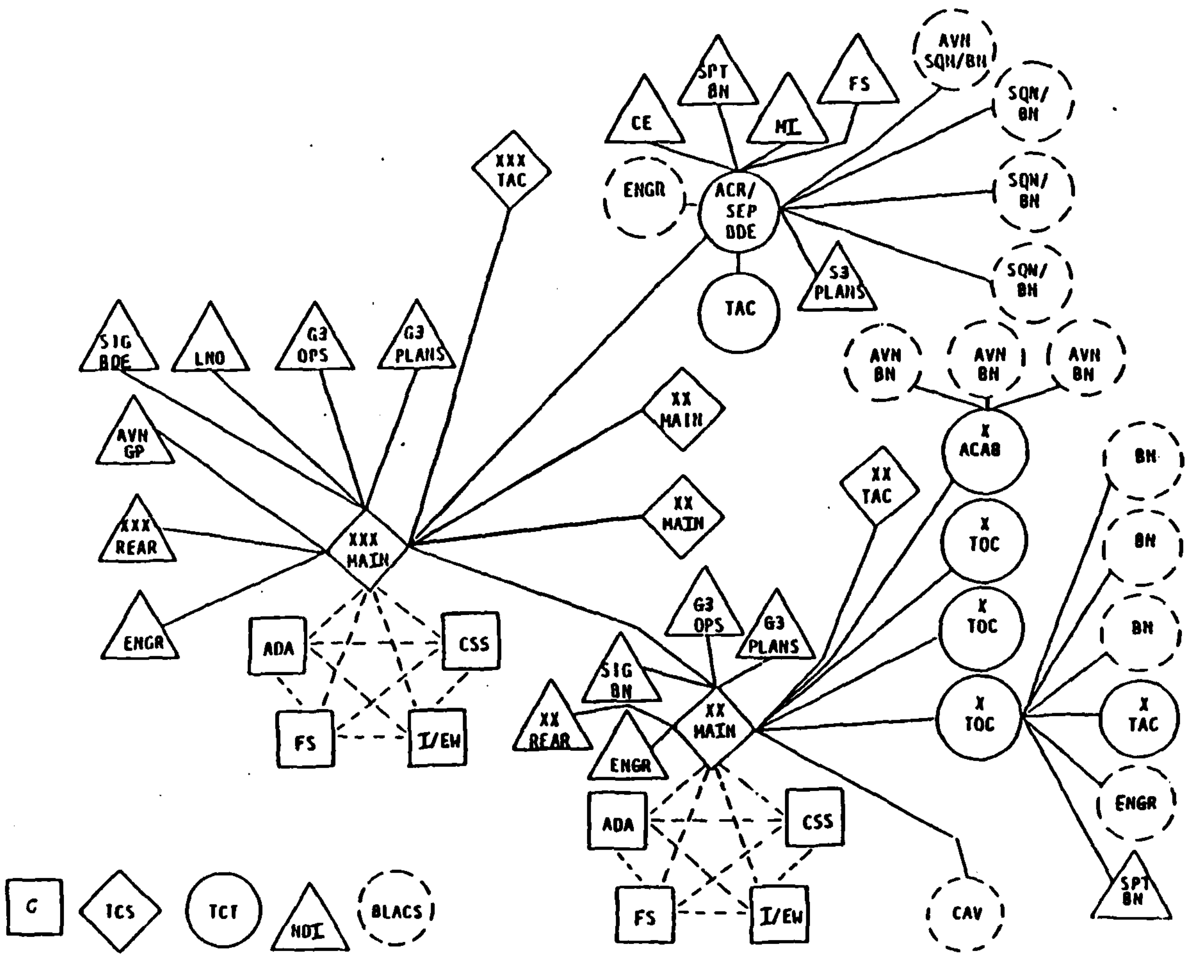
(4) Others. Commanders of other MACOMs, heads of staff agencies, and commanders of Army components of unified and specified commands (e.g., USAREUR), develop plans for ACCS elements within their command that are consistent with the total ACCS architecture and systems specifications. They coordinate ACCS combat and material development with TRADOC and DARCOM, maintaining points of contact with appropriate staff elements involved with new or approved doctrine, organizations, techniques, and material. In addition, they are responsible for developing statements of required operational capability, functional specifications and mission needs (as appropriate), and forwarding them to the ACCS system architect.

b. Management guidance and direction. The ACCS management structure receives guidance and direction from the Army Command and Control Council (supported by a steering committee and working group). It provides executive-level management and coordination of ACCS activities. The steering committee and working group provide guidance on program objectives, coordinate MACOM activities, and resolve issues. HQDA, as ACCS program manager, provides policy, guidance, and direction at key times in the AC^2MP update cycle to assure that it is consistent with PPBS activities and milestones.

5. AC^2MP Developments. There is an extremely large number of actions underway to develop the approved ACCS architecture. As stated, the actions are aimed at a controlled and orderly transition from the existing manual and automated systems to the ACCS objective system. In general, it is an evolutionary development process. This process is defined as the phased development and early fielding of system subcapabilities according to a prioritized plan. The ultimate objective is to satisfy a set of known fixed requirements, yet permit the specification of additional requirements during development. With regard to the CCS^2 and SIGMA, strides have been made toward objective systems for maneuver, combat service support, and intelligence and electronic warfare control. Developments in the maneuver control area, including distribution of hardware capability, are of immediate interest to combat engineers.

a. Maneuver control system developments. A typical US corps (three divisions and one armored cavalry regiment) characteristically has a command (G3/S3) information flow (see Figure A-6). Actions are underway to automate the information flow by placing independent computing and processing devices at each node to receive, transfer, store, process, retrieve, a' _ rint using existing and projected communications equipment. The structure will have

COMMAND INFORMATION FLOW[a,b]



[a]SOURCE: Department of the Army, US Army Training and Doctrine Command, Combined Arms Center, Headquarters, Microprocessor Location Working Groups, Letter with Enclosure (ATZL-CAC-CD), Fort Leavenworth, Kansas, 27 January 1984 (UNCLASSIFIED) (hereafter referred to as Working Group Read-ahead Package).

[b]Force Level = - - - - - - - - -; Maneuver Control System = ————————.

[c]Functional Control System.

Figure A-6

automated assistance, but will not be a true automated network until the interfaces and linkages are established. Much effort is still required on the force level system (SIGMA), indicated in Figure A-6 by the dashed-line pentagram. Like the maneuver control system, each of the other four control systems will have intricate networks of supporting subsystems. The depicted maneuver control system is expected to be achieved by FY 87 and the complete CCS^2 by FY 90.

(1) The kinds of hardware now planned for the maneuver control system consist of independent devices. Currently, the TCS, TCT, three nondevelopmental items (NDI), and a militarized battalion-level processor/computer device (BLD) are being considered as standard. The objective CCS^2 structure provides for C^4 needs from company to corps. The extent of the current maneuver control system, however, will be constrained by available communications equipment and the number of devices at each level in the hierarchy.

(2) In October 1983, CAC conducted an analysis of automated terminals and workstations as part of the Battlefield Communications Review. CAC verified, prioritized, and documented the essential characteristics of a general battlefield data processing terminal and workstation for use by control systems within the CCS^2 architecture. The analysis concluded that the Army should constrain itself to using the TCS, TCT, maneuver control system NDI, single subscriber terminal (SST), and Tactical Army CSS Computer System (TACCS) until the military computer family is fielded.

b. CCS^2 microprocessor requirements. The SIGMA Combat Development Support Facility at CAC has evaluated ways to reduce microprocessor proliferation and redundancy on the battlefield, while ensuring that mission-essential requirements are fulfilled. Based on the CCS^2 architecture, minimum essential characteristics of generic microprocessors and workstations were identified, and the capability of existing and developmental hardware to fulfill the requirement was assessed.

(1) At a minimum, battlefield microprocessor terminals and workstations will:

(a) Be supportable at reasonable cost within the Army maintenance structure in time of war.

(b) Be easily maintainable by Army personnel (e.g., "green suit supportability").

(c) Provide a graphics function, decision graphics capability, and a printer capable of alpha-numerics and graphics.

(d) Provide an expandable data base management system (minimum 512 kilo-bytes internal storage).

(e) Provide for full memory retention and overflow storage.

(f) Provide for message composition of standard message width (i.e., 80 characters).

(g) Possess communication capabilities for ITA-2 BAUDOT; 2 and 4 wire; FM; AM; multichannel (digital and voice); independent channels of 75, 150, 300, 600, 1200, 2400, 4800, 8000, 9600, and 16000 BPS data rates; FSK/di-phase/NRZ electronic interfaces; programmable protocals; and a packet radio switch system.

(h) Provide primary man-system interface capability for control of messages, graphics composition, transmission, and reception.

(i) Use ADA and other Army-approved high order languages.

(j) Be capable of being installed and operate in M577, CUCV, HMMUV, and S-250.

(k) Not impede unit operations during set-up or tear-down.

(l) Utilize bulk encryption devices.

(m) Be air, water, and ground transportable in carrying cases as loose cargo.

(n) Survive blast and fragmentation effects, at least as well as the other equipment used with it.

(o) Be built around a general purpose digital computer capable of interfacing with data storage peripherals.

(p) Be capable of product improvement on a modular basis.

(q) Provide for audio alert or alarm, indication of storage limit overflow, and priority message alert.

(r) Provide for memory expansion.

(s) Be capable of handling data up to TOP SECRET/SCI.

(t) Survive in a nuclear environment as long as crew members remain capable of operating it (High Altitude Electromagnetic Pulse (HAEMP) is required).

(u) Meet operation, storage, and transit requirements specified in AR 70-38 (hot, basic, and cold categories).[2]

(v) Comply with personnel health and safety standards.

(w) Comply with existing DA automation security requirements.

(x) Provide no less than two communications ports (but be expandable to eight).

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[2]Department of the Army, Headquarters, AR 70-38, Research, Development Test and Evaluation of Materiel for Extreme Climatic Conditions, Washington, D. C., 1 August 1979 (UNCLASSIFIED).

(y) Accept power of 50 or 60 cycle; 110/120 and 220/240 Volts AC; 28 Volts DC.

(2) After reviewing current and developmental hardware items in light of the minimum essential characteristics and the CCS^2 architecture, TRADOC has taken the following positions:

(a) With a few specific exceptions, the TACCS will serve as the Army's NDI item solution for the CCS^2 architecture.

