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FIRST ANNUAL SUMMARY OF CAEADS DEVELOPMENT ACTIVITIES.(U)
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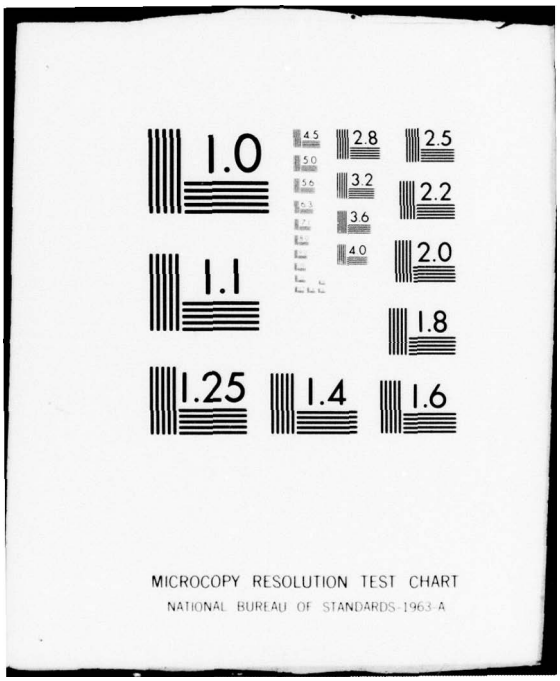
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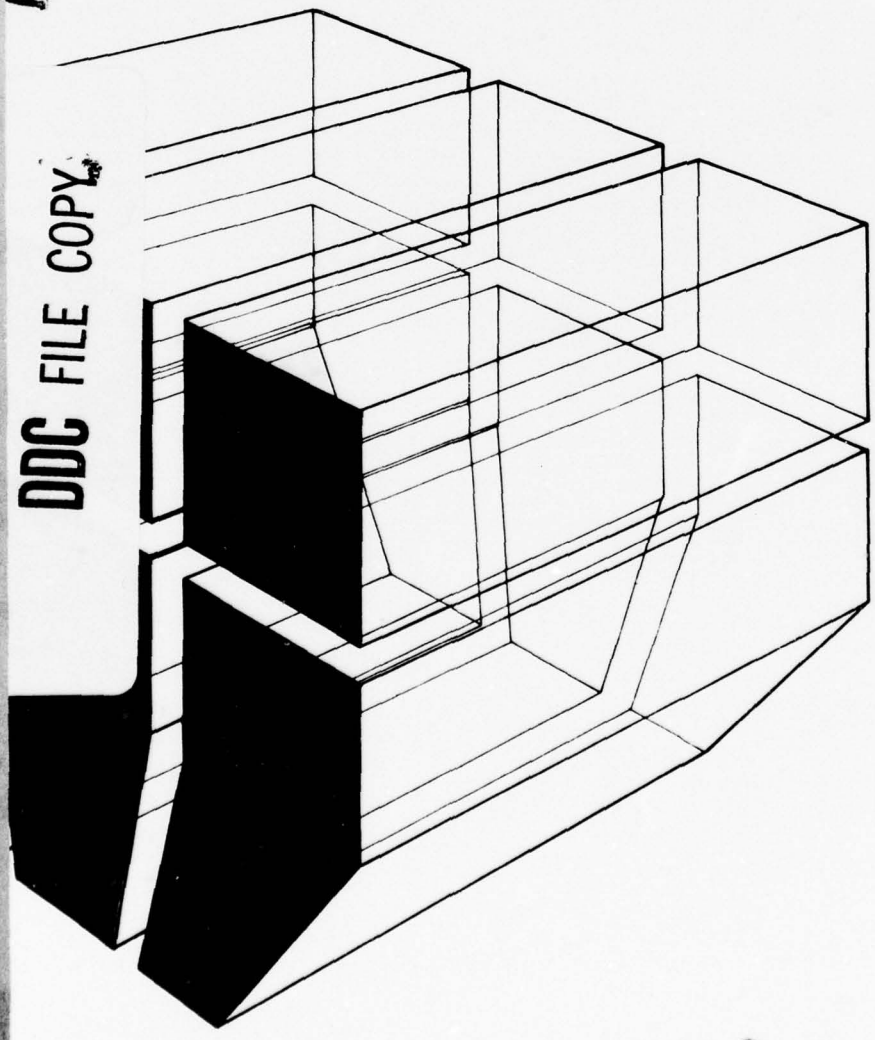

by
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R. Larson

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This report presents a status summary on Computer Aided Engineering and Architectural Design System (CAEADS) development activities for FY77. The report highlights accomplishments to date, planned research activities, and challenges to progress that require consideration by management.

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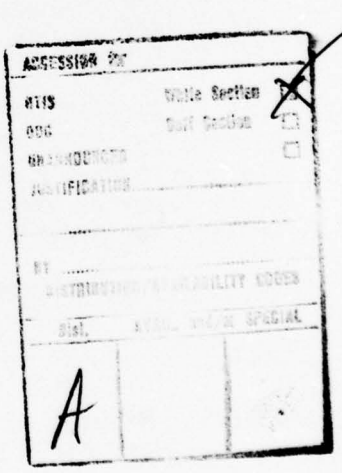
FOREWORD

This report was prepared by the CAEADS Management Team of the U.S. Army Construction Engineering Research Laboratory (CERL) for the Directorate of Military Construction, Office of the Chief of Engineers (OCE) under Project 4A763734DT03, "Military Construction and Field Engineering Development"; Task 01, "Computer-Based Procedures"; Work Unit 005, "Computer Assisted Engineer-Architectural Design System Supplement/Subprogram Software." The applicable QCR is 2.10.001. The OCE Technical Monitor is Mr. Vincent Gottschalk.

The work was conducted under the general supervision of Mr. R. A. Larson, Chief of the CAEADS Management Team, and Mr. E. A. Lotz, Assistant Director for Facilities Coordination.

COL J. E. Hays is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.



CONTENTS

FIRST ANNUAL SUMMARY OF CAEADS DEVELOPMENT ACTIVITIES

1 INTRODUCTION

Background

The Military Construction, Army (MCA) process is complex and involved, calling for multilevel interaction and coordination between many different disciplines and organizational elements. Activities of the MCA process are often repeated for individual projects to arrive at critical decisions. Communication and data handling requirements are large. The complexity of criteria and other guidance influencing design decisions continues to grow as a result of new materials, advances in building techniques, concern for the environment, and the increasing need to conserve energy. In the face of more stringent resources, these growing demands on the planner, the programmer, and the designer created a need for better techniques and methods for getting the job done.

The Computer-Aided Engineering and Architectural Design System (CAEADS), currently being developed at the U.S. Army Construction Engineering Research Laboratory (CERL), will provide a comprehensive, integrated set of computer-based tools to aid the MCA planning, programming, and design process.

The computer is being used increasingly by Corps personnel. Commercially available programs, as well as many developed within the Corps, are being used to different degrees within each District. CAEADS proposes to organize the assimilate all current efforts to fully exploit the computer. The ultimate goal is a totally integrated system that maximizes the efficiency of computer applications in supporting the professionals who perform the military construction facility delivery function.

Purpose

The purpose of this report is to provide a status summary on Computer-Aided Engineering and Architectural Design System (CAEADS) development activities for FY77, including accomplishments to date, planning actions, and challenges to progress that require consideration by management.

Mode of Technology Transfer

Technology transfer of CAEADS will be accomplished in accordance with AR 18-1, Para 2-20c, the System Development Package (SDP), and will consist of six items: (1) Detailed Functional System Requirements, (2) Program Description and Maintenance Manual, (3) Operators (DPI) Users Manual, (4) Functional Users Manual, (5) Training Manual, and (6) Statement of Adherence to Data Element Standardization and Information Control Policies.

2 CAEADS SYSTEM STRUCTURE

The concept design of CAEADS provides for a highly integrated approach in developing systems software. Automatic Data Processing Equipment (ADPE) and communications must support this concept.

Software Components

Operating System Programs

These programs maintain overall integrity, provide access control, and perform the many functions necessary to achieve specified responsiveness.

Criteria Data Base

This component is a project-independent file maintenance information storage and retrieval system in which all general application criteria, guidance, and other information amenable to automation are filed for ready access by any application program.

Project Description Data Base

This component is a project-dependent file maintenance information storage and retrieval system, which is capable of storing the three-dimensional description of individual facilities together with associated nongeometric information.

Design Application Programs

This is the set of all programs, both internal and external to CAEADS, both government-owned and commercial, that will be used to accomplish design analyses and related functions from CAEADS data in response to specified requirements.

