



U.S. Army Corps of Engineers  
Water Resources Support Center  
Institute for Water Resources

# **CORPS OF ENGINEERS OPERATIONS AND MAINTENANCE BUDGET DECISION SUPPORT SYSTEM**

**DIVISION VERSION  
(COMB\_DSS\_D)**

**Letter Report**

19960220 083

October 1994

DISTRIBUTION STATEMENT A

Approved for public release;  
Distribution Unlimited

IWR Report 94-R-6

ETIC QUALITY INSPECTED 1

**CORPS OF ENGINEERS OPERATIONS AND MAINTENANCE  
BUDGET DECISION SUPPORT SYSTEM - DIVISION VERSION  
(COMB\_DSS-D)**

**LETTER REPORT**

by

**Craig A. Strus  
Richard M. Males**

**Planning and Management Consultants, Ltd.  
Rt 9 Box 15 (Hwy 51 S)  
P.O. Box 1316  
Carbondale, IL 62903  
(618) 549-2832**

for the

**U.S. Army Corps of Engineers  
Institute for Water Resources  
7701 Telegraph Road  
Alexandria, VA 22315**

**DISTRIBUTION STATEMENT A**

**Approved for public release;  
Distribution Unlimited**

**October 1994**

**IWR Report 94-R-6**

## PREFACE

This report presents a summary of the work done to develop and support the use of the Corps of Engineers Operations and Management Budget Decision Support System - Division Version (COMB\_DSS-D) during the FY 96 budget process. The COMB\_DSS-D assists Division representatives with the analysis and ranking of work items to be included in the budget and the determination of work allowances for the coming year. This product is the latest decision support tool developed for the Operations, Construction and Readiness Division

The original COMB\_DSS was developed during 1992 as a prototype for testing during the FY 94 budget cycle for decision support at the Headquarters level. The prototype test was a success and the prototype was used 'on-line' by Headquarters during the FY 94 budget process. The COMB\_DSS was improved during 1993 for the FY 95 budget process at Headquarters and a prototype software tool targeted at Divisions was developed and tested at the Ohio River Division. This prototype, named the COMB\_DSS-D, was a success at ORD and the Headquarters, OC&R Division made the decision to field the COMB\_DSS-D at all Divisions. This report summarizes the development of the COMB\_DSS-D, the training sessions given to Division personnel and the experiences of the Divisions in using the COMB\_DSS-D during the FY 97 budget process.

There are three published reports about the COMB\_DSS and the COMB\_DSS-D:

Males, Richard M. et. al., Corps of Engineers Operation & Maintenance Budget Decision Support System: Division Prototype (COMB\_DSS-D), IWR Report 93-R-15, U.S. Army Corps of Engineers Institute for Water Resources, September 1993.

Strus, Craig A. and Males, Richard M., Corps of Engineers Operation & Maintenance Budget Decision Support System (COMB\_DSS): Improvements During the FY 95 Budget Process, IWR Report 93-R-18, U.S. Army Corps of Engineers Institute for Water Resources, December 1993.

Strus, Craig A., et. al., Corps of Engineers Operations and Maintenance Budget Decision Support System (COMB\_DSS): System Concept, Design, and Prototype Evaluation, Volume I: Main Text and Appendix A, Contract Report HL-94-1, U.S. Army Corps of Engineers Waterways Experiment Station, April 1994.

Strus, Craig A., et. al., Corps of Engineers Operations and Maintenance Budget Decision Support System (COMB\_DSS): System Concept, Design, and Prototype Evaluation, Volume II: Appendixes B through G, Contract Report HL-94-1, U.S. Army Corps of Engineers Waterways Experiment Station, April 1994.

There is also a user's manual for the COMB\_DSS-D. The manual was given to the users of the COMB\_DSS-D during the FY 96 budget process. Limited copies are available via the Institute for Water Resources.

Comments about this report are encouraged and should be directed to Michael R. Walsh, CEWRC-IWR-R, Casey Building, Fort Belvoir, VA 22060 (703) 355-3087.



## ACKNOWLEDGEMENTS

David C. Harmon, CECW-OM, has provided guidance and support since the advent of the COMB\_DSS. Mr. Harmon has been critical to the success of the COMB\_DSS and, most recently, provided guidance, testing, information, and support for the COMB\_DSS-D during the FY 96 Division budget submittal process. Michael R. Walsh, CECW-IWR-R, was the project technical monitor and provided the project team invaluable support, design insights, technical guidance, and advanced testing through all phases of COMB\_DSS and COMB\_DSS-D development. Planning and Management Consultants, Limited (PMCL) provided technical support under contract to the Institute for Water Resources (IWR.) Craig A. Strus was PMCL's principal investigator and was involved in system design, development, testing, and documentation. Russ E. Robinson developed the data import and export mechanisms, performed system testing, and was involved in system documentation. Scott E. Eguire, PMCL, was involved in the development of the help system and assisted in system documentation. Richard M. Males, RMM Technical Services, Inc., a subcontractor to PMCL, has been central to system design, development, documentation, and testing of the COMB\_DSS and COMB\_DSS-D. Walter M. Grayman, Walter M. Grayman Consulting Engineers, was involved in training, testing, and system documentation. Laura Harmet, CERL, provided support and training for GAPPL, an update package developed by CERL. Finally, PMCL would like to thank all of the Division personnel who tested, used, and provided the design team with valuable comments and onsite testing.