(b) The TCS, TCT, and the enhanced SST with printer will serve in those locations which require a full processor.

(c) All emerging battlefield automated systems requiring a terminal or workstation must consider using the devices above to meet hardware requirements. Nonuse must be justified to and approved by the ACCS manager.

6. Hardware Requirements and Allocations. Using the Army of Excellence force structure and the CCS^2 architecture, CAC recently completed a study of the five battlefield functional area control systems, the tactical record traffic system, requirements for large screen display, and generic processor characteristics.[3] The objective of the study was to identify the locations requiring microprocessors from corps through battalion and separate company.

a. As a result of the study, CAC made a preliminary allocation of microprocessors to designated staff sections within the type of units included in the Army of Excellence force structure. The preliminary allocations were presented to TRADOC centers and schools for proponent comment and input. Allocations to engineer units were critiqued at the USAES during a

[3] Department of the Army, US Army Training and Doctrine Command, US Army Combined Arms Combat Development Activity, Battlefield Communication Review (BCR) Terminal Evaluation, Fort Leavenworth, Kansas, 26 October 1983 (UNCLASSIFIED).

CAC-sponsored microprocessor location working group meeting held 28 March 1984. After all proponent comments are resolved, a memorandum of agreement will be developed which finalizes the requirements and locations of microprocessors and related devices within CCS^2.

b. Proposed allocations to engineers and others are shown in Figures A-7 through A-16. Figure A-17 explains the abbreviations and symbols used. The BLD, common to many engineer elements, is a generic hardware item that meets the minimum characteristics identified in paragraph 5b(1).

CORPS HQ-LEVEL ALLOCATIONS[a]

CORPS HQ

REAR

G-3	TCT' LSD FAX
G-1/G-4	TACCS V2 FAX
G-5	SST FAX

MAIN

G-3 OPS	TCS TCT' LSD FAX
G-3 PLANS	AC' LSD FAX
G-2 OPS	SST** LSD
ASIC(CTOC SPT ELE)	TCS'** MICROFIX II** LSD FAX
FSE	VFMED LSD
CAME	SST* SST LSD
ACE	BLD LSD
G-1	TACCS V2 FAX
G-4	TACCS V1 FAX

TAC

G-3	TCS LSD
G-2	SST** LSD
G-2/G-3	FAX
FSE	VFMED LSD
ENGR LNO	BLD LSD
ADA LNO	SST
G-1/G-4	SST FAX

[a]SOURCE: Working Group Read-ahead Package.

Figure A-7

DIVISON HQ-LEVEL ALLOCATIONS[a]

DIV HQ

REAR

G-3	TCT' LSD FAX
G-1/G-4	TACCS V2 FAX
G-5	SST FAX

MAIN

G-3 OPS	TCS TCT' LSD FAX
G-3 PLANS	AC' LSD
G-2 OPS	SST** LSD
ASIC(DTOC SPT ELE)	TCS'** MICROFIX II** LSD FAX
FSE	VFMED LSD
DAME	SST* SST LSD
ADE	BLD LSD
G-1/AG	2 X TACCS (SIDPERS/TAMMIS) FAX
G-4	TACCS V1 FAX
DTO	TACCS V1(DAMMS)

TAC

G-3	TCS
G-2	SST**
G-2/G-3	LSD FAX
FSE	VFMED
ENGR LNO	BLD LSD
ADA LNO	SST
G-1/G-4	SST FAX

[a]SOURCE: Working Group Read-ahead Package.

Figure A-8

ENGINEER BATTALION (DIVISION) ALLOCATIONS[a]

ENGR BN

DIV ADE	CP	MVR BDE ENGR

ADE	BLD LSD	S-3	TCT' LSD	BDE ENGR	BLD SSD
		S-2	SST		
		S-2/S-3	LSD FAX		
		S-1/S-4	TACCS V2 FAX		

[a]SOURCE: Working Group Read-ahead Package.

Figure A-9

ACR HQ-LEVEL ALLOCATIONS[a]

ACR

TRAINS

S-1/S-4	TACCS V2 FAX

TOC

S-3	TCT LSD
S-3 PLANS	AC'
S-2	SST LSD
S-2/S-3	FAX
MI TOC SPT PLT	TCT'** MICROFIX II** LSD FAX
MI TOC SPT PLT	TCT'** MICROFIX II** LSD FAX
FSE	VFMED LSD
REGT ENGR	BLD LSD
SIG OFF	AC'

TAC

S-3	TCT
S-2	SST
S-2/S-3	LSD
FSO	FDMD
ALL	FAX
FSO ALL	FDMD FAX

ENGR CO

CO HQ	TACCS V2 (SIDPERS/SUPPLY)

[a]SOURCE: Working Group Read-ahead Package.

Figure A-10

SEPARATE HEAVY BRIGADE HQ-LEVEL ALLOCATIONS[a]

SEP HVY BDE (PROPOSED)

TRAINS

S-1/S-4	TACCS V2 FAX

ENGR CO

HQ	TACCS V1 (SIDPERS)

TOC

S-3	TCT
S-3 PLANS	AC'
S-2	TCT'** MICROFIX II**
S-2/S-3	LSD
FSE	VFMED LSD
BDE ENGR	BLD SSD
SIG OFF	AC'
ALL	FAX

TAC

S-3	TCT
S-2	SST
S-2/S-3	LSD
FSO	FDMD
ALL	FAX

[a]SOURCE: Working Group Read-ahead Package.

Figure A-11

SEPARATE LIGHT BRIGADE HQ-LEVEL ALLOCATIONS[a]

SEP LT BDE

TRAINS

S-1/S-4	TACCS V2 FAX

TOC

S-3	TCT
S-3 PLANS	AC'
S-2	TCT'
S-2/S-3	SSD
FSE	VFMED LSD
BDE ENGR	BLD SSD
SIG OFF	AC'
ALL	FAX

TAC

S-3/S-2	TCT SSD
FSO	FDMD
ALL	FAX

ENGR CO

HQ	TACCS V1 (SIDPERS)

[a]SOURCE: Working Group Read-ahead Package.

Figure A-12

RACO BRIGADE HQ ALLOCATIONS[a]

RACO BDE

CP

S-3	TCT
S-3 PLANS	AC'
S-2	TCT'
S-2/S-3	LSD FAX
FSE	VFMED LSD
BDE ENGR	BLD SSD
SIG OFF	AC'
S-1/S-4	TACCS V2 FAX

TAC

S-3/S-2	TCT LSD
FSO	FDMD
ALL	FAX

ENGR CO

HQ	TACCS V1 (SIDPERS)

[a]SOURCE: Working Group Read-ahead Package.

Figure A-13

ENGINEER BRIGADE HQ ALLOCATIONS[a]

ENGR BDE

CP

S-3	TCT'
S-2	SST
S-2/S-3	LSD FAX
S-1/S-4	TACCS V2 FAX

ACE

ACE	BLD LSD

[a]SOURCE: Working Group Read-ahead Package.

Figure A-14

ENGINEER GROUP HQ ALLOCATIONS[a]

ENGR GP

CP

S-3	BLD
S-2	SST
S-2/S-3	LSD FAX
S-2/S-4	TACCS V2 FAX

[a]SOURCE: Working Group Read-ahead Package.

Figure A-15

ENGINEER BATTALION (CORPS) HQ ALLOCATIONS[a]

ENGR BN

CP

S-3	BLD
S-2	SST
S-2/S-3	LSD FAX
S-1/S-4	TACCS V2 FAX

[a]SOURCE: Working Group Read-ahead Package.

Figure A-16

ABBREVIATIONS AND SYMBOLS

(')......................Designates Manuever Control System NDI

(*)......................Replaced when ADACS is Fielded

(**)....................Replaced when ASAS is Fielded

(***)..................Replaced when CSS Control System (TACCS C2) is Fielded

AC......................Access Terminal

ADACS..................Air Defense Artillery Control System

ASAS....................All-Source Analysis System

BLACS..................Battalion-Level Command and Control System

BLD....................Battalion-Level Device

DAMMS..................DA Movement Management System

FAX....................Lightweight Digital Facsimile

FDMD....................Fire Support Team Digital Message Device

HPIP....................Handheld Personnel Information Processor

LSD....................Large Screen Display

MCS....................Maneuver Control System

NDI....................Non-Developmental Item

SAAS....................Standard Army Ammunition System

SAMS....................Standard Army Maintenance System

SARSS..................Standard Army Retail Supply System

SHORAD C2..............Short-Range Air Defense Command and Control System

SSD....................Small Screen Display

SST....................Single Subscriber Terminal

TACCS..................Tactical Army CSS Computer System

TACFIRE................Tactical Fire Direction System

TAMMIS..................Theater Army Medical Management Information System

TCS....................Tactical Computer System

TCT....................Tactical Computer Terminal

TRTS....................Tactical Record Traffic System

ULLS....................Unit-Level Logistics System

VFMED..................Variable Format Entry Device

Figure A-17

LAST PAGE OF ANNEX A

ANNEX B

DRAFT FUNCTIONAL REQUIREMENT SPECIFICATIONS

FOR

THE AUTOMATED COMBAT ENGINEER OPERATIONS AND PLANNING SYSTEM

ANNEX B

DRAFT FUNCTIONAL REQUIREMENT SPECIFICATIONS

FOR

THE AUTOMATED COMBAT ENGINEER OPERATIONS AND PLANNING SYSTEM

1. Purpose. This annex describes the draft functional requirement specifications for ACEOPS. The description emphasizes its countermobility aspects and follows the format specified in Technical Bulletin (TB) 18-100, as closely as possible.[1]

2. Scope. The specifications are limited to the information, data, and reports which must be exchanged between system elements considered standard throughout the system. They call for local computation, analysis, and processing capability, but do not define local needs. In general, local processing will be nonstandard, based on the needs of each particular commander and staff.