Hardware

Hardware, which includes ADP centers, work stations, and communications, represents a complex problem because of the difference in hardware requirements by various design application programs; however, the hardware configuration is expected to evolve with the software. Tradeoffs between use of centralized vs. decentralized processors and

various combinations of each are being evaluated. The supporting communications network will be designed in conjunction with the ADPE selection process. Cost considerations will be paramount in determining the most appropriate hardware configuration. Neither specific hardware nor the exact configuration of individual work stations for input and output have been determined yet.

3 ORGANIZATION OF DEVELOPMENT ACTIVITIES

The current CAEADS Project Team was formed at CERL in July 1976 as an outgrowth of a project development status review. The team organization provides for an overall team manager and three specialty managers. The team manager has overall responsibility for the development of CAEADS. The system specialty manager is responsible for the overall system design, and the planning and programming of CAEADS activities. The applications specialty manager is responsible for interaction with user organizations to determine requirements and for investigating and defining computer applications that should be incorporated into CAEADS. The implementation specialty manager is responsible for all actions necessary to install system components, first in a test mode, and then in an operational mode as they are developed.

Primary guidance on CAEADS development is provided by the staff of the Engineering Division, Military Construction Directorate, OCE. A Field User Advisory Group (FUAG), composed of representatives of five Districts, two Divisions, and two major Army commands, was established to review progress of CAEADS development periodically and to make recommendations based on their evaluation of user requirements and priorities.

A group of leading experts in the field of computer-aided design provides professional assistance in guiding CAEADS planning and development. This assistance includes the review of system documentation as it is developed.

Many of the research tasks were accomplished by contract in order to supplement CERL's in-house capability and to incorporate current technology in the commercial and educational spectrum into CAEADS.

4 ACCOMPLISHMENTS

Summary of Activities Through FY76

At the end of FY76, a concept design which embodied more than 3 years of investigative research was developed for CAEADS, and plans were prepared for the detailed design phase. The concept design that defined the components described in Chapter 2 was reevaluated by Corps of Engineers staff members and professional consultants, who recommended that no changes be made to the system's fundamental attributes.

A duplex approach to development was reaffirmed, in which design and implementation of stand-alone versions of CAEADS components would proceed concurrently with design of the integrated system. Each of these components will be converted to modules of the integrated system in the future.

Prior to FY77, considerable effort was given to the development of individual CAEADS components, with little concern to how they would ultimately fit into the integrated system. The rationale behind such an approach was that computerized applications (tools) should be developed in a stand-alone mode as a first step in accomplishing the overall systems plan. The majority of all research and development resources expended prior to FY77 were for individual stand-alone components.

Progress in FY77

While emphasis remained on stand-alone components in FY77, development of the detailed, integrated CAEADS was initiated. The current CAEADS System Development Plan shown in Figure 1 reflects the work accomplished in FY77 and projected activities for the following three fiscal years. The chart has been used both to assess and control overall progress and as a discussion medium between the user and the researcher during conferences and the field participation program. The System Development Plan is updated periodically to reflect redefinition of requirements and changing priorities as new knowledge clarifies technological opportunities.

The Field User Advisory Group (FUAG) met twice during FY77. Appendix A provides the minutes of these meetings. The observations and recommendations of this group were incorporated into system development decisions. For example, the FUAG stressed the need for giving priority to the planning and project definition steps of the process to insure that the documents given to the designer are comprehensive and accurate. The current CAEADS development plan reflects this priority recommendation.

A field visitation program was conducted early in FY77 to acquaint operating personnel with CAEADS and the plan for its development. Visits were made to nine Corps Districts responsible for the design of military construction projects, two Corps Divisions, and two major Army commands. Feedback during question and answer periods also emphasized the need for improvements in the planning and project definition phases of the MCA process.

Integrated System Design

At the beginning of FY77, two major contracts were awarded to architect engineer (A/E) firms. The contract awarded to Daniel, Mann, Johnson, & Mendenhall (DMJM) of Los Angeles, CA, provided for the development of a detailed system design for the overall CAEADS which provides a comprehensive configuration of the system and its functional capabilities. The other contract, awarded to Applied Research of Cambridge (Canada), Ltd., provided for a complete evaluation of current technological development in geometric data-handling systems. An additional contract, which investigated the feasibility of installing an automated drafting system at CE District offices, was completed. Table 1 summarizes accomplishments on CAEADS overall design for FY77.

Individual Stand-Alone Components

CERL in-house research was primarily devoted to continued development of stand-alone automated application tools. These included a final design cost estimating system, life cycle cost data collection procedures, computer based specifications, DD Form 1391 processor, evaluation of installation utility systems, systematic evaluation and review of criteria for habitability, industrialized building information system, habitability information system, building thermal loads analysis and simulation system, environmental technical information system, and computer procedures for life cycle design of pavement. Table 2 summarizes accomplishments on stand-alone components for FY77.

Preparation of Specifications for FY78 Contracts

To enable contractual services to begin early in the new fiscal year, scopes of work for FY78 priority tasks were prepared, and their approval requested. Included were services to provide (1) an advanced system design of CAEADS which is a continuation of the work by DMJM, (2) software development specifications for the CAEADS system communication organizer and geometric data handling subsystem, (3) computer procedures for updating the installation master plans basic information map data and for evaluating utilities load impacts on map data, (4) a system

design for an automated design criteria management subsystem, and (5) a human factors analysis of the DD Form 1391 processing program.

Other Accomplishments

A brochure containing information on the overall CAEADS and three separate newsletters reporting the status of development activities were prepared and sent to interested personnel and organizations.

5 ASSESSMENT AND PLANNED ACTIONS

FY77 Plan Vs. Actual

The overall FY77 objective was to identify all essential development tasks and organize these into a coordinated action plan which would facilitate systematic and orderly accomplishment of detailed development activities and lay the foundation for full-scale, timely development during FY78 and beyond. This objective was achieved and documented in a report on detailed system design.[1]

For individual stand-alone components, the key objectives planned for FY77 were met (See Figure 1). The progress on individual tasks occurred in the proper order and was consistent with the overall CAEADS development priorities and time-phasing. In the area of integrated system design, the groundwork for attaining commonality (hardware, software, communications, and documentation) and system coherence has been laid.[2]

As a result, future development is expected to consist largely of extension or continuation of the FY77 accomplishments, with no significant alterations in the approach and research direction.

Future Plan

The future course of action is firmly set and no major changes in technical objectives or approach are anticipated. Table 3 lists planned major tasks and the capability goals for each.

CAEADS Team

The organization of the CAEADS team is responsive to current development requirements, and no changes are recommended at this time.

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[1] Daniel, Mann, Johnson, and Mendenhall, Computer-Aided Engineering and Architectural Design System (CERL draft technical report), Vols I-VII.

[2] Daniel, Mann, Johnson, and Mendenhall.