## TABLE OF CONTENTS

PREFACE .....	iii
ACKNOWLEDGEMENTS .....	v
I. INTRODUCTION .....	1
BACKGROUND .....	1
PREVIOUS REPORTS .....	2
PROJECT OBJECTIVES .....	4
ORGANIZATION OF REPORT .....	4
II. COMB_DSS-D BACKGROUND .....	5
CONCEPTUAL OVERVIEW .....	5
HQUSACE PROTOTYPE .....	8
DIVISION PROTOTYPE .....	8
III. COMB_DSS-D DEVELOPMENT .....	11
OVERVIEW .....	11
REQUIREMENTS ANALYSIS .....	11
COMB_DSS-D VERSION 1.0 .....	12
DIVISION TRAINING .....	12
SYSTEM SUPPORT .....	14
WORK ALLOWANCE CAPABILITY .....	14
IV. SUMMARY .....	17
OVERVIEW .....	17
NEXT STEPS .....	17





## LIST OF FIGURES

FIGURE II-1	SAMPLE COMPOSITE SCENARIO PROCESSES .....	6
FIGURE II-2	SCENARIO STORAGE TO ROLLUP TABLES .....	7
FIGURE III-1	COMB_DSS-D BUDGET ANALYSIS SEQUENCE .....	13

## LIST OF TABLES

TABLE II-1	COMB_DSS/COMB_DSS-D HISTORY .....	2
TABLE II-2	COMB_DSS/COMB_DSS-D REPORTS .....	3
TABLE III-1	COMB_DSS-D SYSTEM UPDATES .....	15

# I. INTRODUCTION

## BACKGROUND

The COMB\_DSS-D is an acronym for Corps Operation and Maintenance Budget Decision Support System - Division Version. The COMB\_DSS prototype was originally developed as part of the Improvement of Operations and Management Techniques (IOMT) research program. The COMB\_DSS was a project oriented towards providing decision support capabilities for the existing O&M budget development process at the HQ level. Specifically, the COMB\_DSS provides assistance in financial analysis and development of rankings for the work items in the annual budget submittal. The COMB\_DSS prototype system was actually used in the 1994 budget submittal.

Because the COMB\_DSS was successful, IOMT funded a prototype Division decision support system (COMB\_DSS-D) to provide similar capabilities at the Division level. The COMB\_DSS-D prototype was tested on-site at the Ohio River Division in the FY 95 budget year. Again, the prototype COMB\_DSS-D was so successful that Headquarters, OC&R Division decided to extend the use of the COMB\_DSS-D to all Divisions.

System refinements were made to the COMB\_DSS-D early in 1994 to accommodate revised budget guidelines and specific Division requirements. Training was conducted in May 1994 and the COMB\_DSS-D was distributed to Divisions and used in place of the Division ABS in the FY 96 budget submittal.

Prior to the development of the COMB\_DSS-D, the Division ABS was used to handle budget analysis and ranking and current year work allowance submittals to HQUSACE. Initially, the COMB\_DSS-D did not handle work allowance management. However, by the end of the FY 96 budget process, the COMB\_DSS-D included a work allowance module yielding a single analysis and reporting system for budget submittal and work allowance adjustments. The COMB\_DSS/COMB\_DSS-D development process and history is summarized in Table I-1.

**TABLE I-1**  
**COMB\_DSS/COMB\_DSS-D HISTORY**

SYSTEM	YEAR	DESCRIPTION
COMB_DSS prototype	FY 1992/BY 1994	<ul style="list-style-type: none"> <li>Developed prototype system for use at HQUSACE during Corps-wide budget analysis and submittal</li> </ul>
COMB_DSS-D prototype	FY 1993/BY 1995	<ul style="list-style-type: none"> <li>Developed prototype system from COMB_DSS prototype and applied it, with support of the design team, at ORD during their BY 1995 submittal.</li> </ul>
COMB_DSS	FY 1993/BY 1995	<ul style="list-style-type: none"> <li>Refined the COMB_DSS prototype for use by HQUSACE in budget analysis and submittal.</li> </ul>
COMB_DSS-D	FY 1994/BY 1996	<ul style="list-style-type: none"> <li>This project.</li> <li>Refined the COMB_DSS-D from COMB_DSS enhancements in previous cycle.</li> <li>Added edit and reporting capabilities found in the Division ABS.</li> <li>Developed extensive documentation.</li> <li>Trained Divisions on system usage and supported system during distributed use.</li> <li>Added work allowance capabilities for adjustments to current year monies.</li> </ul>
COMB_DSS	FY 1994/BY 1996	<ul style="list-style-type: none"> <li>This project.</li> <li>Support HQUSACE during use of COMB_DSS system.</li> </ul>

• FY = fiscal year; BY = budget year

## PREVIOUS REPORTS

A series of reports have been developed and/or published under this continuing research effort, as shown in Table I-2.