3. Existing System Description.

a. The ABPS is now used for obstacle planning by USAREUR. This system was installed in 1974 at V and VII Corps Corps Support Command (COSCOM) data processing units (DPUs) on IBM 360/40 computers.

b. The ABPS is basically a noninteractive, administrative, bookkeeping system which produces a variety of data summaries and reports, including the engineer resource requirements needed to implement the obstacle plans of forward-deployed forces. Countermobility data are originated on coding sheets at the engineer squad level and reported through the chain of command to the corps staff engineer. The data are prepared on a series of 80-column punch cards, processed and evaluated at the corps level, and returned to the squad level for incorporation into target folders. The ABPS can catalog all targets in support of General Defense Plans (GDPs). It also can provide summaries by types of materiel and levels of command; by map sheet, obstacle type, obstacle

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[1]Department of the Army, Headquarters, TB 18-100, Life Cycle Management, Appendix M, Washington, D. C., 15 August 1981 (UNCLASSIFIED).

time sequencing, and geographic location; and can audit by munition storage location. ABPS programs are UNCLASSIFIED, but input cards and output printouts are SECRET. Figure B-1 shows the relationships between ABPS programs and printed reports.

c. Since the ABPS was fielded, it has been plagued with problems stemming from undocumented modifications (different in each corps) and personnel turnover; the full set of original COBOL-F programs cannot be executed. In 1982, the ABPS was audited and reviewed by the US Army Computer Systems Support Group, Europe, which is currently correcting basic ABPS program deficiencies. No other ABPS improvements or enhancements are planned.

d. The ABPS is executed semiannually, or as requested by corps major subordinate commands. Because of security requirements and, currently, the high probability of a program abort, it is not uncommon for the corps to wait weeks before the ABPS is successfully executed at the DPUs and printouts are returned to the corps staff engineer.

e. Current initiatives to improve the ABPS will only place the system back into operation with enhancements to its pre-edit and change option capability. These changes should improve the chances of full program execution; however, they will not improve input/output turnaround.

f. The ABPS is marginally adequate for meeting peacetime countermobility planning needs only; it has no anticipated wartime application. It cannot support sensitivity analysis of the obstacle plan or answer "what if" questions, and does not interface with any other existing or planned automation. It also cannot accommodate current AFCENT initiatives for ADP target list rationalization.

RELATIONSHIPS BETWEEN PROGRAMS AND PRINTED REPORTS

Program	Remark Code	Report	Classi-fication	Printed Output
BAR01	a.	Sequential Target List	S*	One target summary per page
		Card Error Summary	S	List of card types known to be in error
BAR02	b.	Target-Type Summaries		
		Corpswide	S	One-page summary
		By Zone	S	One summary per zone
		Preparing Unit Summaries		
		By Unit	S	One summary per unit
		Target Recap	S	One-page summary
		Minefield Recap	S	One-page summary
		Executing Authority Summaries		
		By Unit	S	One summary per unit
		Target Recap	S	One-page summary
		Minefield Recap	S	One-page summary
		Sector Summaries		
		By Unit	S	One summary per unit
		Target Recap	S	One-page summary
		Minefield Recap	S	One-page summary
		CRBA Number Summary	S	One summary per priority class
		Tactical Unit Priority Summaries	S	One summary per priority class
BAR03	b.	Mapsheet Summaries	S	Coordinates and target numbers sorted by map sheet and preparing unit
BAR04	b.	Materiel Requirements Summaries		
		Corpswide	S	One-page summary
		Preparing Unit	S	One summary per unit
BAR05	a.	Materiel Comparison Summaries		
		Prepositioned Stock Point (PSP) Reference List	S	Location and coordinates of each PSP
		PSP Materiel Audits	S	One summary per PSP
		Coordinate List	S	List of coordinates for targets assigned to a PSP

REMARKS

a. The "A," "B," and "C" cards must be sorted by target; all cards for a single target are grouped together.

b. This program may not be executed until program BAR01 creates one of two data storage files.

*Downgraded to CONFIDENTIAL when separated from all other pages.

Figure B-1

g. The block diagram in Figure B-2 shows how data flows through each organizational element that produces input and/or receives output from the ABPS. There are no systems external to ABPS that produce input and/or currently receive output from it.

4. Required System Capabilities.

a. The ACEOPS will be more responsive and useful as a peacetime planning tool for countermobility operations than the ABPS. ACEOPS will be designed for interactive operation and local processing, so obstacle data can be manipulated and analyzed as part of the day-to-day GDP planning process. Visual methods such as video and graphic plots, as well as hardcopy printouts, will be exploited.

b. ACEOPS will have a wartime application. It will allow users to assess and report the status of countermobility operations during execution in real or near-real time, keep records on the status of obstacle execution, and streamline the obstacle reporting process. In addition, ACEOPS will automate essential reports and enhance combat engineer C^4.

c. ACEOPS will consist of a network of modules capable of sharing information at the corps, division, and brigade staff engineer level. Each echelon will be able to interface with the five functional systems of the CCS^2 concept: maneuver, control, intelligence, and electronic warfare, fire support, combat service support, and air defense artillery. Figure B-3 describes the anticipated ACEOPS data flow during peacetime operation. Figure B-4 describes the ACEOPS wartime data flow.

d. The basic system, module characteristics, and module functions of the ACEOPS are outlined below.

ABPS DATA FLOW
(PEACETIME ONLY)

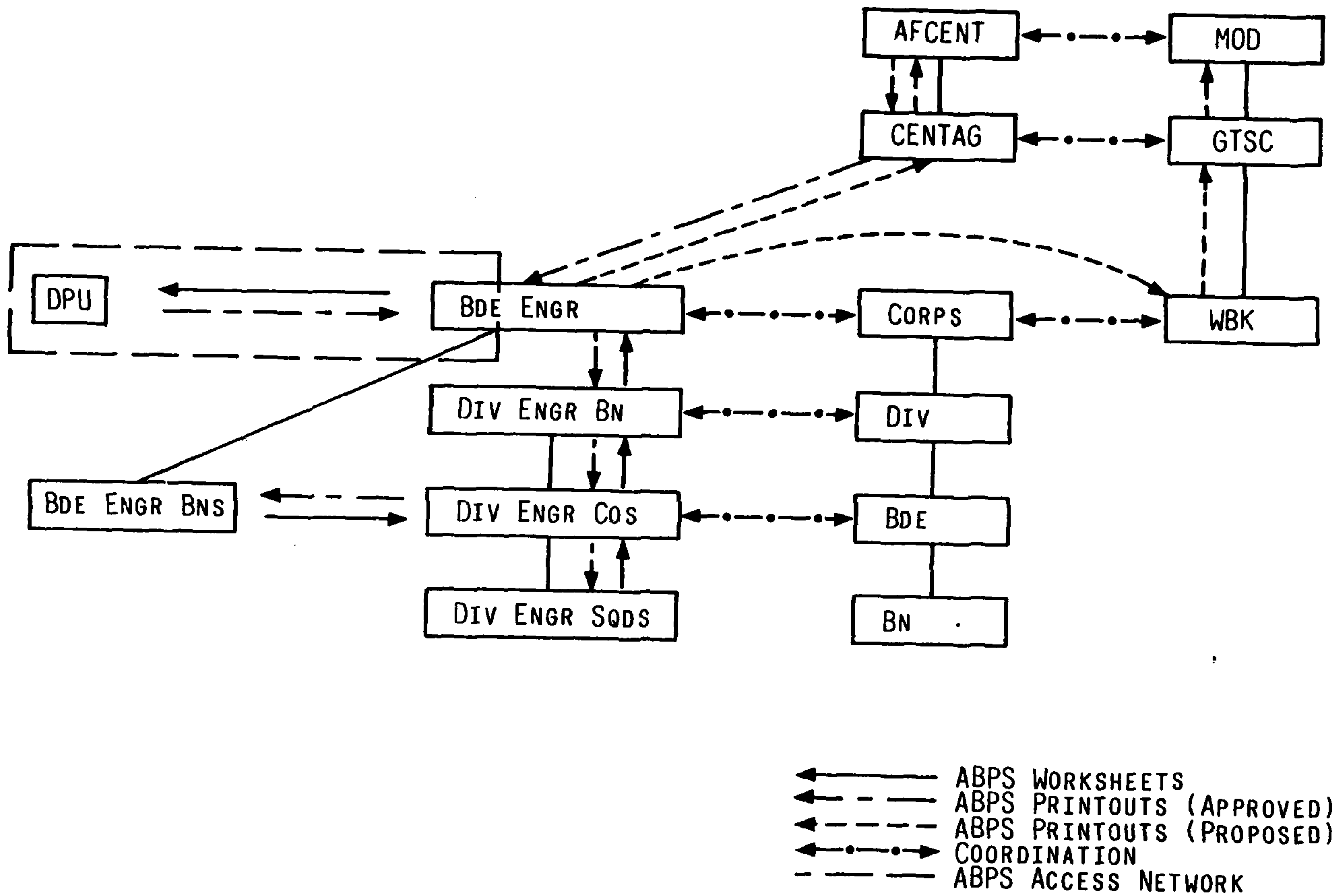

FIGURE B-2

ACEOPS DATA FLOW
(PEACETIME)