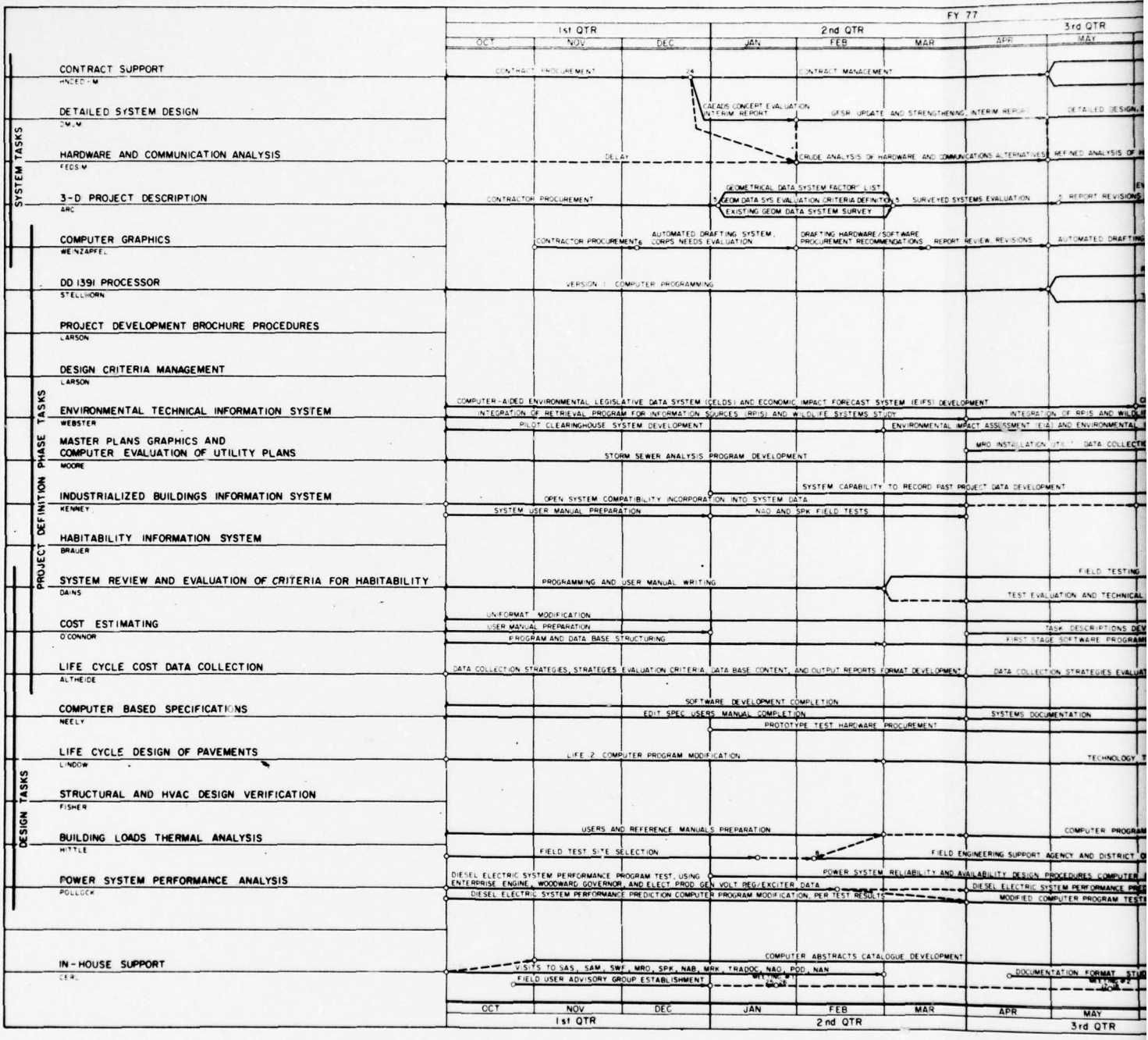

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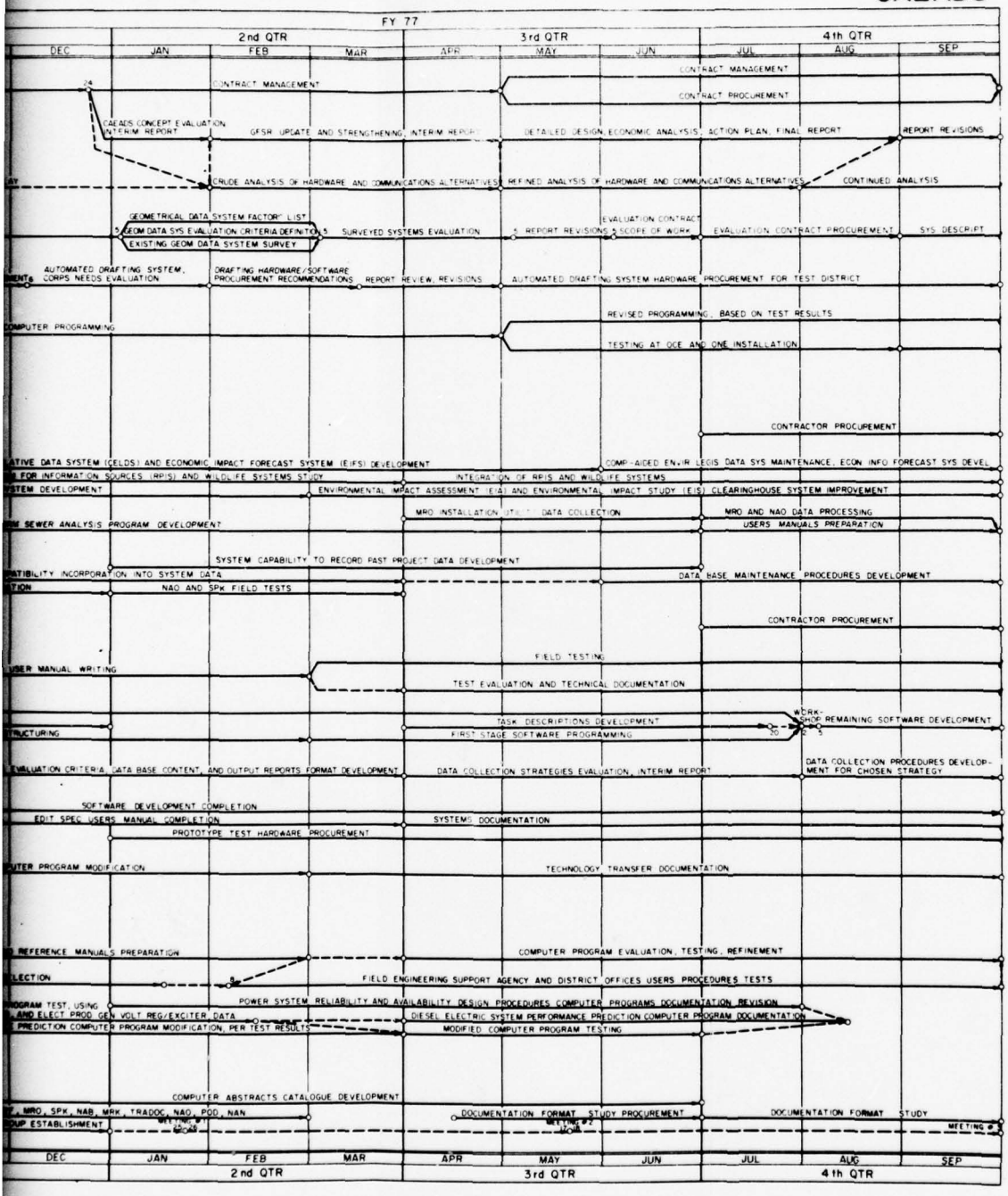
Figure 1. CAEADS development plan.

CAEADS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FIELD TESTING
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TEST EVALUATION AND TECHNICAL DOCUMENTATION
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REMAINING SOFTWARE DEVELOPMENT
TASK DESCRIPTIONS DEVELOPMENT
RUCTURING
FIRST STAGE SOFTWARE PROGRAMMING
EVALUATION CRITERIA, DATA BASE CONTENT, AND OUTPUT REPORTS FORMAT DEVELOPMENT
DATA COLLECTION STRATEGIES EVALUATION, INTERIM REPORT
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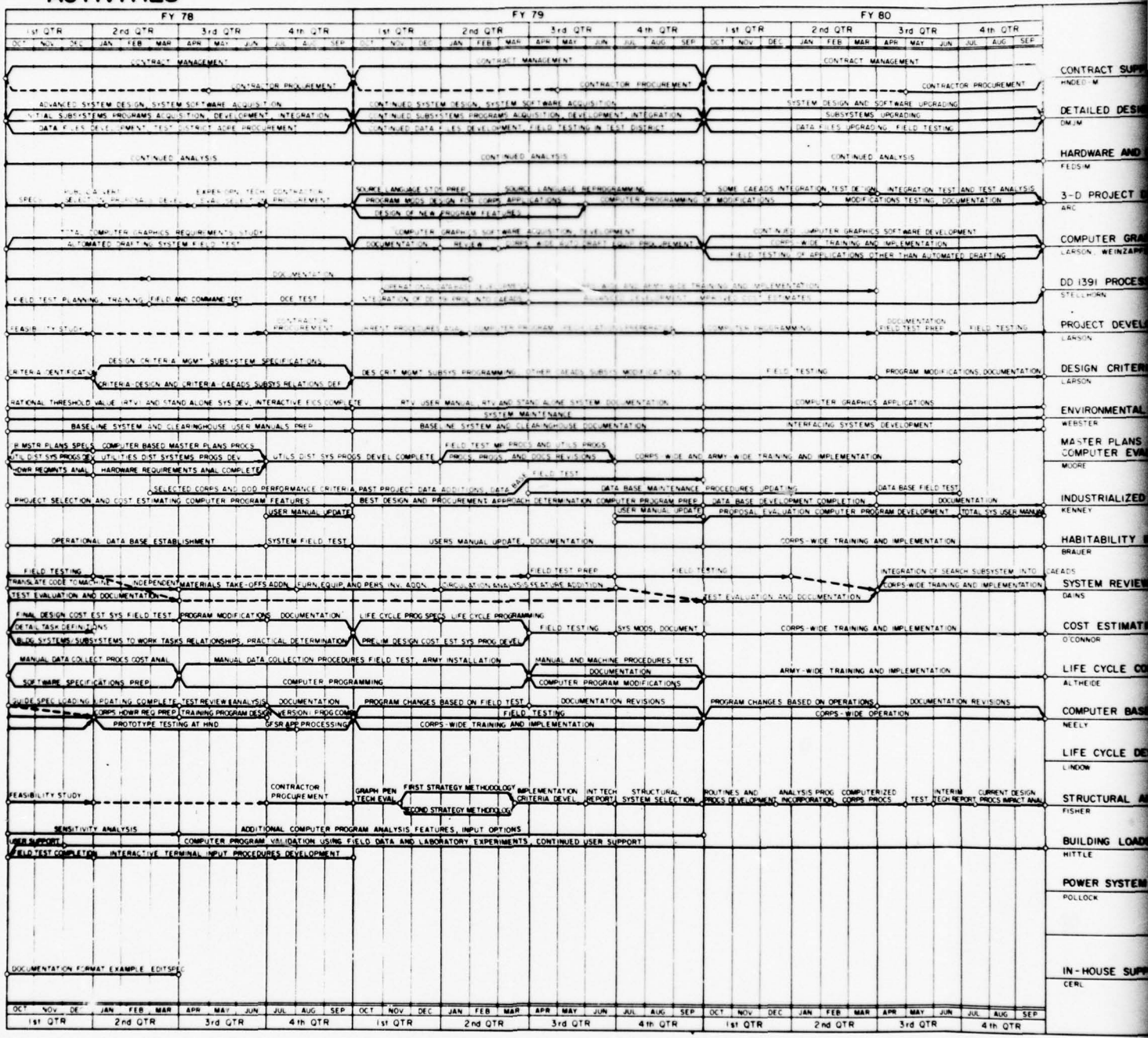

