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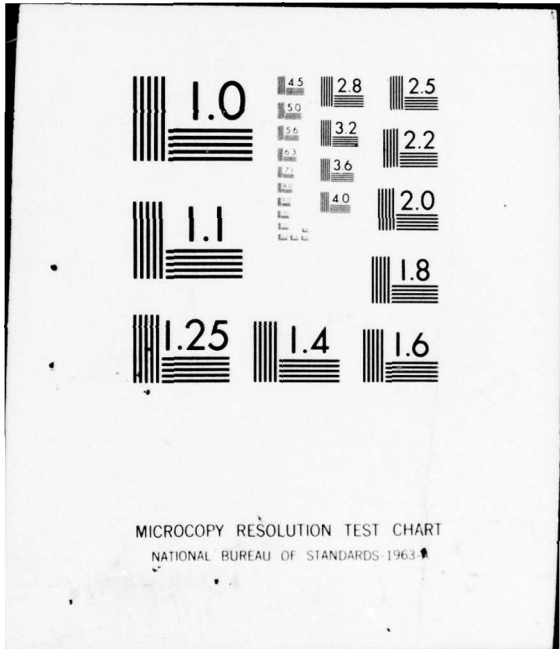
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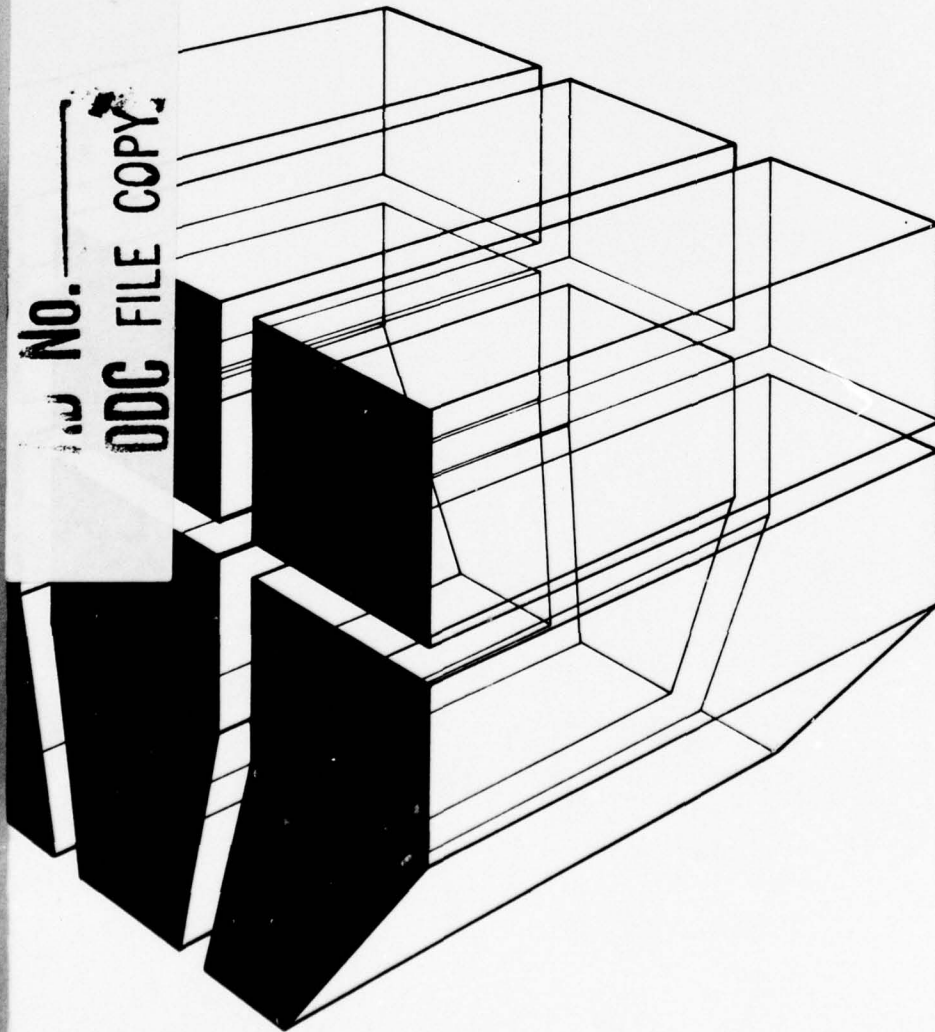
SPECIAL REPORT P-87
March 1978