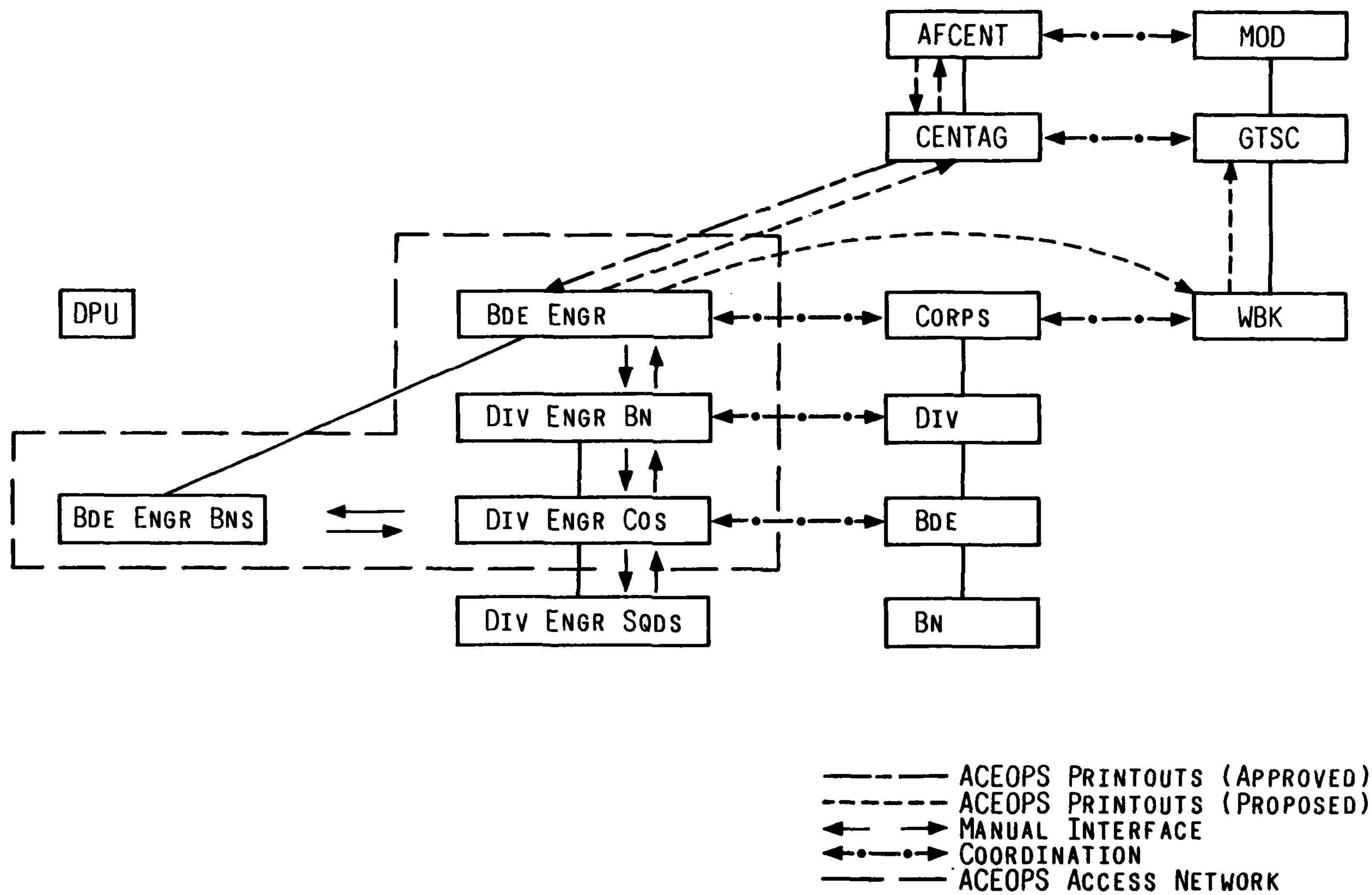

FIGURE B-3

ACEOPS DATA FLOW
(WARTIME)

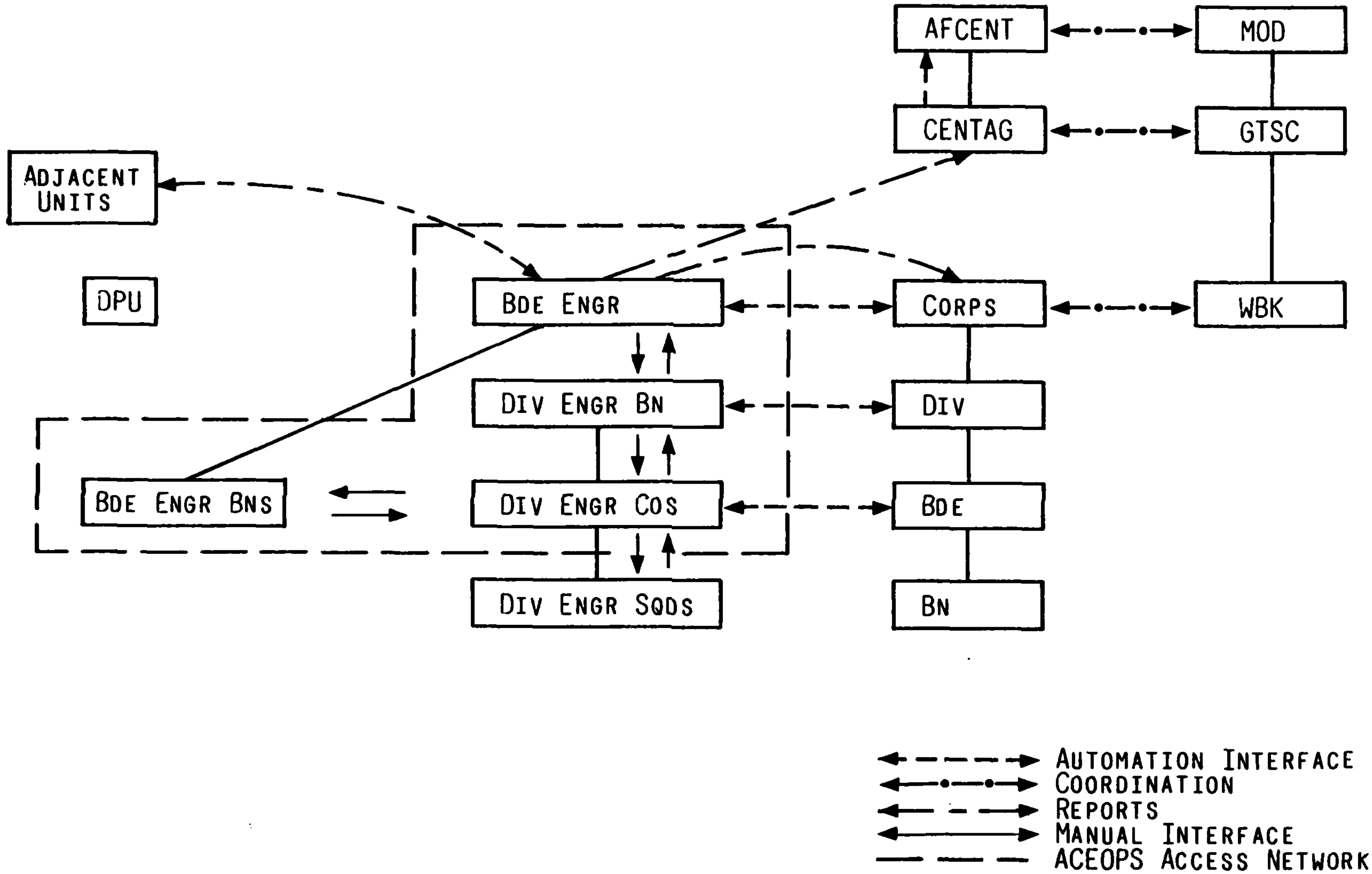

FIGURE B-4

(1) ACEOPS system characteristics.

(a) Module network.

1. Has modules at corps, division, and brigade staff engineer elements.

2. Can interface with command and control elements at maneuver brigade, division, and corps.

3. Can share information through interface and courier-transportable magnetic data files.

(b) Can process and transmit classified information up to SECRET/NATO-SECRET.

(c) Can interface over 2- and 4-wire circuits, Army multichannel, and host-nation commercial communication systems.

(2) ACEOPS module characteristics.

(a) Can do local processing.

(b) Has a data base management system with edit capabilities.

(c) Can display terrain via video maps or digitized terrain.

(d) Can develop, update, and transmit graphics, formatted and free-text electronic mail, and overlay information.

(e) Can produce hardcopy via printer or plotter.

(3) ACEOPS module functions.

(a) Can produce resource accounting and status reports, such as task organizations and unit locations (overlay and table); obstacle emplacements (type, location, resource requirements); and materiel requirements (type, quantity).

(b) Can provide higher, lower, or adjacent units with reports required by operational direction and standard operating procedures (SOPs).

(c) Can store, maintain, and retrieve data such as terrain information, route reconnaissance, engineer situation (overlay), and engineer briefing (update).

5. Information Processing Capabilities.

a. Data element definitions and input/output formats given in this paragraph should be standardized among the ACEOPS modules. To the extent practical, they should be consistent and compatible with the external reporting and data transfer requirements of CENTAG, AFCENT, and the German Territorial Southern Command (GTSC). Applicable guidance is given in:

(1) Central Region (CR) Directive 80-71-3.[2]

(2) CR Directive 80-71-6.[3]

(3) CR Directive 80-50.[4]

(4) V and VII Corps Field SOPs.

b. At a minimum, ACEOPS should provide processing support for the following reports: ENGREP, ENGRSPOTREP, RIVER BRIDGE REP, BARREP-A through E, and MISSREP. Figures B-5 and B-6 show the information flow and frequency of these reports. (Paragraphs 7 through 11 describe each report, including input

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[2] North Atlantic Treaty Organization, Allied Forces Central Europe, Headquarters, CR Directive 80-71-3, Combat Interoperability Engineer Information Flow, Brunssum, Netherlands, 7 October 1982 (NATO-UNCLASSIFIED).

[3] North Atlantic Treaty Organization, Allied Forces Central Europe, Headquarters, CR Directive 80-71-6, Combat Engineer Interoperability ADP for Barrier Target Lists, Draft, Brunssum, Netherlands, 19 December 1983 (NATO-CONFIDENTIAL).

[4] North Atlantic Treaty Organization, Allied Forces Central Europe, Headquarters, CR Directive 80-50, Land Reporting System (LANDREP), Part II, Brunssum, Netherlands, 1 August 1982 (NATO-CONFIDENTIAL).

INFORMATION FLOW BETWEEN OPERATIONAL LEVELS*

	INFORMATION TYPE				
LEVEL	SITUATION ASSESSMENT	SIGNIFICANT OCCURRANCES	RIVER BRIDGE/RAFT OPERATIONS	OBSTACLE TRACKING	ENGINEER EFFORT COORDINATION
CENTAG	ENGREP	ENGRSPOTREP			
	↑	↑ ↓			
CORPS	ENGREP	ENGSPOTREP	RIVER BRIDGE REP (LINES 1-5)	BARREP-D	MISSREP
	↑	↑ ↓	↑ ↓	↑	↑ ↓
DIV/ENG BDE	ENGREP	ENGSPOTREP	RIVER BRIDGE REP (LINES 1-5)	BARREP-C/E	MISSREP
	↑	↑ ↓	↑ ↓	↑ ↓	↑ ↓
BDE/ENG BN	ENGREP	ENGSPOTREP	RIVER BRIDGE REP (LINES 1-5)	BARREP-B/E	MISSREP
	↑	↑ ↓	↑ ↓	↑ ↓	↑ ↓
COMPANY	ENGREP	ENGSPOTREP	RIVER BRIDGE REP (LINES 1-14)	BARREP-A/B/E	MISSREP
	↑	↑ ↓	↑ ↓	↑ ↓	↑ ↓
PLATOON	ENGREP	ENGSPOTREP	RIVER BRIDGE REP (LINES 1-14)	BARREP-A/B/E	MISSREP
	↑	↑ ↓	↑ ↓	↑ ↓	↑ ↓
SQUAD	ENGREP	ENGSPOTREP	RIVER BRIDGE REP (LINES 1-14)	BARREP-A/E	MISSREP

*SOURCE: Department of the Army, United States Army, Europe, V Corps, Headquarters, Standardization of Engineer Reporting Within V Corps, Letter, AETV-EN, with 7 Inclosures, Frankfurt, Federal Republic of Germany, 21 April 1983 (UNCLASSIFIED) (hereafter referred to as V Corps standardization letter).