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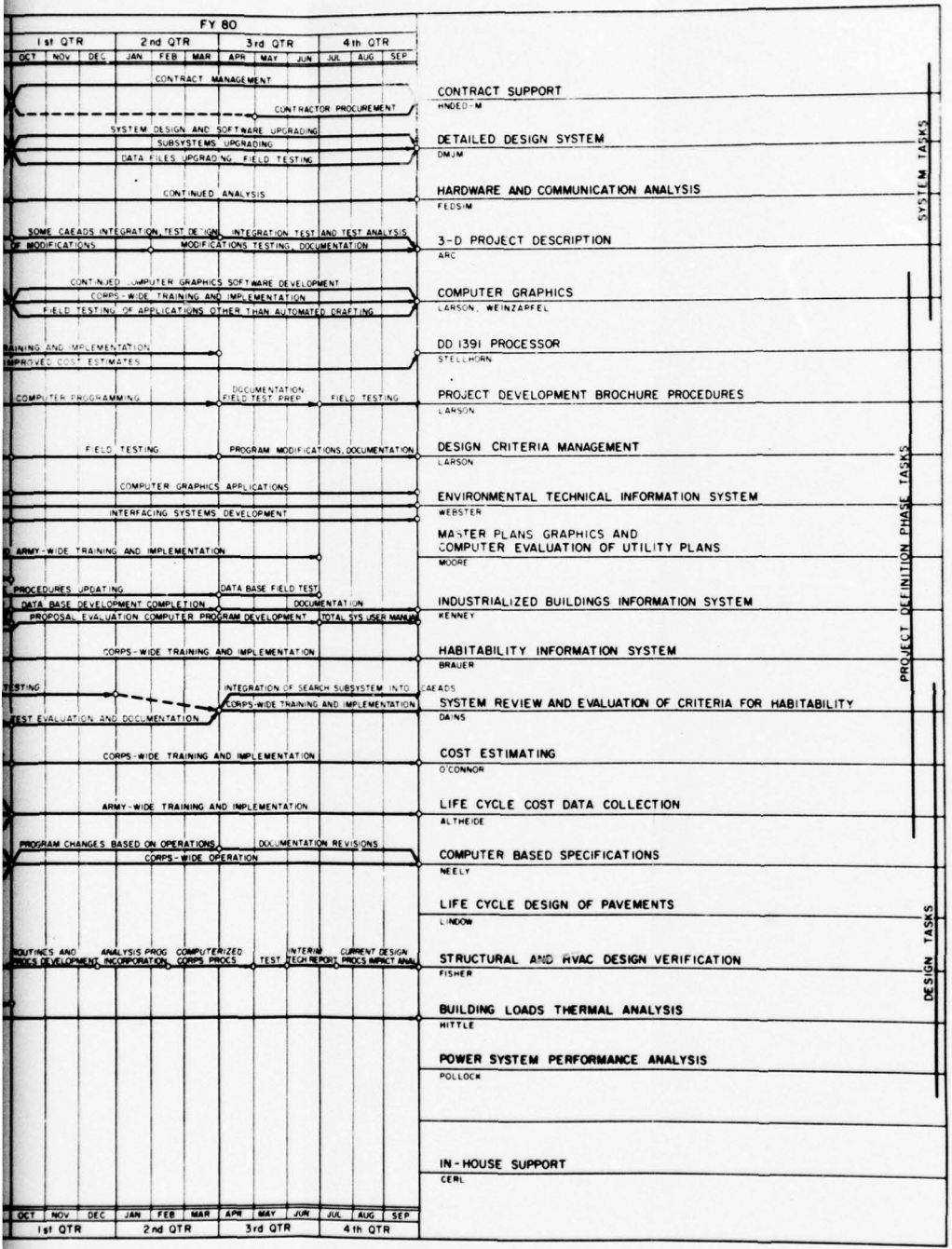
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FY78 Work Plan

Table 4 outlines the work plan for FY78, showing programmed vs. actual funding and the impact caused by this funding. In broad sense, the overall reduction in levels of effort will cause delays in some projected product delivery dates, particularly in the development of the integrated CAEADS design. However, significant progress should be made in fielding stand-alone modules.

6 FUTURE CONSIDERATIONS

Although expanded support has brought CAEADS closer to realization, a few crucial matters impinge upon future development activities, and cognizance of and planning for them should continue.

Continuity of Funding Support

Funding support must be continued and must be at a level that will maintain continuity in research activities. Equally important is the balance in funding support between the integrated system design tasks and the individual stand-alone components. The balanced fund support is needed to achieve orderliness and coordination in the overall development accomplishments (for example, the support provided in FY77).

Field User Participation in CAEADS

Fundamental to FY77 accomplishments was the active participation by field users in CAEADS development activities. They provided invaluable assistance in formulating development task priorities and long- and short-term development goals. Continued field user interaction through FUAG and District visitation programs is vital to insure that CAEADS development progresses in concurrence with user requirements and priorities.

Consistency of Regulatory Guidance

Producing CAEADS involves research, development, testing, and engineering (RDTE) activities as well as computer systems development. Hence, it is subject to regulatory procedures set forth in AR 70-1[3] and AR 18-1.[4] ER 1110-1-10[5] is equally applicable, since the system is being designed for Corps-wide use. Inconsistent interpretation of these directives causes difficulties in arriving at a consistent plan of action. Specific guidance on which regulation to follow for various developmental tasks should be provided by OCE.

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3 Army Research, Development, and Acquisition, AR 70-1 (Department of the Army, 1 May 1975).

4 Management Information Systems Policies, Objectives, Procedures and Responsibilities, AR 18-1 (Department of the Army, 22 March 1976).

5 Development, Review, and Use of Computer Programs, ER 1110-1-10 (Department of the Army, 30 June 1970).

AR 18-1 appears to be the most relevant to CAEADS development, but it fails to consider RDTE activities accompanying the software engineering activities and treats them all under a business-oriented system category which requires little or no scientific or engineering effort to develop. Furthermore, it calls for extensive documentation and review cycles, resulting in a significant increase in development cost and time. An approach to expedite development, which would comply with the documentation requirements, would be to complete all activities through the "System Integration Test" (Para 1-19, AR 18-1) under AR 70-1 authority and to complete the remaining activities under AR 18-1. This approach would enable researchers to reach the "Prototype Evaluation Test" (Para 1-20, AR 18-1) without being deterred by lead times required for a number of approvals.

Another approach, which may be considered concurrently with the above, would be to apply AR 18-1 to the overall CAEADS level (e.g., integrated system design) only. The individual functional components would be developed with abstracted documentation requirements (except for the program documentation package), but their compliance with the regulation would be insured through development specifications to be set forth by the integrated CAEADS design. The period of time that individual subsystems operate as stand-alone could be regarded as an integral part of system integration testing for the total CAEADS.