**TABLE I-2**  
**COMB\_DSS/COMB\_DSS-D REPORTS**

#	TITLE	DATE COMPLETED	APPLICABLE SYSTEM
1	Strus, Craig A., et. al., <u>Corps of Engineers Operations and Maintenance Budget Decision Support System (COMB_DSS): System Concept, Design, and Prototype Evaluation</u> , Volume I: Main Text and Appendix A, Contract Report HL-94-1, U.S. Army Corps of Engineers Waterways Experiment Station, April 1994.	October 1992	COMB_DSS prototype
2	Strus, Craig A., et. al., <u>Corps of Engineers Operations and Maintenance Budget Decision Support System (COMB_DSS): System Concept, Design, and Prototype Evaluation</u> , Volume II: Appendixes B through G, Contract Report HL-94-1, U.S. Army Corps of Engineers Waterways Experiment Station, April 1994.	October 1992	COMB_DSS prototype
3	Males, Richard M. et. al., <u>Corps of Engineers Operation &amp; Maintenance Budget Decision Support System: Division Prototype (COMB_DSS-D, IWR Report 93-R-15</u> , U.S. Army Corps of Engineers Institute for Water Resources, September 1993.	September 1993	COMB_DSS-D prototype
4	Strus, Craig A. and Males, Richard M., <u>Corps of Engineers Operation &amp; Maintenance Budget Decision Support System (COMB_DSS): Improvements During the FY 95 Budget Process</u> , IWR Report 93-R-18, U.S. Army Corps of Engineers Institute for Water Resources, December 1993.	December 1993	COMB_DSS
5	Corps of Engineers Operation and Maintenance Budget Decision Support System - Division Version (COMB_DSS-D) - Concept and Design Report	April 1994	COMB_DSS-D
6	Corps of Engineers Operation and Maintenance Budget Decision Support System - Division Version (COMB_DSS-D) - User's Manual and Budget Process Description	September 1994	COMB_DSS-D

This report is the seventh in a series of published and unpublished reports on the COMB\_DSS software. Note that the first two volumes were published by Waterways Experiment Station, the second and third reports were published by the Institute for Water Resources, and the fourth and fifth reports were developed during the course of this project and are not published.

## **PROJECT OBJECTIVES**

The project objectives were multi-fold, as follows:

- Perform a requirements analysis using the existing budget guidance, the existing Division ABS, and the existing COMB\_DSS-D prototype
- Modify the COMB\_DSS-D prototype, making it a distributable, budget worthy decision support system at the Division level
- Fully document the COMB\_DSS-D as it should be used in the budget process at the Division level
- Train Division personnel on the use of the COMB\_DSS-D prior to its use in the FY 96 budget cycle
- Provide system support for the COMB\_DSS-D as required
- Provide system support for the COMB\_DSS

All of the project objectives were accomplished.

## **ORGANIZATION OF REPORT**

This chapter provides an overview of the research events leading up to this work effort and discusses the research objectives. Chapter II discusses, in more detail, previous efforts leading up to current COMB\_DSS-D system. Chapter III provides a conceptual overview of the COMB\_DSS/COMB\_DSS-D and discusses, in detail, the requirements of this work effort. Chapter IV summarizes this project and discusses future directions of DSS tools in the Corps O&M Arena.

## II. COMB\_DSS-D BACKGROUND

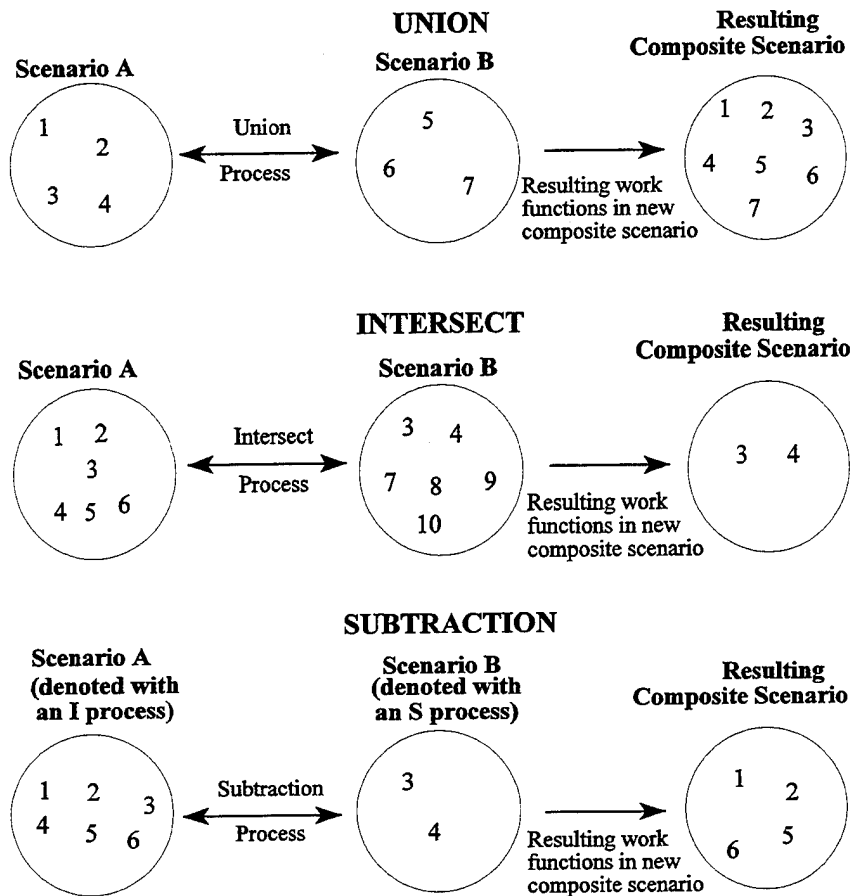
### CONCEPTUAL OVERVIEW

During the evolution of the first COMB\_DSS prototype, the concept of a *scenario* was developed. A scenario is simply a subset of work functions (e.g., a set of work functions from the same District or a set of work functions with the same feature cost code). The COMB\_DSS prototype allowed the user to build, modify, and delete scenarios, thereby providing a means for managing 'groups' of work functions. Additionally, by storing scenarios, an audit trail of analysis events is created. This scenario concept was adapted for the COMB\_DSS-D and, like the COMB\_DSS, contains three types of scenarios: *Primary*, *Composite*, and *SQL*.