Figure B-5

TRANSMISSION MEANS AND TIMES*

REPORT TYPE	LEVEL	TRANSMISSION MEANS	AS OF	WHEN SUBMITTED
ENGREP	CENTAG	TELETYPE	2359Z DAILY	
	CORPS	TELETYPE	2359Z DAILY	0200Z
	DIV/ENG BDE	TASS OR COURIER	2359Z DAILY	2300Z
	BDE/ENG BN	TASS OR COURIER	2359Z DAILY	2100Z
	COMPANY	COURIER OR FM	2359Z DAILY	1900Z
	PLATOON	COURIER OR FM	2359Z DAILY	
	SQUAD	COURIER OR FM	2359Z DAILY	
BARREP - A	SQD, PLT, CO	FM	AS STATUS CHANGES	AS STATUS CHANGES
BARREP - B	PLT, CO, BDE	FM OR COURIER	REPORT TIME	0600,1200,1800,2359
BARREP - C	DIV/ENG BDE	TASS OR COURIER	REPORT TIME	0600,1200,1800,2359
BARREP - D	CORPS	TASS OR COURIER	REPORT TIME	0600,1200,1800,2359
BARREP - E	SQUAD THRU DIV	FM, TASS OR COURIER	REPORT TIME	0600,1200,1800,2359
MISSREP	CORPS	TASS	AS REQUIRED	AS REQUIRED
	DIV/ENG BN	TASS	AS REQUIRED	AS REQUIRED
	BDE/ENG BN	TASS	AS REQUIRED	AS REQUIRED
	COMPANY	FM	AS REQUIRED	AS REQUIRED
	PLATOON	FM	AS REQUIRED	AS REQUIRED
	SQUAD	FM	AS REQUIRED	AS REQUIRED
RIVER BRIDGE REP	CORPS	TASS	AS REQUIRED	AS REQUIRED
	DIV/ENG BN	TASS	AS REQUIRED	AS REQUIRED
	BDE/ENG BN	TASS	AS REQUIRED	AS REQUIRED
	COMPANY	FM	AS REQUIRED	AS REQUIRED
	PLATOON	FM	AS REQUIRED	AS REQUIRED
	SQUAD	FM	AS REQUIRED	AS REQUIRED
ENGSPOTREP	ALL LEVELS	FASTEST MEANS	EVENT OCCORRANCE	ASAP

*SOURCE: V Corps standardization letter.

Figure B-6

data elements and output formats.) Processing support should include hands-on operation, user-friendly input/output, and the ability to perform sensitivity analyses.

c. ACEOPS also should provide local programming support. Although specific input/output relationships cannot be defined, necessary processing capabilities would include a spreadsheet capability, a data base system, and at least one high-level programming language.

6. Constraints.

a. An interim system capability should be fielded at least by FY 87.

b. Since ACEOPS is a high-priority, high-payoff effort, its development should be given top priority consistent with the CCS^2 concept of the AC^2MP.

c. ACEOPS must be able to operate with 120/200-volt, 50/60 Hertz power (commercially or tactically generated).

d. ACEOPS system modules must be able to set up or tear down in fewer than 20 minutes and require no more than two people to carry.

e. Modules must be able to operate from stationary command post vehicles and armored personnel carriers. They must be rigged well enough to withstand tactical cross-country relocation under battlefield conditions in such vehicles.

7. Barrier Report (BARREP).

a. Purpose: BARREP transmits the status of individual obstacles and obstacle systems from lower to higher headquarters. It projects upcoming engineer work effort and forecasts when a given obstacle or system will be complete. The report is specifically designed to transmit obstacle data as the force transitions from peace to war; it demands considerable information on the status of preplanned barrier systems. The report is dynamic, changing as additional obstacle systems are developed.

b. Security classification: SECRET.

c. Category and precedence: Category 1, immediate.

d. Submitted by: units installing obstacle system.

e. When submitted: to brigade engineer as status of a given obstacle or obstacle system changes state; from brigade engineer to division engineer and from division engineer to corps engineer every 6 hours (0600, 1200, 1800, and 2359).

f. Content: five formats, as described below.

(1) BARREP-A is the basic obstacle status feeder report. The squad or platoon leader uses BARREP-A to transmit current information on a single obstacle. The report feeds directly into BARREP-B without translation in form or content. It has five lines of data designed for voice transmission (see Figure B-7).

(2) BARREP-B is maintained by the brigade engineer and is kept current as the obstacle's status changes. It reports the status within a given subsystem. (A subsystem is defined as a logical grouping of individual obstacles which support a task force commander's scheme of maneuver.) Every 6 hours, the brigade engineer sends a current copy of BARREP-B to the division engineer for each of the subsystems in the brigade sector. Figure B-8 shows the BARREP-B format.

(3) BARREP-C, maintained by the division engineer, derives information from BARREP-B. It translates the specific data from BARREP-B into an analysis of obstacle completion (by obstacle type) for each of the subsystems. It also groups the task-force subsystems into larger brigade systems.

BARREP-A*

Line 1: Target Number

Line 2: Obstacle Type Code (if previously sent, skip and go to line 3).

Line 3: Obstacle Location (if previously sent, skip and go to line 4).

Line 4: Date-time group (DTG) of current status by serial number (send only appropriate serial number).

Serial Number	Status
d	Initiated
e	Installed
f	Turned Over
g	Executed

Line 5: DTG anticipated to be installed (if not previously sent or if changed since last transmission).

*SOURCE: V Corps standardization letter.

Figure B-7

BARREP-B*

SubSystem Name____________________ As of:____________________

(a) TARGET NUMBER	(b) TYPE	(c) LOCATION	(d) DTG INITIATED	(e) CURRENT DTG INSTALLED	(f) STATUS DTG TND OVER	(g) DTG EXECUTED	(h) DTG EXPECTED INSTALLED	(i) DA 1355 O/H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

(Figure B-8--Continued on Next Page)

BARREP-B*--Continued

AB..........Abatis
ATD.........Anti Tank Ditch
BP..........Beam Post
BR..........Bridge Demo Field Double Ln
BRDM........Bridge Demo Field Single Ln
BRM.........Bridge Demo w/Mines
BRP.........Bridge Demo Prechambered
CFF.........Clear Fields of Fire
D...........Dam
DFA.........Arty Defilade Position
DFT.........Tank Defilade Position
DFTO........Toc Defilade Position
DFV.........Vehicle Defilade Position
FY..........Ferry
LO..........Log Obstacle
MFA.........Minefield M-15 Mines (Pe=.5)
MFAR........Minefield M-15 Mines (Pe=.75)
MFB.........Minefield M-21 Mines (Pe=.5)
MFBR........Minefield M-21 Mines (Pe=.75)
MFC (ABCD)...Minefield M 35 Mines (Pe=.5)
MFD (ABCD)...Minefield M34 Mines (Pe=.75)
MFE.........Minefield Arty Del AP Mines (Pe=.5)

MFER........Minefield Arty Del AP Mines (Pe=.75) Reinforced
MFGI........Minefield Arty Del AT Mines (200x200m)
MFGR........Minefield Arty Del AT Mines (200x200m) Reinforced
MFH.........Minefield Arty Del AT Mines (400x400m)
MFHR........Minefield Arty Del AT Mines (400x400m) Reinforced
NL..........Navigational Lock
P...........POL Facility
PL..........Pipe Line
PM..........PT Minefield
PLT.........Powerline Power
R...........Rubble
RDCR........Road Crater
RDCRB.......M180 Road Crater
RDCRP.......Prechambered Road Crater
RDCR-M......Road Crater w/Mines
TN..........Tunnel
TNLP........Prechambered Tunnel
WO..........Wire Obstacle

*SOURCE: V Corps standardization letter.

Figure B-8

BARREP-C is sent from division to corps every 6 hours. Figure B-9 shows the BARREP-C format.

(4) BARREP-D, maintained at corps level, is derived from BARREP-C. It groups subsystems into a single system, providing a quick reference status check of obstacle system completion across the corps. It is the basis for reporting to higher headquarters. Figure B-10 shows the BARREP-D format.

(5) BARREP-E, maintained at brigade engineer level, records the status of enemy obstacles as they are encountered by friendly forces. Friendly obstacles that were previously posted to BARREP-B are transferred to BARREP-E as they fall into enemy hands. BARREP-E is transmitted to the division engineer every 6 hours. Figure B-11 shows the BARREP-E format.

g. Identifying obstacles, systems, and subsystems:

(1) Individual obstacles will be numbered using the target numbers assigned by the Central Region Barrier Agreement (CRBA). Obstacles emplaced after hostilities begin, and which are not numbered as part of the CRBA, will be assigned numbers using the corps system.

(2) Obstacle subsystems are groups of individual obstacles which work together to support a tactical commander's scheme of maneuver; each group is determined by the brigade engineer. A subsystem can be a single obstacle, a linear grouping of obstacles, or even a large number of obstacles spaced widely apart. The brigade engineer can number each subsystem within his brigade sector from 01 through 99. The division engineer will assign blocks of numbers to each brigade engineer.

(3) Obstacle systems are groups of obstacle subsystems; each group is determined by the division engineer. A system can be composed of a

BARREP-C*

System Name ______________ As of: ______________

		MINEFIELD		BRIDGE				POINT				TANK DITCH			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l) METERS	(m) METERS	(n) %	(o) PROJECTED DIG
SER	SUBSYSTEM NAME	PLANNED	EXECUTED	PLANNED	INSTALLED	T.O.	EXECUTED	PLANNED	INSTALLED	T.O.	EXECUTED	PLANNED	COMPLETE	COMPLETE	COMPLETE
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

*SOURCE: V Corps standardization letter.

Figure B-9

BARREP-D*

SER	(a) System Name or SubSystem Name	(b) % Complete	(c) PROJECTED DTG COMPLETED
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

*SOURCE: V Corps standardization letter.