SUPERVISION AND ADMINISTRATION
COST/RATE FORECASTING SYSTEM
VOLUME I: USER'S MANUAL

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COMPUTER PROGRAM DATA SHEET

Title: Supervision and Administration (S&A) Cost/Rate Forecasting System.

Proponent: Directorate of Military Construction Data Processing Installation: Construction Division of MC Operations and Planning Branch

Language: BASIC

Hardware: Tektronix 4051

Availability: Corps of Engineers Engineering Computer Programs Library.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This volume describes the use of the Supervision and Administration (S&A) Cost/Rate Forecasting System to maintain S&A data, to update the S&A forecasting model, and to forecast future S&A costs and rates. Volume II, the Programmer's Guide, contains software documentation.		

FOREWORD

This research was conducted for the Directorate of Military Construction, Office of the Chief of Engineers (OCE), under O&MA FAD No. 7635-1 (MCC 77-1) dated 1 October 1976. The OCE Technical Monitor was Mr. David A. Spivey.

The work was performed by the Facility Systems Division (FS), U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL. The Principal Investigator was Mr. Michael J. O'Connor. Mr. E. A. Lotz is Chief of FS.

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

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SUPERVISION AND ADMINISTRATION COST/RATE
FORECASTING SYSTEM
VOLUME I: USER'S MANUAL

1 INTRODUCTION

Background

A statistical model for forecasting Supervision and Administration (S&A) costs/rates has been developed to aid the Directorate of Military Construction (DMC), Office of the Chief of Engineers (OCE), in establishing S&A limits for each military construction Division and District.¹ The S&A Cost/Rate Forecasting System is a computer program which provides the DMC with the capability to maintain, update, and use the S&A forecasting model. The system maintains and updates work placement and S&A cost data for each military construction Division and District for the period of 12 fiscal years. It performs multiple linear regression analyses on these data to update the statistical models for predicting S&A costs and rates and 95 percent prediction limits for each Division/District.

The S&A Cost/Rate Forecasting System is implemented on a Tektronix 4051 in BASIC. Programs and data reside on tape cassettes.

Objective

The objective of Volume I of this report is to describe and provide user instructions for the S&A Cost/Rate Forecasting System. Volume II contains software documentation.

Approach

Chapter 2 provides general instructions for system use and Chapter 3 describes system commands.

¹ O'Connor, M. J., and Thompson, B., *Military Construction Supervision and Administration Cost Forecasts*, Technical Report P-80/ADAO40742 (U.S. Army Construction Engineering Research Laboratory [CERL], May 1977).

2 GENERAL SYSTEM USE

The S&A cost/rate forecasting system is loaded by inserting the tape cassette on which it resides into the Tektronix 4051 and pressing AUTO LOAD. Once loaded, the program displays the system menu and prompts the user for further input, as illustrated in Figure 1. For example, if the user wishes to display the data for Alaska, he or she should respond by typing "4,1". The execution of any command causes the menu to be cleared from the screen and appropriate command information to be displayed. Each command display includes the description of the command that is being executed and the name of the database upon which it is operating. Prompts for additional user action and the output from the command are displayed as appropriate. Completion of each command is indicated by the prompt for a new command. Upon detection of an error, an error message is displayed and the processing of the command or sub-command is terminated. Should an error occur which is not handled by the system and, thus, aborts the program, recovery may be easily accomplished by pressing AUTO LOAD; results of previous, successful commands will still be valid.