*Primary* scenarios were designed as the basic method of grouping work functions together for future reference, reporting, and financial analysis. A two page data entry form was developed to allow primary scenario selection criteria to be entered and edited. The first field in the primary scenario screen insists that a unique scenario name be assigned. Some of the constraints, applied to work functions in the creation of a primary scenario, are as follows:

- Appropriation (e.g., E, F, or C) REQUIRED
- Low use navigation flag
- A range of OCE (Bogus) ranks
- A range of output measures (really condition index)
- Two user defined variable ranges (used in ranking)
- A minimum cost on the work function
- A cumulative cost, above which (or below which) no more work functions are obtained for the scenario
- Whether or not the cumulative cost should be calculated in ascending or descending order.
- Constrain to particular Division code(s).
- Constrain to particular Class(es) of work.
- Includes and excludes of particular CWIS numbers, OCE ranks, and Feature Cost Codes.

A *composite* scenario is an integration of primary, composite, or SQL scenarios, built through an 'intersect', 'union', or 'subtraction' process. A Union (U) scenario process will provide the union of work functions contained in each scenario labeled as U (i.e., any work function in any U process is in the composite.) An intersect I scenario process gives the intersection of work functions contained in each scenario labeled as I (i.e., the work function must be present in all I work functions to be included in the composite.) The S scenario process subtracts work functions in the S scenario processes from the work functions in the I scenario processes. The S process cannot be combined with the U process, only with I processes. I and U processes are also mutually exclusive. When S and I are processed jointly, the I scenario processes are handled first, and then the S scenario processes are subtracted. Composite scenario processes are detailed in Figure II-1.



Note: The numbers within the scenarios (represented by circles) represent individual work functions.

FIGURE II-1 SAMPLE COMPOSITE SCENARIO PROCESSES

The COMB\_DSS-D also contains an *SQL* (pronounced 'see-quel') scenario capability, which enables the user to build an ad-hoc scenario with consideration of selection criteria that are not available through the primary scenario data entry forms. The user can enter an *SQL where* clause, which generates a constraint on any field or combination of fields in the table containing available work functions. Once created, an *SQL* scenario can be joined with primary or composite scenarios through the union, intersection, or subtraction processes discussed and depicted previously.

Note that when a scenario is run, the results (the set of work functions that satisfy the selection criteria for the scenario) are stored in the TEMPSCEN table. After a scenario is evaluated, it can be permanently 'stored' in a work function-scenario matrix file stored outside of R:Base and cost summaries are saved in five summary tables shown on the right of Figure II-2.