Figure B-10

BARREP-E*

As of: ______________

SER	(a) LOCATION	(b) OLD TARGET NUMBER	(c) TYPE	(d) MINEFIELD DIMENSIONS	(e) EST TIME TO CLEAR	(f) COORDINATES ENTRY	(g) OF LANE EXIT	(h) MINE TYPE	(i) ANTI-HAND DEVICE
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

*SOURCE: V Corps standardization letter.

Figure B-11

single subsystem or many subsystems. The division engineer identifies each system by lettering it from A to ZZ. Each system is distinguished from adjacent divisional systems by placing the system letter after the division number.

h. Overlays: Overlays showing obstacles, subsystems, or systems are maintained at all levels. With appropriate color-coding and accurate posting, they provide up-to-date status information for command briefings.

8. Engineer Report (ENGREP).

a. Purpose: ENGREP is the platoon leader's, company commander's, battalion commander's, brigade engineer's, or division engineer's daily assessment of the engineer situation in his area of responsibility. It highlights specific engineer issues that are or will impact on the battle and critical administrative or logistic information that could affect the operational capability of a unit.

b. Security classification: SECRET.

c. Category and precedence: Category 1, priority or higher (as required).

d. Submitted by: engineer commanders.

e. When submitted: from State of Military Vigilance (MV) onwards.

(1) To Army group by 0200Z as of 2359Z

(2) To corps by 2300Z as of 2359Z (i.e., a forecast of the situation expected at 2359Z).

(3) To division engineer, engineer brigade, or regimental engineer by 2100Z as of 2359Z (forecast).

(4) To brigade engineer by 1900Z as of 2359Z (forecast).

f. Distribution:

(1) Action--direct higher headquarters (primary, static or main) and alternate command headquarters (rear, mobile, or tactical command post).

(2) Information--flanking formations or units and other headquarters (as appropriate).

g. Content:

(1) Part I--Assessment of the Engineer Situation. Part I gives, in free text, the engineer commander's assessment for the past or next 24 hours of engineer activity. It may include any of the following items:

(a) A review of the tasks completed during the previous 24 hours.

(b) Engineer tasks planned for the next 24 hours.

(c) An appraisal of the unit's personnel strength as it relates to combat effectiveness (green = operational, amber = marginal, red = not able to accomplish mission).

(d) An appraisal of the unit's equipment status as it relates to combat effectiveness (green, amber, red).

(e) Availability of Class I stocks (green = adequate stocks; amber = shortages of some provisions, but still operational; red = shortage--not sufficient to accomplish the mission).

(f) Availability of Class III stocks (green, amber, red).

(g) Availability of Class V stocks (green, amber, red).

(h) Mission-oriented protective posture (MOPP) level 1 through 4.

(i) Radiation level (green, amber, red).

(j) Current location and location of subordinate units.

(k) Current task organization, if changed since last report.

(l) Present or foreseen problems or shortages.

(m) A statement that there has been no change from the previous report.

(n) Additional remarks not covered by previous comments or a statement to clarify a previous comment.

(2) Part II--Atomic Demolition Munitions (ADM) Site Preparation Assets and Status. Part II is a formatted message which gives:

(a) Number of operational ADM military construction (MC) teams.

(b) Number of operational military drilling rigs.

(c) Number of operational civilian drilling rigs.

(d) Number of ADM shafts drilled to the desired depth by GDP option area and reference number to date (chambers drilled in overlapping GDP option areas are reported only once).

(3) Part III--Equipment Status. Part III uses DA Form 2406 to report equipment status through the brigade engineer to the division engineer. At division level, the unit's operational capability is summarized and sent to the corps. Although the corps commander does not need a "bumper number" report on vehicle status, the status of certain critical equipment types such as 5-ton trucks, dozers, bucket loaders, and tank and pump units must be reported. Figure B-12 shows the Engineer Equipment Status Summary form.

(4) Part IV--Engineer Data Sheet. Part IV presents critical information on the status of mobility, countermobility, survivability, and personnel assets (see Figure B-13). It can be expanded to include any item considered critical to the operational capability of engineer units.

ENGINEER EQUIPMENT STATUS SUMMARY*

Unit: ____________________ As of: ____________________

UNIT		SUBORDINATE UNIT**								UNIT TOTAL		
No.	(a) EQUIPMENT TYPE	(b) O/H	(c) FMC	(d) O/H	(e) FMC	(f) O/H	(g) FMC	(h) O/H	(i) FMC	(j) O/H	(k) FMC	(l) %FMC
1	DOZER											
2	SCRAPER											
3	LOADER											
4	5-TON DUMP											
5	2-TON DUMP											
6	APC											
7	916 TRACTOR											
8	TANK & PUMP											
9	CEV											
10	AVLB											

*SOURCE: V Corps standardization letter.
**O/H = On-hand equipment; FMC = Fully mission capable

Figure B-12

ENGINEER DATA SHEET*

FROM: TO: AS OF:

SERIAL	ENGINEER DATA SHEET	SUBORDINATE FORMATION					TOTAL
	PERSONNEL RESOURCES						
1	NUMBER OF EFFECTIVE COMBAT ENGINEER SQUADS AVAILABLE COMPARED TO AUTHORIZED NO.						
2	BRIDGING RESOURCES (MLC 50+ in m.)						
	WET SUPPORT BR ON WHEELS						
3	GROUNDED						
4	IN USE						
5	DRY SUPPORT BR ON WHEELS						
6	GROUNDED						
7	IN USE						
8	ASSAULT BR SPAN ON ON LAUNCHER						
9	ON TRANSPORTER						
10	GROUNDED						
11	IN USE						
	BARRIER RESOURCES						
12	A TK MINE M15						
13	M21						
14	OTHER						
15	OTHER						
16	OTHER						
17	OTHER						
	EXPLOSIVES						
18	CRATERING						
19	BULK						
20	SHAPE						
21	DM 41						
22	DM 19,20						
23	OTHER						
	SURVIVABILITY RESOURCES						
24	MACHINE OH/AUTH DOZER						
25	SCRAPER						
26	BUCKET						
27	CEV						
28	OTHER						
29	OTHER						
	CLASS IV MATERIAL						
30	CONCERTINA						
31	MINEFIELD MARKING SET						
32	OTHER						
33	OTHER						
34	OTHER						

*SOURCE: V Corps standardization letter.

Figure B-13

9. Engineer Mission Coordination Sheet (MISSREP).

a. Purpose: MISSREP is an operational report which establishes a standard format for coordinating engineer missions. It is designed to efficiently transfer specific details about an engineer mission between operational levels.

b. Security classification: SECRET.

c. Category and precedence: Category 1, priority or higher (as required).

d. Submitted by: engineer commanders at all levels.

e. When submitted: as required.

f. Submitted to:

(1) Action--subordinate headquarters responsible for accomplishing missions and higher headquarters as required.

(2) Information--as required.

g. Content: Using the serial/line number system, the sender need not transmit more than the specific details of each mission. Figure B-14 shows the MISSREP format and mission type codes.

10. Engineer Spot Report (ENGSPOTREP).

a. Purpose: ENGSPOTREP provides engineer staffs at various levels with information on items of particular engineer operational importance. This is the only engineer report that tracks the actions of enemy engineers.

b. Security Classification: usually SECRET.

c. Category and precedence: Category 1, priority or higher (as required).

d. Submitted by: engineer commanders at brigade, division, and corps level to their respective superior engineer commanders and territorial

MISSREP FORMAT AND MISSION TYPE CODE*

SERIAL		UNIT					
		(a)	(b)	(c)	(d)	(e)	(f)
1	MISSION NUMBER						
2	LOCATION OF MISSION						
3	MISSION TYPE CODE						
4	MISSION PRIORITY						
5	START TIME REQUIRED						
6	START TIME ACTUAL						
7	REQUIRED COMPLETION TIME						
8	PERCENT COMPLETE						
9	COMPLETION TIME ACTUAL						
10	CRITICAL EQUIPMENT NEEDED						
11	CRITICAL MATERIAL NEEDED						
12	REMARKS						

(Figure B-14--Continued on Next Page)

MISSREP FORMAT AND MISSION TYPE CODE*--Continued

AB..........Abatis
AFB.........Aluminum Foot Bridge
ATD.........Anti Tank Ditch
BP..........Beam Post
BR..........Bridge Demo Field Double Ln
BRM.........Bridge Demo w/Mines
CFF.........Clear Fields of Fire
D...........Dam
DFA.........Arty Defilade Position
DFT.........Tank Defilade Position
DFTO........Toc Defilade Position
DFV.........Vehicle Defilade Position
DM..........Denial Mission
ER..........Engineer Reconnaissance
FB..........Float Bridge, Class 60
FY..........Ferry
HCP.........Harden Command Post
HD..........Construct Hull Defilade Positions
LO..........Log Obstacle
LTR.........Light Tactical Raft
MB..........Minefield Breach
MC..........Minefield Clearing
M4T6........M4T6 Float Bridge
MFA.........Minefield M-15 Mines (Pe=.5)
MFAR........Minefield M-15 Mines (Pe=.75)
MFB.........Minefield M-21 Mines (Pe=.5)
MFBR........Minefield M-21 Mines (Pe=.75)
MFC (ABCD)...Minefield M 35 Mines (Pe=.5)
MFD (ABCD)...Minefield M34 Mines (Pe=.75)
MFE.........Minefield Arty Del AP Mines (Pe=.5)
MFER........Minefield Arty Del AP Mines (Pe=.75) Reinforced
MFGI........Minefield Arty Del AT Mines (200x200m)
MFGR........Minefield Arty Del AT Mines (200x200m) Reinforced
MFH.........Minefield Arty Del AT Mines (400x400m)
MFHR........Minefield Arty Del AT Mines (400x400m) Reinforced
MSR.........Main Supply Route Maintenance
NL..........Navigational Lock
P...........POL Facility
PL..........Pipe Line
PM..........Powerline Power
R...........Rubble
RAP.........Rear Area Protection
RAS.........Rear Area Security
RB..........Ribbon Bridge
RDCR........Road Crater
RDCRB.......M180 Road Crater
RDCRP.......Prechambered Road Crater
RDCR-M......Road Crater w/Mines
RP..........Recon Patrol
TN..........Tunnel
TNLP........Prechambered Tunnel
TT..........Timber Trestle
WO..........Wire Obstacle
WP..........Water Point

*SOURCE: V Corps standardization letter.