SUPERVISION AND ADMINISTRATION COST/RATE FORECASTING SYSTEM

COMMANDS

<u>ID</u>	<u>DESCRIPTION</u>
1	ADD A DIVISION/DISTRICT DATABASE
2	DELETE A DIVISION/DISTRICT DATABASE
3	CHANGE A DIVISION/DISTRICT DATABASE
4	DISPLAY A DIVISION/DISTRICT DATABASE
5	PERFORM REGRESSION ANALYSIS
6	DISPLAY MODEL EQUATION AND STATISTICS
7	PLOT S&A COST/RATE CURVES
8	FORECAST S&A COST/RATE

DATABASES

<u>ID</u>	<u>NAME</u>	<u>ID</u>	<u>NAME</u>
1	ALASKA	2	BALTIMORE
3	FORT WORTH	4	KANSAS CITY
5	LOS ANGELES	6	MEDITERRANEAN
7	MOBILE	8	NEW YORK
9	NORFOLK	10	OMAHA
11	PACIFIC OCEAN	12	SACRAMENTO
13	SAVANNAH		

ENTER "<COMMAND ID>, <DATABASE ID>"
OR "M" FOR MENU OR "Q" TO QUIT
>

Figure 1. System menu display.

3 COMMANDS

Add a Division/District Database

This command is used to add an entirely new database to the system. The new database ID must not be the same as the ID of any existing database and must be a positive integer between 1 and 99, inclusive; the database name also must not be the same as that of any existing database. The system will prompt the user for the database name and data as illustrated in Figure 2. A database name may be any alphanumeric string up to 20 characters long.

Delete a Division/District Database

This command deletes the entire 12-record database for the specified Division/District. To prevent accidental deletions, this command prompts the user to verify that he or she really wishes to delete the dataset. See Figure 3 for an example of this command.

Change a Division/District Database

This command is used to change data records and to add the newest (or oldest) and delete the oldest (or newest) record in the existing database. The system issues the following prompt:

ENTER "<FY>, <WORK PLACEMENT>, <S&A COST>"

The fiscal year must be a two-digit number equal to either (1) one of the years in the existing database, (2) one year earlier than the earliest year, or (3) one year later than the latest existing year. The work placement and S&A cost are decimal numbers that express the costs in millions of dollars. If the fiscal year entered by the user matches the fiscal year of an existing data record, then that record's data will be replaced with the new input data after the user is prompted for verification. If the fiscal year is one greater than the most recent or one less than the least recent, then the whole database is shifted one year to accommodate the new data, deleting the record at the opposite end of the database (in either case, the user is informed of the deletion). If all three values are zero, the command terminates. Upon successful completion of a change transaction (other than one with three zeroes), the change prompt is reissued. Changes to a Division/District database will "zero out" the previously existing forecasting model for that Division/District to insure that all forecasts are based on the current database. See Figure 4 for an example of the use of this command.

ADD A DIVISION/DISTRICT DATABASE

DATABASE ID = 1

ENTER "<DATABASE NAME>"
>ALASKA

DATA FOR 12 CONSECUTIVE YEARS MUST BE ENTERED IN ASCENDING ORDER (2 DIGIT
FY, COST IN MILLIONS)

ENTER RECORD 1: "<FY>, <ESTIMATED WORK PLACEMENT>, <S&A COST>"
>65, 27.323, 1.707

ENTER RECORD 2 FOR FY66: "<ESTIMATED WORK PLACEMENT>, <S&A COST>"
>20.477, 1.701

.
.
.

ENTER RECORD 12 FOR FY76: "<ESTIMATED WORK PLACEMENT>, < S&A COSTS>"
>38.287, 2.336

ENTER "<COMMAND ID>, <DATABASE ID>"
OR "M" FOR MENU OR "Q" TO QUIT
>

Figure 2. Add a Division/District database command.

DELETE A DIVISION/DISTRICT DATABASE

DATABASE 1 FOR DIVISION/DISTRICT ALASKA
TYPE "YES" TO DELETE, ANYTHING ELSE TO LEAVE AS IS
>YES
DATABASE 1 FOR DIVISION/DISTRICT ALASKA DELETED

ENTER "<COMMAND ID>, <DATABASE ID>"
OR "M" FOR MENU OR "Q" TO QUIT
>

Figure 3. Delete a Division/District database command.

