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DEMONSTRATION MODEL SYSTEM. VOLUME III. NEDCOM USER'S GUIDE.(U)

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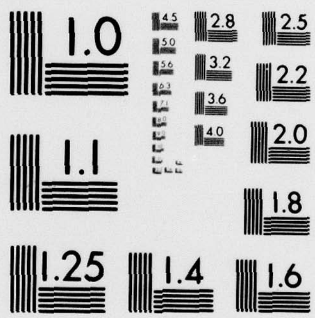

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DEMONSTRATION MODEL SYSTEM.

VOLUME III.

NEDCOM USER'S GUIDE.

by

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1.0 INTRODUCTION

The Naval Electronics Design Cost Model (NEDCOM) is implemented on the APPLE II Computer System. NEDCOM is an interactive program. The following user instructions, coupled with the documentation provided by NEDCOM during execution, should be sufficient to permit even an inexperienced user to successfully operate NEDCOM.

NEDCOM configures a system out of individual Lowest Removable Assemblies (LRA's). The program is capable of handing a system consisting of up to 100 distinct LRA types, each of which is characterized by 7 input variables. In addition, NEDCOM requires as input 61 system-level variables which describe the system operating environment, system manpower and training requirements, system design, and the Naval support environment.

The user is given a choice of six different run type options. He can enter new system and LRA data, append a new LRA configuration to an existing system description, alter data previously entered and stored on disk, add additional LRA types to an existing LRA configuration, perform sensitivity analysis on system variables, and finally, run a previously stored system configuration without making any changes. The first two options create new information files which are stored on disk for future use. The third and fourth options are used to alter the information stored on these files. The final two options execute system runs without any changes in stored data.

NEDCOM running time is less than one minute per LRA type in the normal, "fastrun" operating mode. An optional, "slowrun" mode can produce significant, though unpredictable, increases in program running time. The payoff of the slowrun option is in increased accuracy in the spare stockage inventory level calculations.

Program runs are initiated by typing "RUN NEDCOM" on the APPLE keyboard. From that point on the user is prompted by the program for the input data needed to complete program execution. In most cases the input request will be self-explanatory. The additional information necessary to operate NEDCOM is provided in Section 2.0, below.

2.0 OPERATING NEDCOM

The description below assumes no user familiarity with the APPLE II. We strongly suggest, however, before the user attempts to operate NEDCOM, he become familiar with the computer, its operating system, and the APPLESOFT language.

POWER-UP

1) Turn on the APPLE using the POWER switch on the rear panel.

2) Turn on the TV monitor by depressing the ON-OFF switch on the front panel.

3) Turn on the printer by depressing the POWER switch at the front.

INITIALIZE THE APPLE

1) While holding down the "CNTRL" key, press the "B" key on the APPLE keyboard.

2) Press the "RETURN" key on the APPLE keyboard.

3) Insert the working disk into the disk drive.

4) Type in "PR#6". (This brings the Disk Operating System into the computer.) Press the "RETURN" key.

5) Type in "RUN NEDCOM", then press "RETURN". This loads the NEDCOM program into the APPLE, and starts execution.

From this point on, NEDCOM takes control. The user need only respond to the questions posed on the monitor.

Each NEDCOM run is tagged by a Run Identification number. This is an eight digit number as follows:

DD (first two digits) - the numerical day.

MM (second two digits) - the numerical month (e.g. May = 05).

YY (third two digits) - the numerical year.

XX (last two digits) - two unique digits identifying this particular run number.

The Run Identification Number is used to store and recall any information from disk storage.

There are six run type options available in NEDCOM. These are detailed below:

1) Enter a new data set. The user is asked to input parameters describing the system design, Navy environmental and cost factors, system operating environment, system training and manpower requirements, and LRA specific data. This information is automatically stored on disk. A new file is created under the name of the current run identification number. Each input variable is assigned an input sequence number, ranging from 1 to 61 for system variables, and 0 to 6 for LRA specific variables. A complete set of definitions of the input variables is provided in Table 2.1.