Figure B-14

commands of all levels to the appropriate engineer commander(s) in their area of responsibility.

e. When submitted: as required.

f. Submitted to:

(1) Action--direct higher headquarters (primary, static, or main).

(2) Information--appropriate territorial or allied commands, and others (when applicable)

g. Content: This report (in free-text format) allows engineer commanders and their staffs to keep their superiors fully informed of events of engineer operational importance; it also transmits information from higher to lower headquarters. It should be submitted when events like those listed below occur.

(1) Outloading of barrier material to field locations begins.

(2) Personnel and barrier material arrive at Zone A target locations.

(3) Barrier preparations begin in Zone A in each corps area after the appropriate alert measure is declared.

(4) Significant delays in planned barrier preparations occur.

(5) Significant shortage of mines, barrier materials, manpower, and bridging occur.

(6) Vital targets (as listed in CRBA Article 5, paragraph j) are destroyed.

(7) Important targets specified by AFCENT or Army groups are destroyed or captured.

(8) Major denial measures are executed.

(9) Important obstacles fall intact into enemy hands.

(10) Barrier material is lost.

(11) Engineer ammunition is sabotaged.

(12) Engineer ammunition storage sites are sabotaged.

(13) The transfer of barrier from one formation to another begins or ends.

(14) ADM teams are lost.

(15) Drilling rigs are lost.

(16) Reinforcing engineer units arrive.

(17) Engineers are used in a nonengineer role.

(18) Family of Scatterable Mines (FASCAM) minefields are emplaced (report includes start point coordinates, length, density, and effective duration).

(19) Any command post at the company level or higher is relocated.

(20) Any contact is made with enemy force (report includes composition and nature of contact).

11. River Bridge Report (RIVER BRIDGE REP).

a. Purpose: RIVER BRIDGE REP is an operational report which establishes a standard format for coordinating tactical river or raft missions. It is designed to efficiently transfer specific details about engineer river bridge missions between operational levels.

b. Security classification: SECRET.

c. Category and precedence: Category 1, priority or higher (if required).

d. Submitted by: engineer commanders at all levels.

e. When submitted: as required.

f. Submitted to:

(1) Action--subordinate headquarters responsible for accomplishing missions and higher headquarters (as required) to inform the unit of river bridge status.

(2) Information--as required.

g. Content: Lines 1 through 5 of the report are transmitted to the corps engineer level; lines 6 through 14 contain more specific information and are not reported beyond the brigade engineer or engineer battalion level. The following format is used to transmit this report:

(1) Line 1--bridge/raft type code.

(2) Line 2--location of crossing site.

(3) Line 3--time required to be operational.

(4) Line 4--unit operating the crossing site.

(5) Line 5--crossing unit.

(6) Line 6--DTG first vehicle arrives at near-shore engineer reporting point (ERP).

(7) Line 7--DTG last vehicle departs at near-shore ERP.

(8) Line 8--number of vehicles at near-shore ERP (wheeled or tracked).

(9) Line 9--DTG first vehicle arrives at the crossing site.

(10) Line 10--DTG last vehicle departs the crossing site.

(11) Line 11--number of vehicles to cross (wheeled or tracked).

(12) Line 12--DTG first vehicle arrives at far-shore ERP.

(13) Line 13--DTG last vehicle departs the far-shore ERP.

(14) Line 14--number of vehicles at far-shore ERP.

LAST PAGE OF ANNEX B

ANNEX C

ACTIVITIES TO AUTOMATE

ANNEX C

ACTIVITIES TO AUTOMATE

1. Purpose. This annex describes the various combat engineer activities in USAREUR that were identified as candidates for automation by ESC's questionnaires and interviews, and by ESC's review of a variety of documents pertaining to engineer plans and operations.

2. Limitations.

a. The automation applications outlined in this annex do not exhaust all possibilities, and generally reflect needs based on the current methods of operation. Changes in doctrine, threat, operational concepts, force structure, unit design, and so forth are certain to create new automation needs and change or eliminate others.

b. The candidates for automation suggested by ESC's research sources may have been constrained by the perceived capabilities of current hardware and software systems. Because of rapid advances in automation technology, these identified applications could be short lived. For that reason, automation needs are stated generically and are not related to specific hardware or software systems.

3. <u>Information Systems</u>. These kinds of applications involve the transfer of technical, staff, and command information among the various organizations and echelons. Detailed technical and staff information is processed and aggregated in varying degrees depending on which echelon in the force organization is generating the command information. The information is event and status oriented, and is amenable to reporting systems designed to update data bases previously established (often using preformatted documents). Automating these processes exploits the speed and accuracy with which computers manipulate large data bases, efficiently receive and transfer formatted data, and generate a wide variety of decision aids. Combat engineer information systems candidates include the following applications:

a. Engineer status and situation assessment reports. Reports in this category are derived from CR directives and corps SOPs. They contain the minimum essential information needed at each level of command. Within USAREUR, reports in this category constitute the basic combat engineer automation requirements underlying the engineer subsystem CCS[2]. The specifications in Annex B are derived from these reports. Specific report modules include:

(1) Engineer Assessment, Reporting of Site Preparation for ADM, and Reporting of Barrier Preparation (this report is required by CR Directive 80-71-3). Detailed information supporting this report is acquired by the USAREUR corps using the ENGREP, BARREP, Engineer Situation Report, and ENGSPOTREP. Detailed data are aggregated in the specified document format at corps level for submission to higher headquarters.

(2) ENGSPOTREPs. These reports are required at all levels and contain information of particular operational importance to the engineer commanders at each level.

AD-A148 533 AUTOMATED COMBAT ENGINEER OPERATIONS AND PLANNING SYSTEM (ACEOPS)(U) ARMY ENGINEER STUDIES CENTER FORT BELVOIR VA L G SUPRISE NOV 84 USAESC-R-84-7 2/2

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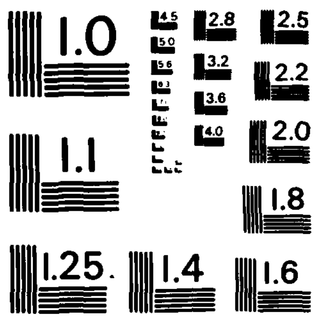

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(3) Engineer resource data. This report is designed to provide engineer staffs at various levels of command with basic planning data. The basic engineer data sheet is established in peacetime and is designed to be updated during periods of tension and after hostilities begin by using the engineer data report. The ENGREP proposed in Annex B is designed to fulfill this reporting requirement.

b. Minefield reports. These reports, required by Standardization Agreement (STANAG) 2036 and directed by the CR, are included in USAREUR corps SOPs. Normally, minefield reports are not submitted above corps level. The reports encompass conventional and scatterable minefields. They require both textual information and graphical representations such as scaled overlays and sketches. Basic minefield report data are provided by the BARREP, ENGSPOTREP, Mission Coordination Sheet, and ENGREP.

c. Transfer of obstacle documentation. After the start of hostilities, there is a need to provide timely, comprehensive, and accurate data on the status and location of obstacles to engineer and operational staffs of flanking units, replacement units, and units affected by sector boundary changes. The information to be transferred requires that scaled overlays and standard obstacle documentation (specified by CR directive) be exchanged.

4. Data Bases and Analyses. Combat engineer commanders and staffs need to produce plans, provide technical input to others, and make decisions in both peacetime and wartime. These activities require the accumulation and analysis of large amounts of data which may change frequently. Automation has the potential to improve the speed, accuracy, and efficiency with which engineers perform these tasks. Applications in this area are of two broad types: data bases and analysis procedures.

a. Data bases. These kinds of applications include: establishing and maintaining data bases, data manipulating procedures, and the output of required information in useful forms such as visual displays and formatted text.

(1) Engineer reconnaissance and intelligence data. This data base can be established in peacetime and updated as needed during peacetime or wartime. The data base would include data pertaining to terrain, routes and bridges, river-crossing sites, obstacles and minefields, denial operations, and engineer equipment, facilities, and materials. The data base system should provide for the graphic display of areas of interest (e.g., video maps with topical overlays) as well as formatted reports and other decision aids.

(2) Engineer material stocks, location, and status. This data base should include US Army engineer Class IV, Class V, bridging, and other key material items as well as host-nation engineer material items which US forces could have access to in wartime.

(3) Organizational information. These data bases are intended to facilitate the day-to-day administration of engineer organizations at all levels. The types of information included pertain to training activities, rosters, Table of Organization and Equipment (TOE) data, task organization, schedules, and similar items.

b. Analysis procedures. Applications in this category utilize the capability of the computer to perform calculations and complex analyses. Automation permits a more complete and comprehensive evaluation of alternatives ("what if" type analyses) and increases staff productivity and responsiveness. The procedures can rely on standard computer software to some extent, but most will require system programming support. Typical analytic applications include:

(1) Scheduling and allocating the engineer material movement of haul resources consistent with the priority of material needs and quantities required.

(2) Determining the impact of changes in mission priorities on engineer resource allocations, task organization, etc.

(3) Analyzing the effects of changes in available engineer resources (units and material) on assigned missions, plans, tasks, priorities, task organization, etc.

(4) Assessing the impact of changes in plans (i.e., changes in the obstacle plan) on resource allocations, material stocks required and their distribution, task organization, priorities, etc.

(5) Evaluating material stockage posture (e.g., best stock distribution plan and alternative or better stock point locations).

(6) Calculating detailed resource requirements for individual tasks such as craters, minefields, bridge demolitions, river-crossing operations, emplacement construction, and the many other engineer tasks.

5. Miscellaneous Applications. These kinds of applications can best be described as office automation requirements generated more by current peacetime needs than wartime requirements. However, once the hardware is in place, the capability exists to perform the applications in wartime. Typical applications in this category include:

a. Preparation of administrative correspondence (i.e., word processing).

b. Preparation of plans, operations orders, reports, and other formatted documents.

c. Electronic mail.

d. Maintenance of organizational administrative files such as rosters, calendars, distribution lists, addresses, phone numbers, inventory lists, library holding lists, and personnel data (e.g., weapons qualifications, driver's licenses).

LAST PAGE OF STUDY

ANNEX D

STUDY REVIEW COMMENTS

ANNEX D

STUDY REVIEW COMMENTS

I. INTRODUCTION

1. Purpose. At the completion of this study, ESC published a draft report that was distributed for review and comment to the study sponsor, the Study Advisory Group, and a select list of agencies interested in the study topic. The purpose of this annex is to present the results of that review process.