CHANGE A DIVISION/DISTRICT DATABASE
CHANGE DATABASE 1 FOR DIVISION/DISTRICT ALASKA

ENTER DATABASE CHANGES; TO TERMINATE, ENTER THREE ZEROES

ENTER "<FY>, <WORK PLACEMENT>, <S&A COST>"

>64, 24.3, 1.6

ADDING YEAR TO BEGINNING OF DATA; LAST YEAR DISCARDED

ENTER "<FY > <WORK PLACEMENT>, S&A COST "

>68, 21.731, 1.636

CHANGING DATA FOR FY68

DO YOU WISH TO CHANGE THIS DATA (YES OR NO)?

YES

ENTER "<FY>, <WORK PLACEMENT>, <S&A COST>"

>76, 38.287, 2.336

ADDING YEAR AT END OF DATA; FIRST YEAR DISCARDED

ENTER "<FY>, <WORK PLACEMENT>, <S&A COST>"

>0, 0, 0

ENTER "<COMMAND ID>, <DATABASE ID>"

OR "M" FOR MENU OR "Q" TO QUIT

>

Figure 4. Change a Division/District database command.

Display a Division/District Database

This command displays the database for a specified Division/District, either on the graphic screen or on a hardcopy device at the user's option. Figure 5 demonstrates the use of this command, and Figure 6 shows a sample display.

Perform Regression Analysis

This command performs multiple linear regressions and statistical analysis necessary to determine the forecasting model for the specified Division/District database. There are no further user prompts for this command.

Display Model Equation and Statistics

This command displays the forecasting model and statistics for the specified Division/District, either on the graphic screen or on a hardcopy device at the user's option. Figure 7 demonstrates the use of this command, and Figure 8 shows a sample display.

Plot S&A Cost/Rate Curves

This command plots the S&A cost and S&A rate predictions vs. estimated work placement for the next fiscal year for the specified Division/District. Output is displayed on either the graphic screen or the digital plotter at the user's option. If a plot over the entire allowable range for estimated work placement is not desired, a subrange may be specified. Figure 9 shows an example of the use of this command, and Figure 10 shows a sample plot made by the digital plotter.

Forecast S&A Cost/Rate

This command calculates and displays the predicted S&A cost and rate for the next fiscal year and as a function of the estimated work placement for the specified Division/District. The system prompts the user for the estimated work placement and displays the forecasts as shown in Figure 11. A zero estimated work placement value will terminate the command.

DISPLAY A DIVISION/DISTRICT DATABASE

DATABASE 1 FOR DIVISION/DISTRICT ALASKA

WHICH DEVICE "SCREEN" OR "HARDCOPY"?
>HARDCOPY

ENTER "<COMMAND ID>, <DATABASE ID>"
OR "M" FOR MENU OR "Q" TO QUIT
>

Figure 5. Display a Division/District database command.

DISPLAY A DIVISION/DISTRICT
ALASKA

<u>FY</u>	<u>WORK PLACEMENT (MILLION \$)</u>	<u>S&A COST (MILLION \$)</u>	<u>S&A RATE (%)</u>
65	27.323	1.707	6.25
66	20.477	1.701	8.31
67	18.547	1.686	9.09
68	21.731	1.636	7.53
69	31.620	2.268	7.17
70	27.356	1.794	6.56
71	15.527	1.121	7.22
72	18.567	1.458	7.85
73	18.609	1.519	8.16
74	29.411	1.789	6.08
75	27.040	2.178	8.05
76	38.287	2.336	6.10

Figure 6. Sample database display.

DISPLAY MODEL FUNCTION AND STATISTICS

WHICH DEVICE "SCREEN" OR "HARDCOPY"?
> HARDCOPY

ENTER "<COMMAND ID>, <DATABASE ID>"
OR "M" FOR MENU OR "Q" TO QUIT
>

Figure 7. Display model equation and statistics command.