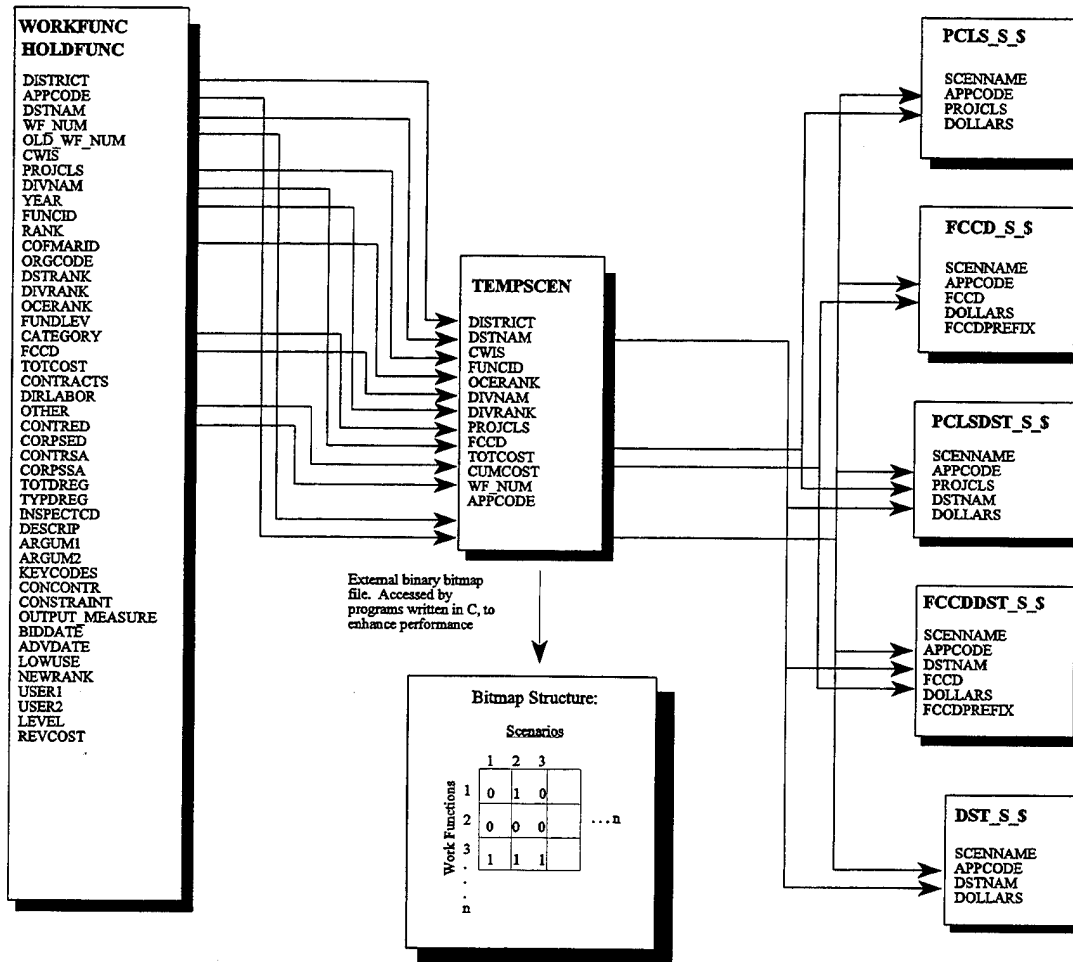


FIGURE II-2 SCENARIO STORAGE TO ROLLUP TABLES

The concept of *scoring* was also introduced in the original COMB\_DSS prototype. The scoring capability allowed the COMB\_DSS user to assign a score to a scenario. In this process, each work function for a given scenario is assigned the scenario's score. Because a work function may be in more than one scenario (overlapping scenarios), the lowest score (1 is better than 2) is assigned to the work function. The entire set of work functions are then 'dumped', by Division, score (ascending), and division rank (ascending) to an ASCII file. This file is then read by a custom program which, for a given score and division, creates a stack containing descending Division ranks. These Division stacks are then placed into a single, common stack, with each Division chosen randomly, to arrive at a final OCE rank that preserves, in as much as possible, the Division rank (i.e., the original Division rank is only disturbed by the inclusion of the score). The scenario/scoring approach is not possible under the use of previous HQUSACE tools, and its advent into the budget process has saved the Corps money in terms of time and resources.



## HQUSACE PROTOTYPE

The original IOMT work effort focussed on the development of decision support tools to better support the annual budget submittal process. A system concept was developed and was followed by multiple software 'prototypes', in which a prototype was built, reviewed by Headquarters personnel, and modified based upon the review. This process is termed rapid application development (RAD), or iterative prototyping, in which a system is built, reviewed, and modified to better serve the client needs, after a relatively brief design phase.

In August of 1992, the COMB\_DSS prototype was applied to the FY 1994 budget cycle. Once the Division analysis was complete, the Division databases were aggregated into a Corps-wide database, which served as the starting point for Headquarters analysis. A number of problems were uncovered in the Corps-wide database, which were resolved with the COMB\_DSS prototype's quality assurance data checks. Following database corrections, the actual analysis began.

To ensure that the system operated as intended, personnel from the design team provided on-site support. As the analysis process evolved, a number of system bugs were uncovered and corrected. Additionally, a number of rollup reports were written to provide information that was not 'on menu' (built) into the system. In retrospect, the on-site support proved invaluable as: (1) the system would not have been successful otherwise, and (2) it was shown that system modifications could be made in a short period of time.

## DIVISION PROTOTYPE

A follow up research effort was funded by IOMT to explore the potential for DSS in the budget process at the Division level. The design team saw the COMB\_DSS prototype as the starting point for Division analysis and felt that the system could be modified to support Division requirements. The Ohio River Division (ORD) was selected as a test-bed for implementation, and an initial meeting took place in March 1993. The meeting involved a discussion of system requirements, which were broken into five primary components, as follows:

- (1) Quality Assurance - checks on the District data
- (2) Scenario Analysis - financial summaries of the data
- (3) Division Ranking - development of the Division ranks
- (4) Impact Analysis - determination of impacts of HQ and OMB decisions
- (5) Data Transfers - data input and output to/from ABS format files

In the development of iterative prototypes, each of the five components were evolved to meet Division needs. All of the COMB\_DSS capabilities were retained for the Division prototype, but only a subset of them were actually used in the budget submittal process.

The ranking procedure used in the HQ version of COMB\_DSS was demonstrated to Division

personnel, but did not meet ORD ranking requirements. The HQ ranking method operates at an aggregate level, ranking scenarios, as discussed in the previous section. ORD, with fewer work functions to handle, and a determination to permit Districts to develop their own rankings in so far as possible, set 'cutoff' ranks, below which District rankings were accepted automatically. ORD then examines and ranks each work function from level 2 through waivers. This was done in a two-day group meeting at which representatives of the Districts were present. Computer support was necessary to capture the assigned ranks developed during this meeting, and to display the financial consequences (allocation of dollars by District, within each funding level), of the ranking. Accordingly, an entire set of routines to provide 'real-time' support for the ranking process was developed for the COMB\_DSS-D prototype.

Division personnel indicated that, upon development of scenarios and the use of financial analysis to assess those scenarios, work functions would need to be re-ranked, starting at a different rank level for each District, appropriation code, and FCCD group (Operation feature costs versus Maintenance feature costs). This had been accomplished 'manually' in the past, by comparison, prioritization, and integration of work functions from District paper piles into a single Division paper pile. This new Division paper pile was then assigned new Division ranks based upon the meeting participants' decisions. To serve the Division needs, the design team modified the COMB\_DSS-D prototype's work function table, including a field called 'NewRank'. Once the NewRank field was in place, an additional table was built into the COMB\_DSS-D prototype that allowed the Division to edit the starting rank for each District by appropriation. Thus, by providing different starting ranks for each District, appropriation code, and FCCD group (O&M), the ranking of all work functions up to a certain cutoff (e.g., level 1) was automated.