Project Management Environment

The overall responsibility of the CAEADS Project Team includes cognizance of and technical input to the development activities of individual stand-alone components. Largely due to the project management environment effected in FY77, the team was able to fulfill this responsibility. However, as individual stand-alone components advance toward integration, the management environment is likely to grow in importance. Continued, possibly expanded, support is therefore needed to insure effective and efficient development and implementation of CAEADS.

7 CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The CAEADS development organization and technical approach are sound, accomplishments to date are concrete, and full-scale coordinated development undertakings can be launched following FY77. Support from outside CERL has been invaluable and will continue to be needed, especially in the areas of funding support, field user interaction, interpretation of regulatory process, and project management environment.

Recommendations

The following actions are recommended:

1. Support of the present CAEADS development approach should be confirmed since it takes full advantage of economic benefits from both stand-alone components and the integrated system. (See the DMJM final report on initial system economic analysis.[6])

2. For the near-term, a balanced funding support between the integrated system design and the stand-alone components development should be continued. The balanced support is the premise which draws major economic gains. However, where developmental funding is constrained, priority should be placed on developing and fielding stand alone components.

3. Centralized administrative guidance should be provided by OCE on the applicability and interpretation of the regulatory procedures set forth in AR 18-1 and AR 70-1 as they apply to CAEADS development. Currently, the CAEADS project office is providing such centralized guidance to the R&D community relying primarily upon AR 18-1, DOD 4120.17M, and FIPS Pub 38 requirements.

4. Among functional components under CAEADS, the first priority should be given to the design and selection of the CAEADS data base and software subsystem to describe a facility as it is being designed. This subsystem, when implemented, handles all the geometric and nongeometric data that describe the facility in totality, and will be the heart of CAEADS. This task is technically the most challenging and is on the critical path of the overall development plan.

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[6] Daniel, Mann, Johnson, and Mendenhall, Computer-Aided Engineering and Architecture Design System (CERL draft technical report).

5. All go/no-go decisions on CAEADS and its components should be subjected to rigorous economic analyses. These analyses should be reviewed on a regular basis and updated as significant new information becomes available. The mechanism for these decisions is the CAEADS MISEA and CERL Return on Investment (ROI) periodic exercises. exercises.

6. An effective management environment where the CAEADS Project Team effectively coordinates, assimilates, and integrates individual components' development activities should be continued.

Table 1

CAEADS Accomplishments in FY 77

Integrated System Design Tasks

Tasks	Funds ($000)	Accomplishments	Remark
Detailed System Design	410	Concept system design for total CAEADS completed. Detailed system design initiated. Reports/Documentations: a. General Functional System Requirements (GFSR). b. CAEADS Economic Analysis (CAEADS/EA). c. Detailed Functional System Requirements (DFSR). d. Project Master Plan (PMP). e. "Field Participation in CAEADS" Technical Manuscript ADS-4.	
Hardware and Communication Analysis	106	Analysis for total CAEADS hardware and communication requirements completed.	New
3-D Project Description	56	State-of-the-art techniques of computer representation of three-dimensional structure investigated. Reports/Documentations: "Computer Representation of 3-D Structures for CAEADS" Draft.	New
Computer Graphics	20	Feasibility of implementing automated drafting systems at Corps District Office investigated. Reports/Documentations: "Evaluation of Need, Outline of Criteria and Recommendations for Procurement of Automated Drafting Systems for US Army Corps of Engineers District Implementation," Draft.	New

Table 2

CAEADS Accomplishments in FY77

Individual Application Modules

Tasks	Funds ($000)	Accomplishments	Remarks
DD Form 1391 Processor	72	Version I facilitating computer-aided preparation and checking of DD Form 1391 submittals completed and preliminary tests conducted. Reports/Documentations: a. "DD Form 1391 Processor - Users Manual," Draft. b. "DD Form 1391 Processor - System Overview," Draft. c. "DD Form 1391 Processor - Prototype Demonstration," Draft.	Continuation
Environmental Technical Information System	255	1. The Construction, Operations and Maintenance, Mission Change, Training, RDTE, Procurement, and Industrial functional areas of EICS have been field-tested. Reports/Documentations: a. User Manual RDTE b. Document EICS c. User Manual--Integrating a Tech Spec d. EIFS--Multiplier Aspects e. System Documentation EIFS f. System Documentation CELDS g. Complete RDTE, Indstr User Manual	Continuation

Table 2 (cont'd)

Tasks	Funds ($000)	Accomplishments	Remarks
Computer Evaluation of Utility Plans	59	a. Sanitary and storm sewer batch programs completed. b. Interactive water distribution system analysis program completed. Reports/Documentations: a. "Users Manual--Storm Sewer," Draft. b. "Users Manual--Water Distribution," Draft.	Continuation
Industrialized Building Information System	100	Software program with initial set of data under field testing process. Reports/Documentations: "Users Manual for Computerized Information on Industrialized Building Systems," Draft.	Continuation
Systematic Review and Evaluation of Criteria for Habitability (SEARCH)	135	Expanded building design evaluation capabilities to include multi-story buildings, non-rectangular space evaluation, and shortest walking distance evaluation completed, field-tested, and modifications from field tests made. Reports/Documentations: "SEARCH--Users Manual," Draft.	Continuation
Cost Estimating	120	Final design cost estimating system designed and software development 99% completed. Reports/Documentations: a. "Computer-Aided Final Design Cost Estimating System Overview," TR P-81. b. "Computer-Aided Final Design Cost Estimating System Users Manual," Draft.	Continuation

Table 2 (cont'd)

Tasks	Funds ($000)	Accomplishments	Remarks
Life Cycle Cost Data System	55	Six data collection strategies for obtaining life cycle maintenance & repair cost data developed, evaluated, and comparative analysis under way. Reports/Documentations: "Recommendations on the Strategies for Collecting Life Cycle M&R Cost Data," Draft.	Continuation
Computer-Based Specifications	139	Implementation system under development. Reports/Documentations: a. "Management Information System Economic Analysis (MISEA) - System Development Review." b. "EDITSPEC Project Master Plan." c. "EDITSPEC - Users Manual."	Continuation
Life Cycle Design of Pavements	63	LIFE2 system, capable of providing life cycle costs for alternative pavement design schemes and maintenance & repair strategies, completed and operational. (Field testing & training completed.) Reports/Documentations: "Systems Approach to Life Cycle Design of Pavements," Vol 1, 2, 3, Draft.	Continuation

Table 2 (con't)

Tasks	Funds ($000)	Accomplishments	Remarks
Building Thermal Loads Analysis	100 (40)*	BLAST program development completed and field-tested. Draft implementation plan complete. Validation initiated. Reports/Documentations: "BLAST User and Reference Manuals," Vol I & II, TR E-119.	Continuation

* Additional funds from Air Force.

Table 3

CAEADS Future Tasks (Near-Term)

I. *Integrated System Design*

Tasks	Capability Goals	Recommended FY78 Funding ($000)	Ending FY
Detailed System Design	An advanced system design for CAEADS providing an expanded Detailed Functional System Requirement (DFSR), an updated CAEADS Economic Analysis (CAEADS/EA), and an updated Project Master Plan (PMP).	345	80
Hardware Requirements Analysis	Alternative configurations of hardware components and communication devices supporting integrated CAEADS.	30	80
System Software and Data Base	Software components and related data bases which (1) allow interfaces between individual subsystems, (2) organize and maintain project-independent and project-dependent data files, and (3) provide geometric data handling capability for three-dimensionally representing and manipulating project data.	435	83
Computer Graphics	Turnkey, automated drafting systems for implementation at District offices.	275	79
Design Criteria Management System	Management system to facilitate centralized management and retrieval of all design criteria, guidance, parameters, and historical records that apply to facility planning and design process.	190	80

Table 3 (cont'd)

II. Individual Application Modules

Tasks	Capability Goals	Recommended FY78 Funding ($000)	Ending FY
DD Form 1391 Processor	a. Computer-aided preparation of DD Form 1391. b. Computer-aided checking of DD Form 1391 submittals. c. Computer-aided analysis and evaluation of military construction programs at all levels.	80	79
Project Development Brochure Procedures	a. Computerized preparation of PDB. b. Improved processing of functional requirements. c. Improved identification of supporting facilities requirements.	75	80
Environmental Technical Information System	a. The Environmental Impact Computer System (EICS I) identifies potential impacts associated with DA activities, supplies ramification remarks explaining each impact, and identifies potential mitigation procedures. b. The Economic Impact Forecast System (EIFS) provides socioeconomic data and estimates of economic impact associated with DA actions. c. The Computer-Aided Environmental Legislative Data System (CELDS) provides abstracts of pertinent state and Federal environmental regulations.	250	79

Table 3 (cont'd)