DISPLAY MODEL EQUATIONS AND STATISTICS
ALASKA

FY65 THRU FY76 DATA

S&A COST = 0.647 + 0.0456W 0.000T 0.00000WT

STANDARD ERROR OF THE ESTIMATE: S = 0.178
COEFFICIENT OF DETERMINATION: R**2 = 0.765

S&A COST IN MILLIONS OF DOLLARS
W = ESTIMATED WORK PLACEMENT IN MILLIONS OF DOLLARS
T = TIME, WHERE FY76 = 12, FY77 = 13

Figure 8. Sample model equation and statistics display.

PLOT S&A COST/RATE CURVES

ENTER DEVICE: "1" FOR GRAPHIC SCREEN, "2" FOR DIGITAL PLOTTER

>2

ENTER WORK PLACEMENT RANGE: "<MINIMUM>,<MAXIMUM>" OR CR

> (return)

TO PLOT GRAPH, PRESS RETURN
WHEN THE GRAPH IS FINISHED, PRESS
RETURN AGAIN TO CLEAR THE SCREEN

(return)

(return)

ENTER "<COMMAND ID>, <DATABASE ID>"

OR "M" FOR MENU OR "Q" TO QUIT

>

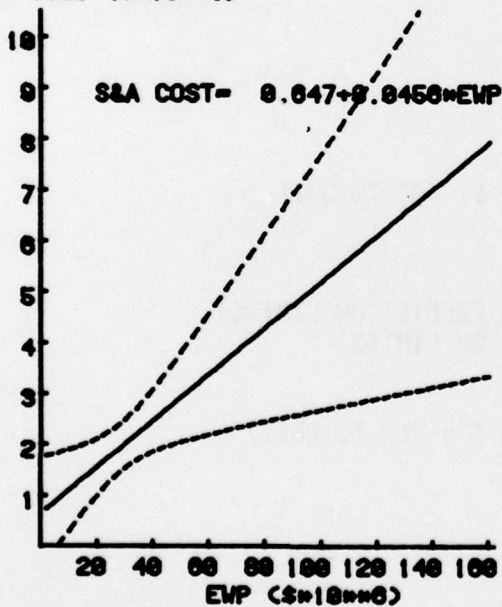
Figure 9. Plot S&A cost/rate curves command.

S AND A COST/RATE VS ESTIMATED WORK PLACEMENT

ALASKA - FY77

— PREDICTED VALUE
--- 95% PREDICTION LIMITS

S&A COST (\$*106)**



S&A RATE (%)

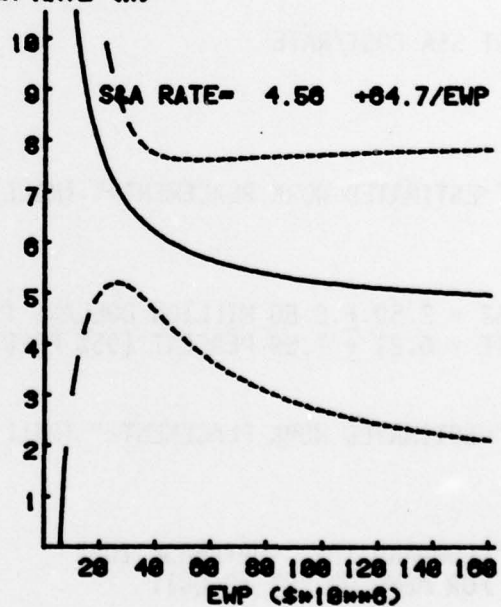


Figure 10. Sample plot of S&A cost/rate curves.

FORECAST S&A COST/RATE
ALASKA
FY77

ENTER "<ESTIMATED WORK PLACEMENT>" (MILLION \$: "0" TO QUIT
>40

S&A COST = 2.50 ± 0.60 MILLION DOLLARS (95% PREDICTION LIMITS)
S&A RATE = 6.21 ± 1.59 PERCENT (95% PREDICTION LIMITS)

ENTER "<ESTIMATED WORK PLACEMENT>" (MILLION \$ = "0" TO QUIT)
>0

ENTER "<COMMAND ID>, <DATABASE ID>"
OR "M" FOR MENU OR "Q" TO QUIT
>

Figure 11. Forecast S&A cost/rate command.

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O'Connor, Michael J

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