2) Enter a new LRA configuration while using an existing system description. NEDCOM will ask the user to provide the run identification number of the system data set to be used, and will then elicit the LRA data for the new configuration. A file will be created on disk named by the current run ID number. The new file will consist of the old system data set and the new LRA data. The existing data set used will remain intact under its original ID number.

3) Alter an existing data set. The user must provide the run identification number of the data set to be altered, and is given a choice between system variable changes and LRA variable changes. The user can continue to make changes in either category as needed. A new file is *not* created by using this option. The data set changes are recorded on the original file.

4) Add LRA types to an existing data set. The user must provide the ID number of the data set to be enlarged, and the new total number of LRA types for the system. The existing system description and LRA configuration remain intact; the effect of this option is to enlarge the LRA configuration. This option does not create a new file on disk. The original file retains its original number and the additional LRA data is recorded on it.

5) Perform sensitivity analysis on one system variable. The user is asked to provide the data set identification number, the sequence number of the system variable to be analyzed, the upper and lower bounds of the variable and its increment size. For example, to check the impact on system cost on changing the required system confidence level against stockout one could input the following data:

    variable number: 51

upper bound: .98

lower bound: .90

increment: .2

NEDCOM will then execute five complete system runs, first setting K^* (sequence number 51) to .90 then .92, .94, .96, and .98.

Sensitivity analysis runs to not alter the data set filed on disk. In particular, the original value of the sensitivity variable is not changed.

6) Run an existing data set. The user is asked to provide the ID number of the existing data set to be used. The system is then run immediately using this data set. The file on disk remains unchanged.

When the system is run, the user must choose between "FASTRUN" and "SLOWRUN." The difference is in the spares calculation: the "SLOWRUN" option requires an iteration for each spare part needed and thus has a longer running time than the less accurate "FASTRUN," which eliminates the need for iteration by using an approximation.

Table 2.1 NEDCOM Input Variables

NAVY ENVIRONMENTAL AND COST FACTORS

1-DC	(\$/day/student)	The average daily cost per student of attending a "C" school training course. The value includes student and instructor salaries, administrative overhead, travel expenses, per day expenses, etc.
2-TA_m	(\$/student)	The per student cost of a maintenance technician "A" school training course.
3-TA_o	(\$/student)	The per student cost of an operator "A" school training course.
4-BN_m	(\$)	The undiscounted annual billet cost for a maintenance technician required to service the system (taken from the Billet Cost Model (BCM).
5-BN_o	(\$)	The undiscounted annual billet cost for a system operator (taken from the BCM).
6-BG	(\$)	The undiscounted annual billet cost for a general labor NEC billet (taken from the BCM).
7-BD	(\$)	The undiscounted annual billet cost for a maintenance technician at a military operated depot (taken from the BCM if military technicians are used; taken from Civilian Billet Cost Model if civil service technicians are used).
8-BO	(\$)	Undiscounted annual billet cost for an officer required to supervise system operation.
9-WH_m	(hr/wk)	The number of hours available for assigned work for maintenance personnel, i.e., the number of hours in the week less hours spent on sleep, messing, personal needs, free time, service diversions (e.g. quarters, general drills), and training.

Table 2.1 (cont.)

10-WH_o	(hr/wk)	Same as WH_m, above, but referring to system operators.
11-WH_d	(hr/wk)	Same as WH_m and WH_o, above, but referring to depot maintenance technicians. WH_d should also be adjusted to include annual down time due to sick leave, vacations, other duties, etc.
12-U	($0<U\leq 1$)	Fraction of work time actually spent on direct labor (labor utilization rate). U accounts for the increase in labor time required to perform a service due to rest periods, adminstrative overhead, etc.
13-TOR_s	(%/year)	Annual percentage of shipboard personnel who attrite out of service and must be replaced.
14-TOR_d	(%/year)	Same as TOR_s, above, but referring to depot maintenance technicians.
15-Z_s	($/person/ship)	The total cost of adding additional personnel to a platform. Includes administration, ship's modifications, support and other costs.
16-h	(dep/ship/year)	Average annual number of ship deployments.
17-D	(days)	Average length of a ship deployment period.
18-ρ	(%/year)	Annual discount rate. Used to reduce to present value the system life cycle cost.
19-COND	($0\leq COND\leq 1$)	Fraction of items coded repair which are beyond capability of maintenance (BCM) and must be condemned.
20-m	($0\leq m$)	Annual maintenance of support equipment rate: the ratio of average annual support of support equipment cost to support equipment initial purchase cost.