Tasks	Capability Goals	Recommended FY78 Funding ($000)	Ending FY
Master Plan Graphics and Computer Evaluation of Utility Plans	a. Computer-aided creation and update of installation master plans. b. Computer evaluation of utilities distribution systems to include electrical, water, sanitary sewer, storm sewer, and gas.	55	80
Industrialized Buildings Information System	Information storage and retrieval system to provide the synthesized information on industrialized building techniques and building products.	100	80
Habitability Information System	A query system containing R&D literature, codes, regulations, TMs, etc., to answer whether information is available to answer the specific query and where it is. These queries concern only the subject area of habitability.	77	82
Systematic Review and Evaluation of Criteria for Habitability	a. Automated evaluation of building design concept and layouts. b. Automated validation, storage, and communication of habitability design criteria.	250	79
Cost Estimating	a. Final design cost estimating system. b. Preliminary design cost estimating system.	325	80

Table 3 (cont'd)

Tasks	Capability Goals	Recommended FY78 Funding ($000)	Ending FY
Life Cycle Cost Analysis	Data storage, retrieval, and updating capabilities for M&R cost of facilities over their lifetime.	65	81
Computer-Based Specifications	a. Computer-assisted generation and update of project specifications. b. Computer-assisted checking, editing, formatting, and printing both OCE Guide Spec and project specifications. c. Computer-assisted posting of OCE Guide Spec.	245	79
Structural and HVAC Design Verification	a. Computer-assisted checking of bldg structural systems and drawing. b. Computer-assisted checking of bldg mechanical systems and drawing.	40	80
Building Loads Thermal Analysis	a. Prediction of bldg energy loads profiles. b. Performance analysis of bldg HVAC systems. c. Computerized checking of HVAC systems designs and layouts.	286	79

Table 4

CAEADS FY78 Funding Reductions Impacts

I. Integrated System Design Tasks

Funds ($000) Budgeted	Allocated	Activity	Effect
345	91	Detailed System Design	$145K contract and $200K for in-house work reduced to $91K for in-house work. DMJM, system contractor, will not be used.
30	0	Hardware Requirements Analysis	Planned contract eliminated. To the extent this work is done, it will be included in Detailed System Design, above.
435	56	System Software and Data Base Specifications	A large contract for $370K to have been awarded 1 Apr 78 will now slip to no earlier than 1 Oct 78. This work effort is on the critical path of CAEADS development.
275	0	Computer Graphics	Negligible. Planned implementation of computer-aided drafting is being deferred at least 2 years pending the outcome of System Software and Data Base Specifications, above, and hardware analysis.
290	63	Design Criteria Management System	$135K contract and $55K in-house reduced to $50K contract and $13K in-house. This subsystem is one of the essential elements of CAEADS.
Subtotal 1275	210*		This fund reduction (approximately 80%) will delay integrated system capabilities by at least 9 months. The result: loss of $2550K net saving potential (based on annual return on investment estimated at $3405K). Effects from loss of experienced contractors and from reduced management capabilities of the CAEADS project team will be great.

* Includes $70K carried over from FY77.

Table 4 (cont'd)

II. Individual Application Modules

Funds ($000) Budgeted	Funds ($000) Allocated	Activity	Effect
80	80	DD 1391 Processor	None. Support is adequate. Product delivery will be in FY79 as planned.
75	0	Project Development Brochure Procedures	Product delivery is deferred by 9 months until late FY81, at a cost of $410K net saving potential. (A feasibility study will be done during 1st Quarter FY78 as part of Detailed System Design, above, to validate requirement and to make the work plan definite.
250	210	Environmental Technical Information System	Minor. Product delivery will be in FY79, as scheduled. (Note: nonautomated support funding has held up also. This may cause delay in product delivery.)
55	45	Master Plan Graphics & Computer Evaluation of Utility Plans	Minor. Product delivery will be in FY80, as scheduled. (Some of the planned work will be accomplished under Detailed System Design, above.)
100	0	Industrialized Buildings Information System	Product delivery is deferred by 1 year until FY81; a loss of $540K net saving potential.
77	0	Habitability Information System	Product delivery is deferred by 1 year until FY83; a loss of $233K net saving potential.

Table 4 (cont'd)

Funds ($000) Budgeted	Funds ($000) Allocated	Activity	Effect
250	40	Systematic Review and Eval of Criteria for Habitability	No effect on Version I; Version II will be deferred by 1 year until FY80 at a loss of $387K net saving potential.
325	85	Cost Estimating	No effect on final design cost estimating system. Product delivery in FY78 as planned. Preliminary design cost estimating system is deferred by 6 months at a loss of $140K net saving potential.
65	0	Life Cycle Cost Data System	Product delivery is deferred by 1 year until FY82; a loss of $168K net saving potential.
245	245	Computer-Based Specifications	Support is adequate to meet programmed RDTE goals. Delivery of research products is on schedule: FY79. Funds for initial Corps training not programmed.
40	0	Structural and HVAC Design Verification	Scheduled delivery of products (FY80) is deferred by 9 months until late FY81; a loss of approximately $300K net saving potential.
286	85 plus (344)	Building Loads Thermal Analysis	None. Support is adequate for system verification tests planned in FY78. The rest of the funding support ($344K) is to be provided by ERDA & GSA. Product delivery is on schedule: FY79.
Subtotal 1803	790	Estimated loss of total savings potential	= $1,908K
Total I&II 3078	980*	Estimated loss of grand total savings potential	= $4,458K

* This includes $70K carried over from FY77.

APPENDIX:

MINUTES OF MEETINGS: CAEADS PLANNING GROUP
AND FIELD USER ADVISORY GROUP

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL	SUBJECT
CERL-ZCA	Minutes of CAEADS Planning Group

TO Distribution FROM CERL-ZCA, Sadoff DATE 19 Apr 77 CMT 1
SADOFF/tb/299

1. On 31 March and 1 April 1977 a meeting was held at the Construction Engineering Research Laboratory, Champaign, Illinois to discuss plans for CAEADS participation in the project definition phase (master planning, DD 1391, PDB etc.) of military construction design. This DF is a summary of that meeting.

2. ATTENDEES: A list of attendees and participants in that meeting is listed in Incl 1.

3. AGENDA: The agenda for the meeting is furnished as Incl 2.

4. The purpose of the meeting was to acquaint representatives from the major commands and OCE with CERL's present and planned efforts for the project definition phase of Military Construction design. On the first day, CERL activities were presented; on the second day, the participants were asked to provide comments, albeit from each one's own particular point of view, concerning CERL's planned activities. The group of attendees was broken up into two groups to increase individual participation.

5. The comments by the groups follow. The CAEADS teams responses to comments, one by one, are also furnished.

6. COMMENT: CAEADS needs an installation requirements orientation. It appears to be a design tool for the district.

RESPONSE: CAEADS is planned to be a design tool for Corps districts. However, it must interface with the Military Construction design process that takes place at the installation and major commands (master planning, DD 1391, PDB etc.). The problems expressed by the installation and major command personnel are real. However, solutions will come not just from CAEADS, but from Integrated Facilities System (IFS), other CERL 1391 and PDB work, and in the integration of the above. It is through the interfacing of all this work (of which CAEADS is a part) that the problems of the installations and major commands can be solved.

7. COMMENT: CAEADS must take into account training and implementation procedures at the installations. The cost and manpower impact must be evaluated.

RESPONSE: Impact on installation and district resources will be a continuing consideration in CAEADS development and implementation. Implementation of CAEADS modules will be made with minimum impact on district and installation resources with respect to money and people. An education program will accompany the major portions of the system. It is realized that manpower usually cannot be upgraded in job duties. Machine systems must not require higher grade skills than user personnel now have.

DA FORM 1 FEB 67 2496 REPLACES DD FORM 96, WHICH IS OBSOLETE.

★ U.S. GPO 1976-0-765-037

8. COMMENT: There should be some standardization of functional responsibility throughout the same staff elements. Different commands interpret the regulations and do things differently.

RESPONSE: The operational procedures in CAEADS are intended to be unambiguous and straightforward. CAEADS, like any major computer system, will have an inherent flexibility, allowing individual installations or major commands to accomplish their missions as they deem necessary. It will still be up to each organization to internally implement the system as they see fit.

9. COMMENT: Human judgement should be taken into account in CAEADS.

RESPONSE: CAEADS is a tool of the professional. It in no way intends to replace the professional, only to assist him in doing his job more efficiently. A human judgement aspect will always be a key aspect of the military construction design process.

10. COMMENT: CAEADS should take into account such items as multiuse space construction, emergency planning, PDB standardization, and justification requirements for Congress.