### **III. COMB\_DSS-D DEVELOPMENT**

#### **OVERVIEW**

This work effort was funded by CECW-OM further develop the COMB\_DSS-D prototype, making it the budget analysis and submittal tool used by all Divisions in the FY 96 budget cycle. In previous budget years, the Division ABS was used for ranking, reporting, and submittal of budget information. In the FY 95 budget cycle, the Ohio River Division moved data from the Division ABS into the COMB\_DSS-D prototype, generated reports, performed analysis on data accuracy, revised the Division ranks, and moved the final ranks back to the Division ABS for upload and submittal to the Corps-wide ABS database. All other Divisions used the Division ABS for the budget process at that time.

The starting point for this project was the COMB\_DSS-D prototype system, which was modified to handle the reporting and editing capabilities found in the Division ABS. This resulted in a single system at the Division level for reporting, revising, and submitting Division-level budgets.

#### **REQUIREMENTS ANALYSIS**

At the start of this project, the COMB\_DSS-D was modified to accommodate enhancements made to the COMB\_DSS in the previous budget cycle. With this version in hand, the design team presented the COMB\_DSS-D prototype to Division representatives to obtain guidance on system requirements and to determine which of the COMB\_DSS-D capabilities would be exercised and which were lacking. The revised budget guidance and the existing Division ABS were also reviewed at this time. A detailed list of changes were identified from these sources and multiple prototypes were built for review. Some of the system changes are summarized as follows:

- Add a set of standard reports that mimic the Division ABS reports
- Revise the import and export procedures to generate a file that can be uploaded and integrated into the Corps-wide database.
- Revise the menu structure to sequence it with the actual budget process.
- Enhance the data entry and editing capabilities so that work function information can be edited but remain valid (e.g., disallow the entry of invalid feature cost codes, cwis codes, category codes, etc.)
- Replace the 'scoring' concept used at Headquarters for final rankings with a Division level 'autoranking' and reporting process.

- Generate a set of ranking reports that are faster and more flexible than those built for ORD in the previous budget cycle
- Enhance the COMB\_DSS-D data rules so that they match the rules found in the Division ABS
- Develop a process by which the COMB\_DSS-D is used during budget submittal

## **COMB\_DSS-D VERSION 1.0**

The changes outlined above were integrated into multiple prototype versions, which were reviewed by Headquarters and Division personnel. A meeting was held with Division representatives to reveal the current prototype system prior to the Division training. The intent of the meeting was to determine if the COMB\_DSS-D prototype contained the desired/necessary capabilities at that time. It was determined that there were a few shortcomings in the reporting and ranking features. Additionally, the design team felt that the documentation required further development. The design team focussed on ranking, reporting, and documentation after this meeting and prior to Division training, which resulted in COMB\_DSS-D Version 1.0.

## **DIVISION TRAINING**

The Division training course occurred at Headquarters in mid-May during a one week period. The workshop participants were broken into two groups, each of which was trained over a two-day period. The training facilities housed a 486-based computer for each workshop participant. Each computer was connected to the CDC mainframe computer located at WES, which is where the uploaded District databases are located. Workshop participants used FTP to access their mainframe accounts and run mainframe programs written by HQUSACE that create the Division database from the District databases. Additionally, mainframe programs were run that create the download files for the COMB\_DSS-D. These download files were then downloaded to the training computers at high speeds using TCP/IP. Once downloaded, the files were moved to the COMB\_DSS-D directory, where they were imported into the COMB\_DSS-D for reporting, analysis, ranking, and uploads back to the mainframe. The general scheme used by the Division's in their training exercise and subsequent 'live' analysis is depicted in Figure III-1.