2. Scope. This annex presents ESC's response (Section II) to the significant and substantive comments received on the draft report (Sections III, IV and V). (No editorial comments are included since they were automatically included in the final report, either in response to review comments or as part of ESC's routine editorial process.) In addition, concurrences were telephoned to ESC by three agencies:

a. HQ Combined Arms Center (ATZL-CAC-CD), Fort Leavenworth, Kansas 66027.

b. HQDA DCSOPS Command, Control, Communications, and Computers Directorate (DAMO-C4), Washington, D. C. 20301.

c. DARCOM Center for System Engineering and Integration (CENSEI), Fort Monmouth, New Jersey.

II. DISPOSITION OF COMMENTS

3. Actions on USAREUR DCSENGR Comments (see Section III). ESC interprets the comments from USAREUR DCSENGR (see Section III) as a concurrence with the study report. No action is required on paragraphs 1, 2, 3, and 6 of their response. ESC's positions or actions on the remaining comments, keyed to paragraphs in the USAREUR response, are as follows:

a. Paragraph 4a: Agree. TEMPEST secure operation is intrinsic to the capability stated in Annex B, paragraph 4d(1)(b) and Annex A, paragraph 5b(1)(s) and (u). Capabilities to operate in a field environment are adequately covered in Annex A, paragraph 5b(b), (j), (k), (m), (n), (t), and (u).

b. Paragraph 4b: The system development process requires testing before acceptance and fielding. ESC believes that it is premature to specify the manner or vehicle for testing at this time.

c. Paragraph 4c: Agree.

d. Paragraph 4d: The study recommendations can be implemented immediately, and that is what ESC proposes. The wording of the recommendations has been modified to reflect this position. However, the nature of the comments hints that a system development milestone schedule is what is desired. System development is beyond the scope of the study.

e. Paragraph 5: Agree. Recommendations have been modified accordingly.

4. Actions on USAES Comments. ESC interprets the USAES comments (see Section IV) as general concurrence. ESC's position on paragraph 2 of the USAES response is:

a. The study was done for USAREUR DCSENGR and it follows that it relies primarily on USAREUR engineer community perceptions of needed management information and tools. ESC believes that linking ACEOPS to CCS^2 and AC^2MP, as recommended, would result in an engineer system as universally applicable as any other functional system in CCS^2 or AC^2MP. Modification or expansion to include other world areas, if needed at all, could be included in the orderly CCS^2 and AC^2MP implementation process.

b. ESC agrees that CERL is fully capable of ACEOPS software development and, if adequately funded, could produce in a manner compatible with CCS^2 and AC^2MP. A recommendation has been added reflecting this position.

5. Actions on CERL Comments. After receiving CERL's comments (see Section V), ESC's ACEOPS team contacted CERL to discuss the comments in more detail, particularly the nature and merits of CERL's research and development proposal for Combat Engineer Command and Control Systems. As a result of these discussions, ESC believes that what CERL proposes is feasible and includes the concepts and capabilities called for in ACEOPS. The principal constraint will be funding to support the level required for timely development.

LAST PAGE OF ANNEX D

APPENDIX D-1

III USAREUR DCSENGR COMMENTS

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY, EUROPE, and SEVENTH ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF, ENGINEER
APO NEW YORK 09403

Maj Mason/tpm/AUTOVON
370-8011

13 SEP 1984

AEAEN-MET

SUBJECT: Draft Study: Automated Combat Engineer Operations and Planning System (ACEOPS)

Commander/Director
US Army Engineer Studies Center
Casey Building #2594
Fort Belvoir, Virginia 22060-5583

1. Reference draft study done by Engineer Studies Center (ESC), entitled Automated Combat Engineer Operations and Planning System (ACEOPS), dated May 1984.

2. This office has reviewed subject document and requested comments from appropriate subordinate commands. Response has been limited, however some comments are furnished for your consideration prior to final publication of the study.

3. ACEOPS, as conceived, offers a much needed, and long overdue, facility for the accumulation, processing, and transmitting of essential engineer information. Current automatic data processing capability for engineers in this theater is limited to the Automated Barrier Planning System (ABPS), accurately described in the study as barely adequate. ACEOPS represents a dynamic capability to interactively process needed data in a timely and useful manner. The stipulation that it be completely interfaced with the rest of the ADP programs projected for the corps level is one of overriding importance.

4. Additional comments include:

a. The system must be TEMPEST secure and fully capable of operation (as well as mobility) in a field environment.

b. A prototype of the system should be field tested at a major unclassified exercise (such as LOGEX) prior to its implementation.

c. The draft study presents a good overview of engineer requirements, for both peace and war, which should be considered in the development of the system.

d. A proposed milestone plan for actual implementation of the study's recommendations would be useful to planners in the field.

AEAEN-MET
SUBJECT: Draft Study: Automated Combat Engineer Operations and Planning System (ACEOPS)

5. As indicated frequently in the draft, engineer input to the Army-wide plans and concepts for automation is necessary. Although USAES is the proponent for the provision of this input, this headquarters feels it to be critically necessary that it, along with appropriate corps representation, be deeply involved as the ACEOPS concept is developed. Study recommendation to that effect could lay the framework for a viable cooperative effort.

6. The amount of work and research devoted to the preparation of this draft report is both obvious and appreciated. We look forward to the completion of the final report and the development of this concept as a working tool for the engineer, particulary in the European theater of operations.

FOR THE DEPUTY CHIEF OF STAFF, ENGINEER:

Cecil O. Locklear

CECIL O. LOCKLEAR
LTC, GS
Chief, MET Division

LAST PAGE OF APPENDIX D-1

APPENDIX D-2

IV USAES COMMENTS

ATZA-CDC (15 Apr 84) 1st Ind
SUBJECT: Transmittal of the Engineer Studies Center Report, "Automated Combat Engineer Operations and Planning Systems (ACEOPS)."

US Army Engineer School, Fort Belvoir, Virginia 22060 25 JUN 1984

TO: Commander/Director, Engineer Studies Center, Corps of Engineer, Casey Building 2594, ATTN: ESC, Fort Belvoir, Virginia 22060

1. The US Army Engineer School Directorate of Combat Developments has reviewed the subject study study. It is an excellent attempt to present the requirements of US Army Europe combat engineers for command and control automated data elements.

2. Recommend that consideration be given to expanding the study to include the other geopolitical areas of the world where US Army Engineers would possibly deploy and to identify specific engineer functions. The objective must be to provide a viable management tool and not a means of digitizing [redacted] reports. The system, both hardware and software, must be totally compatible with the Army C^3 system. The Construction Engineering Research Laboratory could generate required software.

5. The USAES POC is Mr. Richard Thompson, ATZA-CDC, AV 354-3504, Com 664-3777.

FOR THE COMMANDANT:

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THEODORE VANDER ELS
Colonel, CE
Director of Combat Developments

LAST PAGE OF APPENDIX D-2

APPENDIX D-3

V CERL COMMENTS

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORY, CORPS OF ENGINEERS
P.O. BOX 4005
CHAMPAIGN, ILLINOIS 61820 1305

1 5 AUG 1984

REPLY TO
ATTENTION OF:

CERL-FS

SUBJECT: Engineer Studies Center Report, "Automated Combat Engineer Operations and Planning Systems (ACEOPS)"

Commander and Director
Engineer Studies Center, Corps of Engineers
Casey Building 2594
Fort Belvoir, VA 22060

1. We concur with the findings of subject study. As a result of our work in a related area this year, we have reached the same conclusions as in your report, i.e., that "engineer automation requirements can and should be included for concurrent development (with the maneuver control system)" and that an Automated Combat Engineer Operations and Planning System (ACEOPS) would be "expected to be a maneuver control subsystem." We also agree that the strategy should be to use hardware that is already being developed in support of Army-wide Command and Control Subordinate Systems.

2. What you have named ACEOPS we have named Combat Engineer Command and Control System (CECCS). USAES has asked USA-CERL for assistance in developing a CECCS. While the work will not begin officially until FY85, we have done some preliminary "philosophical design" thinking about the problem in an attempt to bring all of the combat engineer related automation initiatives and requirements into perspective. In the near term, we see the development of three separate "classes of applications" being the reality - CECCS related applications, topographic related applications, and technical support type applications. Realistically, these three type applications are not going to merge into an integrated system(s) until well into the future. At inclosure 1 are some concept papers that we have developed recently that show how these three type systems might relate in the near future and in the 2010 time frame. We hope they are food for thought.

15 AUG 1984

CERL-FS
SUBJECT: Engineer Studies Center Report, "Automated Combat Engineer Operations and Planning System (ACEOPS)"

3. You should be aware of the Computer Based Instruction (CBI) initiative being managed by Major Rose, chief of the Captains Training Team (ATZA-TD-CTT) at USAES. By FY87 they plan to start putting PLATO or PLATO-like terminals in every combat engineer battalion in active and reserve units. This may change of course, depending on how successful Phase I of the CBI experiment, the school-house phase, is. But it shows that there are major peacetime systems also being developed and, since training does not stop in wartime, it is logical to assume, that in the future such peacetime systems will be co-located on the same hardware used in the combat units to run the wartime systems. Thus, the system boundaries get fuzzier, the further downstream one looks in time.

4. Reference our work next year on CECCS, we will be using a top-down approach - the "Combat Engineer Command and Control System" work unit - in conjunction with a bottom-up approach to the problem - the "Combat Engineer Military Computer Applications" work unit. This is in line with the "Evolutionary Development" approach to computer systems development espoused by CACDA. Evolutionary development is defined as being the phased development and early fielding of system sub-capabilities according to a prioritized plan, with the ultimate objective of satisfying a set of known fixed requirements in addition to the continuing specification of additional requirements during system development. Information on these two work units and other USA-CERL work units addressing automated products is at Inclosure 2.

5. If you have further questions on our views or on the work we will be doing in this area, please don't hesitate to contact either Mr. John Deponai, Team Leader, Military Engineering Team, FTS 958-7271, or Mr. Charles Herring, Principal Investigator for the Military Computer Applications work unit, FTS 958-7348.

2 Incl
as

PAUL J. THEUER, P.E.
Colonel, Corps of Engineers
Commander and Director

CF:
Commander
USAES
ATTN: ATZA-CDM/CPT Khawaja
Ft. Belvoir, VA 22060

LAST PAGE OF STUDY

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