RESPONSE: While CAEADS does not specifically take these items into account the work being done by other groups in the Laboratory does consider some of these concerns. CAEADS will help by providing more engineering expertise earlier in the design cycle in order that multiuse space, emergency planning et al can be considered and there will be more detailed justification to Congress. The preparation of final justification statements for Congress will remain largely a matter for human judgement (see Comment #9).

11. COMMENT: CERL must make efforts to insure that CAEADS does not increase the work requirements of the installations. Each subsystem must stand on its own and be cost effective before it is retained as an operational proportion of the overall system.

RESPONSE: The purpose of the total CAEADS, and each of the subsystems, is to let the professional involved in military construction design be more effective and efficient. The total CAEADS design is based on achieving a benefit cost ratio greater than unity, all factors considered. Some subsystems are more cost beneficial than others, and results depend on subsystem design, use in a particular application, and the user himself. Since CAEADS does consist of subsystems having a stand alone mode of operation, the user can be selective and accept or reject CAEADS component subsystems, without a total system commitment on an all or nothing basis. Further, some subsystems can be used in varying degrees of complexity, depending on user preference.

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12. COMMENT: The entire master planning cycle through the completion of construction must be analyzed and understood before automation can begin.

RESPONSE: It is realized that the MC design cycle impacts on and is used by many organizations (OCE, MACOMS, installations). This is especially true in the master planning part of the cycle. Before automation begins in any phase that part of the work must be understood with respect to function performed, user, and impact. Meetings such as this will assist CERL in evaluating these items and provide input into the total CAEADS plan.

13. COMMENT: There should be some type of library of PDB's for repetitive type construction.

RESPONSE: This appears to be an excellent idea. Once the requirements for the PDB's are developed in sufficient detail and meet the needs or requirements of all the parties concerned it would seem reasonable to keep a library of existing type PDB's, something like the way Corps keeps standard designs.

14. Comments to these minutes should be furnished to CERL-ZCA, ATTN: Dr. Seung-Jai Kim.

Laurence R Sadoff

2 Incl
as

LAURENCE R. SADOFF
CPT, CE

ATTENDEES - CAEADS PLANNING MEETING

OCE

Mr. Warren Ahloo
Mr. Frank P. Beck

EDPC

Mr. William C. Rackley

FORSCOM

Mr. George K. (Ken) Orton
Mr. Tom Goss

TRADOC

Mr. David A. Lyon
CPT Jim Payne (31 Mar only)

DARCOM

Mr. Coleman Kuhn
Mr. John Parish

Fort Worth District

Mr. Robert D. Duvall

Fort Bliss

Mr. James Kemp

EIDSO

Lloyd Wells

CERL

Dr. Roger Brauer
Mr. Richard J. Colver
Mr. Robert B. Dains
Dr. Robert Dinnat
Mr. David Dressel
Dr. Ravinder K. Jain
Dr. Seung-Jai I. Kim
Mr. Roger L. Lapp
Mr. Raymond E. Larson
Mr. Edward A. Lotz
Mr. Al Moore
Mr. Michael O'Connor
CPT Laurence R. Sadoff
Dr. William H. Stellhorn
Ms. Cheryl Winget

Incl 1

CAEADS Planning Meeting

AGENDA
31 March 1977

0745	Pick up at hotel	Ms. Winget
0815	WELCOME	Dr. Shaffer
0830	Introductory Remarks	Mr. Larson
0845	Background on CAEADS	CPT Sadoff
0915	Project Definition Phase	Mr. Larson
0945	User Requirements	Mr. Duvall Mr. Kemp
1015	BREAK	
1030	Development Plan	Mr. Lapp
1100	Master Planning	Mr. Lapp
1110	CEUP	Mr. Moore
1130	LUNCH	Ms. Winget
1300	DD 1391 & PDB	Dr. Stellhorn
1320	IFS Interface	Mr. Colver
1340	Functional/Technical Requirement & Criteria	Mr. Porter
1415	Cost Estimating	Mr. O'Connor
1435	BREAK	
1450	Industrialized Buildings	Dr. Dinnat
1510	SEARCH	Mr. Dains
1530	Environmental Impact Analysis	Dr. Jain
1550	First Day Summary	Mr. Larson
1615	Depart CERL	Ms. Winget

Incl 2

AGENDA

1 April 1977

0745	Pick up at hotel	Ms. Winget
0815	Discussion Group Introduction	CPT Sadoff
0830	Discussion Groups	
1030	Report Discussion Group 1	
1100	Report Discussion Group 2	
1130	Summary	Mr. Larson
1200	Depart for Airport	Ms. Winget

Incl 2 (cont.)

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

CERL-ZCA

MEMORANDUM FOR RECORD

SUBJECT: Minutes of CAEADS Field User Advisory Group (FUAG) Standing Committee Meeting, 17-18 May 77.

1. The second CAEADS Field User Advisory Group Standing Committee Meeting was held at the US Army Engineer District, Ft. Worth on 17-18 May 77.

2. ATTENDEES: See Incl 1.

3. AGENDA: See Incl 2.

4. The primary goals set for this meeting were (1) the CAEADS long term development plan, (2) short term goals, (3) Project Definition Phase (PDP), and (4) CAEADS concept design presented in the second interim report prepared by the contractor, Daniel, Mann, Johnson and Mendenhall (DMJM). The first day and the first hour of the second day were devoted to the presentation of relevant materials. The remainder of the session was devoted to assessment/evaluation by FUAG members. For the purpose of more detailed discussion, the committee was broken up into two discussion subgroups. Group 1 consisted of the representatives from TRADOC, South Atlantic Division, Omaha, and Sacramento Districts. Their primary objective was to review the CAEADS Project Definition Phase tasks with the evaluation of the CAEADS long term development plan as their secondary goal. Group 2 consisted of representatives from FORSCOM, Pacific Ocean Division, Baltimore, Mobile and Ft. Worth Districts. Their primary objective was to evaluate the second interim report by DMJM. Review of the long term plan was their secondary goal.

5. The comments/recommendations by the discussion groups and responses by CERL are furnished below. Paragraphs 6 thru 12 represent the comments from Group 2 and paragraphs 13 thru 20, the comments from Group 1. The remaining paragraphs (21-24) represent the comments/recommendations made at various times during the meeting but not treated at the discussion group session.

6. COMMENT: Establish a Facilities Engineering (FE) module within the Project Definition Phase which will support FE activities. FE activities in this module may include those related to development of TAB, PDB, 1391, and master plan including utility system layout.

RESPONSE. The Project Definition Phase involves both FE and MC activities. Because of the close interactions in this phase of CAEADS, a coordinated (FE & MC) is essential. There should be no dupplication or overlapping of effort. The CAEADS team will bring this matter to the attention of the OCE staff to develop a coordinated plan for achieving specified objectives.

7. COMMENT: Identify what external forces, including outside organizations and activities, impinge on CAEADS.

RESPONSE. External forces are activities and organizations outside the COE family who impinge on CAEADS. The Air Force is an example. There is a question as to whether the Air Force (or any other agency) would directly utilize some features of CAEADS when it is fully developed. Communication with the Air Force has begun on a very limited scale, not in the depth needed to respond to this recommendation. Initially we will concentrate on COE requirements. Communication with the Air Force and other customers will expand as development of CAEADS progresses.

8. COMMENT: Clearly identify all of the users of CAEADS and the related tasks performed by each.

RESPONSE. The second interim report by DMJM represents a snapshot of the work progress at the time, and its treatment of users is somewhat shadowy because users are represented in the report, not by detailed categorization (e.g., designers, draftsmen, mechanical engineer, estimator, etc.) but by typical District activities associated with Military Construction. This matter, however, will be cleared up through refinement of user scenarios in the final report. The final user scenarios will break down users in detail (e.g., structural designer at Districts) and associate each user category with CAEADS subsystems or functions.

9. COMMENT: More clearly identify the interface between all CAEADS subsystems.

RESPONSE. One of the primary objectives of DMJM work is to identify the necessary interfaces between various stand alone modules and to determine the best means of providing an environment in which the subsystems can effectively communicate with each other. The present obscurity of subsystems interface will be cleared up as we go along.

10. COMMENT: Define the relationship between the FE module and CAEADS in relationship to District and FE activities.

RESPONSE. Referring to Para 6 above, it is not clear at this time whether we should treat the FE module as an entirely separate, physical entity or as one logically separated but utilizing the same software development of CAEADS. However, we fully recognize that FE's perform the same basic activities as Districts do and hence, many CAEADS features can be shared between them. The FE as a class of CAEADS users is being incorporated in the development of user scenario. Also, consideration is being given to involving FE's in the training and testing of CAEADS subsystems.