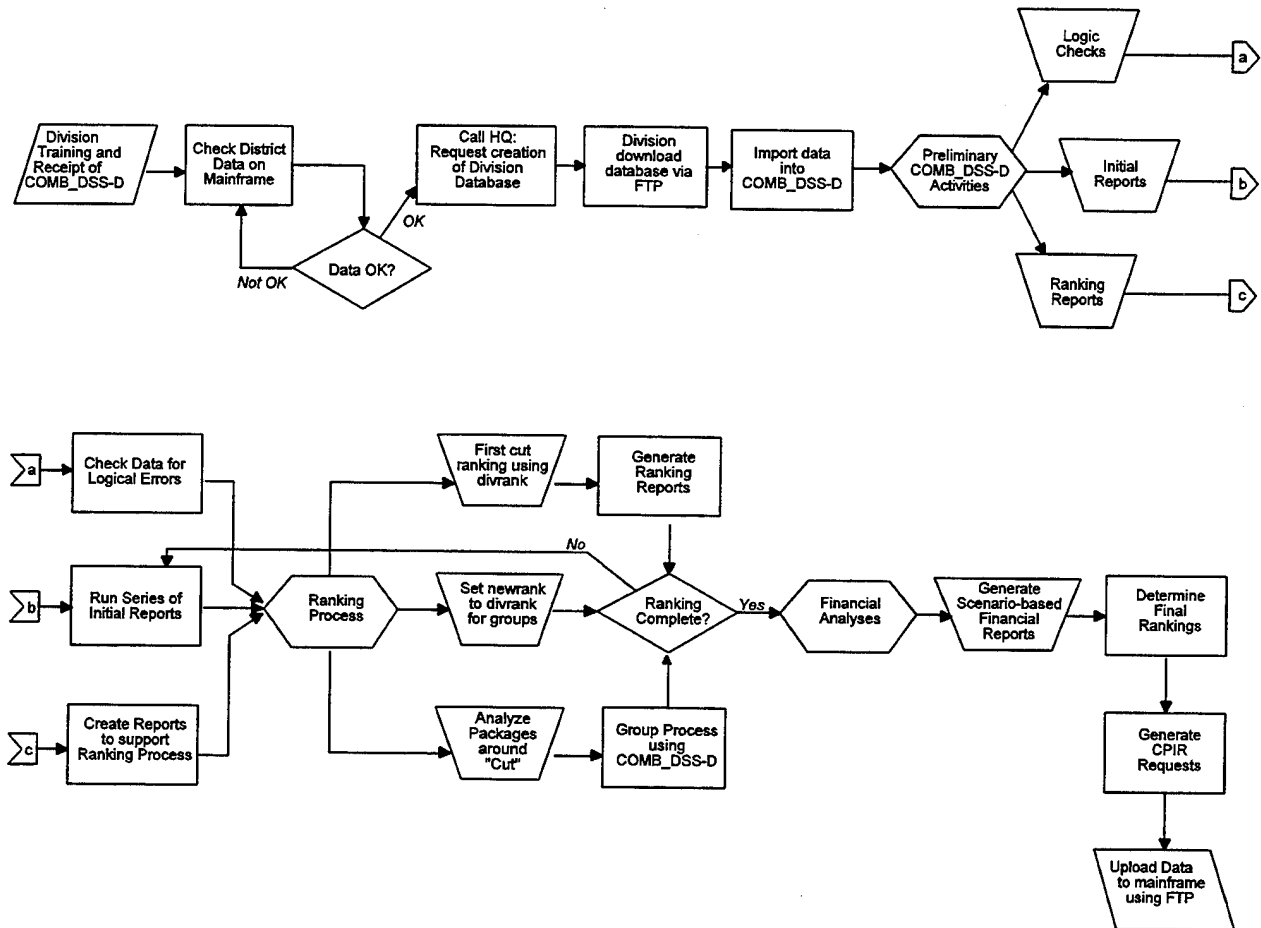


FIGURE III-1 COMB\_DSS-D BUDGET ANALYSIS SEQUENCE

During the training course, all of the COMB\_DSS-D capabilities shown in Figure III-1 were exercised by the workshop participants. The training course was revised slightly between the first and second workshop to focus the participants on issues that were found to be confusing or required additional time. A method for integrating system changes into each Division's COMB\_DSS-D system was established. There were essentially two ways in which a system update or 'patch' could be sent to the Divisions for integration into their local COMB\_DSS-D system. The first method entailed using GAPPLTNG (Get Application, The Next Generation), which is a windows-based program written and maintained by CERL for handling District ABS updates. A CERL representative came to the training course to train Division personnel on the use of GAPPLTNG. The second method for obtaining a COMB\_DSS-D update entailed the use of CorpsMail, which is tied to the CDC-backbone, specifically through the Western regional processing center located at the Portland District. As it turns out, both methods were used during the course of Division budget analysis, ranking, and submittal.

## SYSTEM SUPPORT

Each participant left the training course with COMB\_DSS-D version 1.0 and a draft user's manual and system description. Once the COMB\_DSS-D was actually applied in the budget process, the design team provided support through the IWR Technical Monitor. A number of bug fixes and system enhancements were made and distributed to Divisions through CorpsMail or GAPPLTNG, as shown in Table III-1.

As can be seen from Table III-1, there was substantial support for the COMB\_DSS-D during the budget process. The design team was able to fix all critical problems in a timely manner. Some Division users noted a number of enhanced capabilities that they would like to see in the COMB\_DSS-D. Where possible, these enhancements will be added to the next version of the COMB\_DSS-D.

## WORK ALLOWANCE CAPABILITY

After Division budgets were submitted to HQUSACE, the design team reconvened and discussed the capabilities required of the work allowance portion of the COMB\_DSS-D. As shown in Table III-1, the work allowances were integrated into the COMB\_DSS-D and contained the following features:

- Imports and exports
- Work allowance data entry
- Tab I, II, and III reports
- Data utilities similar to the COMB\_DSS-D.

Although the work allowance portion of the COMB\_DSS-D is run under a separate application, it relies on tables housed in the COMB\_DSS-D database and is therefore a module thereof. The work allowance portion of the COMB\_DSS-D allowed Divisions to adjust their current year budgets in early to mid-September. Little support was required for the work allowances.

**TABLE III-1 COMB\_DSS-D SYSTEM UPDATES**

VERSION	DATE	DESCRIPTION OF WORK
VERSION 1.10	5/12/94	<ul style="list-style-type: none"> <li>• Create revised abbreviated rank reports for Ohio River Division.</li> <li>• Modify single row Division rank revision form to display 'other' costs.</li> <li>• Fix bug in file viewer calling routine.</li> <li>• Create automatic version control capability.</li> </ul>
VERSION 1.20	5/23/94	<ul style="list-style-type: none"> <li>• Adjust description/argument field format on modified abbreviated rank reports.</li> <li>• Fix bug in export report.</li> <li>• Revise quality assurance routine, allowing Divisions to locate data errors and inconsistencies more quickly.</li> </ul>
VERSION 1.30	5/25/94	<ul style="list-style-type: none"> <li>• Adjust export report to force all exports to upper case (required by the mainframe).</li> </ul>
VERSION 1.40	6/01/94	<ul style="list-style-type: none"> <li>• Compact the abbreviated rank report to save paper.</li> <li>• Add category of work to quality assurance check #27.</li> <li>• Allow NewRank to be set between Division rank ranges.</li> <li>• Revise NewRank field when work function is deleted (funding level becomes 7).</li> <li>• Revise quick ranking reports.</li> </ul>
VERSION 1.50	6/02/94 ... 6/24/94	<ul style="list-style-type: none"> <li>• Ensure cost summaries are rebuilt before cost summary reports are run.</li> <li>• Create CPIR report to save substantial time in funding argument submission requirements.</li> <li>• Create rules, enhancing referential integrity.</li> <li>• Revise import to handle constraint field.</li> <li>• Revise data entry forms.</li> <li>• Add help system to application.</li> <li>• Revise autoranking capabilities to handle more cases.</li> </ul>
VERSION 1.60 VERSION 2.0	7/26/94 8/18/94 8/26/94	<ul style="list-style-type: none"> <li>• Create work allowance application</li> <li>• Create work allowance reports (Tab I, II, and III)</li> <li>• Create import and export procedures for work allowances.</li> <li>• Create work allowance data entry procedures.</li> <li>• Write C program to fix potential problem with mainframe download file.</li> <li>• Add work allowance rules.</li> <li>• Revise funding level table.</li> </ul>
VERSION 2.01	9/16/94	<ul style="list-style-type: none"> <li>• Revise work allowance upload report.</li> </ul>





## IV. SUMMARY

### OVERVIEW

This work effort produced a software tool that effectively assists Divisions with analysis and ranking of budget work items. Questionnaires sent to Division users for feedback noted a general satisfaction with the COMB\_DSS-D and considered the product an improvement over previous tools. All of the features required for Division decision-making, budget analysis, ranking, and reporting were either available when the COMB\_DSS-D was distributed or were made available in an acceptable time frame. The documentation was found to be sufficient, once required revisions were made (i.e., prior to the training course and distribution). All of the Divisions used FTP and TCP/IP to download and upload their budget data files, which saved the Corps substantial money in terms of labor and phone charges. The COMB\_DSS-D was also 'mapped' to adhere to the revised budget guidance, which always changes slightly from year-to-year but changed substantially in the FY 96 budget cycle.

### NEXT STEPS

The District ABS is currently being ported to Microsoft Access (a windows-based relational database management system). The port is being performed by Construction Engineering Research Laboratory (CERL) under the guidance of personnel from CECW-OM. The system is currently in design phase, and is slated for implementation in the 1997 budget cycle (fiscal year/calendar year 1995). At the start of this process, the data model underwent substantial revisions to accommodate the changing budget guidance and budget submittal requirements.

At this time, CECW-OM has two desires:

- (1) Integrate the COMB\_DSS and the COMB\_DSS-D into a single system using the revised data model.
- (2) Integrate the COMB\_DSS/COMB\_DSS-D decision support capabilities into the District ABS.

The IWR design team is beginning a new phase of work that will entail: (1) moving the COMB\_DSS/COMB\_DSS-D to Microsoft Access, (2) revising the COMB\_DSS/COMB\_DSS-D data model, such that it adheres to the District ABS and mainframe ABS data models, and (3) integrating the COMB\_DSS/COMB\_DSS-D decision support capabilities into the District ABS system.

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
<p>Public reporting burden for this collection of information is estimated to average 1 hour per response, including reviewing existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.</p>				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE October 1994		3. REPORT TYPE AND DATES COVERED
4. TITLE AND SUBTITLE Corps of Engineers Operations and Maintenance Budget Decision Support System - Division Version (COMB_DSS_D) - Letter Report			5. FUNDING NUMBERS	
6. AUTHOR(s) Craig J. Strus Richard W. Nales				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Planning and Management Consultants, Ltd. Route 1 Box 15 (Highway 51, South) P.O. Box 1116 Carbondale, IL 62903			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Corps of Engineers Chief Engineer for Water Resources 7704 Telegraph Road Alexandria, VA 22316-3868			10. SPONSORING/MONITORING AGENCY REPORT NUMBER IWR Report 94-R-6	
11. SUPPLEMENTARY NOTES Available from the National Technical Information Service, 5300 Port Royal Road, Springfield, VA 22161. (703) 487-4650.				
12a. DISTRIBUTION STATEMENT Unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The Corps of Engineers Operations and Maintenance Budget Decision Support System - Division Version (COMB_DSS_D) is a computerized tool for management, analysis and display of O&M budget data. This tool assists Corps divisions in developing priorities for proposed work. This report summarized the concept, development and use of the COMB_DSS_D during the FY 1996 budget process.				
14. SUBJECT TERMS COMB_DSS_D, decision support system, budget analysis			15. NUMBER OF PAGES 27	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT Unlimited	