11. COMMENT: Assure the practicality and applicability of the proposals being developed under the project for preparation of functional requirements as related to the FE operations (in reference to presentation by CERL-HPA). What is the intent of the functional requirements system? Who is to be the user? Who is responsible for its preparation? Recommend that this type survey be limited, at this time, to repetitive type facilities.

RESPONSE. The functional requirements development Process, as presented by CERL-HPA, was demonstrating a scientific and systematic approach to design information generation by user/occupants, rather than FE personnel. It is a separately funded on-going work unit which is currently addressing, among other things: (1) development of abbreviated procedures for use in the early planning stage; (2) determination of the minimum level of effort and personnel qualifications which are actually required to apply the techniques; and (3) determination of training requirements. Also, since the main value of the procedure is to obtain more complete design relevant information from the user/occupants, all facility types that have user/occupants should be considered applicable for this process.

12. COMMENT: Consider development of cost estimating system for A/E contract.

RESPONSE. Such a guidance document, manual or computerized, showing design/review manhours by typical design types appears to be an excellent idea. We understand this represents an additional undertaking for CAEADS, apart from the construction cost estimate module under the present CAEADS development plan, and will provide Districts with a methodical basis for negotiating A/E contracts as well as forecasting in-house design review workload. We will investigate the possibilities of including this work in the future CAEADS development plan.

13. COMMENT: Clarify the correlation of the various project tasks within CAEADS as shown in the activity chart. Determine the interrelationships between tasks.

RESPONSE. This can (and will) be done by clearly defining software applications supporting each CAEADS activity area.

14. COMMENT: The comment made at the last FUAG meeting (25-26 Jan 77), "The Project Definition Phase of the MC design process . . . should receive the highest priority in the CAEADS long term planning", is still valid.

RESPONSE. This reaffirms the thrust of our present effort. We are continuing to place the highest priority on this phase of the military construction design process, and we will present a comprehensive status review of planned and on-going activities in this area at the next FUAG meeting.

15. COMMENT: The TAB must be available to CAEADS; it is essential for the requirement justification portion of the 1391 program and other Project Definition Phase functions. Investigate the use of the TAB at MACOM and OCE to compare priority of needs.

RESPONSE. This was one of the most strongly emphasized comments, and the issue was much discussed. We recognize the importance and urgency of the TAB for CAEADS and others. The preferred source of data for TAB and the related RPI/BIS is IFS, and there appears to be no reason why CAEADS could not periodically receive current copies of selected files, including TAB, from the headquarters level IFS system. Some installations, however, have reported difficulties resulting from staff shortages and other problems in keeping their IFS records current. We believe it is pointless to install a data file which users agree is inaccurate, and that such an action would undermine user acceptance of CAEADS. A meeting of personnel from selected installations and commands, IFS and CAEADS is being organized to discuss practical strategies (from the installation's point of view) for obtaining and maintaining such accurate records.

16. COMMENT: Recommend proceeding with the full scope of work for the task "Computer Evaluation of Utility Plans". Should proceed rapidly in this direction. Recommend implementation by Ft. Worth District and inclusion in CAEADS. The task title should be changed to "Master Plan Creation and Maintainance of Utility Plans" or the task list expanded to include additional items.

RESPONSE. The task is planned under the Project Definition Phase of CAEADS, which receives our continual highest priority, and the scope of work is in the process of contract approval. Also, OCE approval for selection of test districts has been requested. The probably title for the task is Master Plan Graphics and Utilities Plans Evaluation Procedures.

17. COMMENT: Proceed with computer graphics within the master planning and utility plans. This graphics system must eventually be part of or compatible with the "Computer Grahpics" task, particularly in the hardware.

RESPONSE. A study on feasibility of automated drafting at Districts has been completed as part of the total computer graphics requirements in CAEADS. The study indicated atuomated drafting a viable alternative, but we are temporarily holding implementation decision because of potential conflicts between automated drafting system hardware and total CAEADS graphics system

hardware. A study is being planned on the total requirements, and early implementation of computer graphics system is one of our goals.

18. COMMENT: Continue with the 1391 processor as a priority item.

RESPONSE: The 1391 processor has been and will continue to be a high priority item. Preliminary tests on version 1 processor will be completed by the end of the 4th quarter FY77 and will be available for discussion at the next FUAG meeting. Formal field testing is scheduled for FY78

19. COMMENT: The final CAEADS must provide enough versatility so that a design change, however minor it is, is automatically reflected throughout the project; for instance, if we make an architectural change, the system automatically makes necessary changes in specification and estimate, identifying any interference that may result.

RESPONSE. The system versatility will be the major technical question to be resolved during the subsystem integration steps and the expressed concern will be well taken care of at that time. The overall CAEADS system function will become partly clear when we complete the system concept design in October this year, and will be a subject in our next meeting.

20. COMMENT: The interim report was not very clear in its presentation. The report did not seem to be very self-explanitory.

RESPONSE. As we mentioned at the meeting, the report is a snapshop representing progresses being made in various technical areas at the time of its assemblage. It was intended to stimulate discussions among technical experts about where we are heading. We agree to difficulties in following up the report. The final report will be more comprehensive. A summary report will accompany the final report to facilitate understanding of the overall report.

21. COMMENT: Discuss the interface between data bases in CAEADS.

RESPONSE. The comment has been responded to in conjunction with comment in Para 9.

22. COMMENT: Where in CAEADS should the 3086 fall? Should it be considered as a part of the Project Definition Phase of CAEADS?

RESPONSE. The 3086 is a cost estimating task which ordinarily occurs at the downstream end of project definition Phase. It is usually accomplished after receipt of a design directive.

23. COMMENT: Invite a FE representative to FUAG meetings as an observer.

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SUBJECT: Minutes of CAEADS Field User Advisory Group (FUAG) Standing Committee Meeting, 17-18 May 77.

RESPONSE. We would like to maintain FUAG membership at the present level, at least for the time being, to keep discussions within a manageable time limit. In the meanwhile, we will continue to invite one or more representatives from installations to our future meeting. We feel that in the previous FUAG meetings, the FE side of the house has been well represented by personnel from installations and MACOM, and this is all we need at the present stage of CAEADS development. We do coordinate with DAEN-FE, separately.

24. COMMENTS: (Summary installation and MACOM stated requirements) Keep usage simple. Provide cabability to be used by non-engineers as well. Respond to the needs at installations and MACOM also. Provide easy update and maintenance (without burden to users). Keep installations and MACOMs informed and involved. Shorten design review time. Provide MACOM abilities to combine and analyze installation programs. TAB must receive the first priority (lack of credible data to work with). Front loaded output/benefit is vital. Provide safequardings for installation level users (decentralize to the extent installation is able to access). Consider for installation in-house design works. Provide ability to rapidly update design drawings (priority needs for computer graphics system).

RESPONSE. Some of the comments have been responded in conjunction with the comments above. The others will be incorporated in the design, testing, and implementation of various CAEADS subsystems as we go along.

FUAG MEETING
17 May 1977

(Ft. Worth District)

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Incl 1

3 May 1977

FUAG AGENDA
17 May 1977

0800	WELCOME	COL Wall
0830	Introductory Remarks	Dr. Kim
0845	Finalization of FUAG Charter	Dr. Kim
0900	CAEADS Long Term Plan	Mr. Lapp
0930	DMJM Report	Mr. Lapp
1015	BREAK	
1030	Project Definition Phase	Mr. Larson
1100	User Requirements	Mr. Kemp
1130	LUNCH	
1245	Major Command Requirements	Mr. Spunzo
1310	Functional/Technical Requirements and Criteria	Mr. Porter
1350	Computerized Tab	Dr. Stellhorn
1410	BREAK	
1425	Implementation of Computer in Master Planning	Mr. Duvall
1445	Demo of Computerized Utility Evaluation Programs	Mr. Duvall
1535	Contract for Master Plans Creation and Computer Evaluation of Utility Procedures	Mr. Duvall
1600	Computer Aided Design	Mr. Larson
1630	First Day Wrap Up	Dr. Kim

Incl 2

FUAG AGENDA

18 May 1977

0800	SWF Use of Computer in Design	Mr. Duvall
0900	Intro Discussion Groups	Dr. Kim
1130	LUNCH	
1245	Discussion Group Continues	
1315	Report	Group #1
1400	Report	Group #2
1445	Summary	Dr. Kim
1500	Adjournment	

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Kim, Seung Jai
First annual summary of CAEADS development activities / by S. Kim, R. Larson.--
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1978.
53 p. ; 27 cm. (Interim report - Construction Engineering Research Laboratory ;
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