Table 2.1 (cont.)

21-TDP	($/page)	The per page cost of developing technical data.
22-ADC	($/page/year)	The annual per page cost of maintaining and updating technical data.
23-CC	($/lb./mile)	Cost of insured freight.
24-IEC	($/item)	Cost of entering a new NSN (National Stock Number) into the NSS (National Stock System).
25-IMC	($/item/site/year)	Annual cost of maintaining one NSN item at one site.

SYSTEM OPERATING ENVIRONMENT

26-AN_m	(men)	Real number of maintenance technician work time (in men) on board ship which can be utilized for the system. (For example, if there are three maintenance technicians on board ship each spending 25% of their time on general duty then $AN_m = 3 \times .25 = .75$).
27-AN_o	(men)	Same as AN_m, but referring to operators.
28-AG	(men)	Number of general labor personnel on board ship capable of receiving the "A" and "C" school training required for operating or maintaining the system.
29-N	(number)	The number of ships on which the system is deployed.
30-Q	(number)	The number of systems deployed per ship.
31-LC	(years)	Number of years in the system life cycle.
32-AHR	(hr/system/year)	Average annual system operating hours.

Table 2.1 (cont.)

33-PHR	(hr/sys/deploy.)	Peak number of system operating hours during a deployment period.
34-RRATE	($0<RRATE\leq 1$)	System production cost learning curve reduction rate. The reduction in system unit cost which occurs which the production lot size doubles.
35-RP	($)	The average repair material cost for the repair of an LRA.
36-d	(number)	The number of holding or stockage depots in the depot repair system.
37-d_r	(number)	Number of repair depots in the repair system.
38-COD	($/item)	Average cost of an LRA repair at a contractor operated depot.
39-DRT	(days)	Depot response time, i.e. the time between the arrival of a failed item at a holding depot to the time it is returned to the holding depot from the repair depot.
40-LRT	(days)	Local response time, i.e. the time between the failure of an item and the time it is restored to ready for issue status when the item is repaired on board ship.
41-DIS	(miles)	Average distance between repair and supply depots.

SYSTEM MANPOWER AND TRAINING REQUIREMENTS

42-Θ	(men)	Required number of operators per system.
43-OF	(men)	Number of officers assigned to each ship to supervise system.

Table 2.1 (cont.)

44-Z	(\$/man)	"Other" personnel costs. Z includes such costs as security clearances and indirect and administrative costs.
45-OTD	(days)	Required number of day of "C" school training for system operators.
46-TS	(days)	Required number of days of maintenance technician "C" school training for system orientation and system repair (fault isolation, removal and replacement of LRA's).
47-TR	(days)	Average number of days of "C" school training required to repair an LRA.

SYSTEM DESIGN PARAMETERS

48-ICO	(\$/site)	System installation and checkout cost.
49-ℓ	(number)	Estimated system production lot size (used for learning curve calculations).
50-PT_ℓ	(\$/system)	Estimated system assembly, or put-together, cost at lot size ℓ, i.e. the system costs in addition to the unit costs of the LRA's in the system.
51-K^*	($0 \le K^* < 1$)	Desired system confidence level against stock out of spare LRA's.
52-n	(number)	Number of different LRA types in the system.
53-WP	(lb.)	Average LRA weight, including shipping container weight.
54-PP	(number)	Number of new piece parts in the system which will have to be entered into the NSS.

Table 2.1 (cont.)

55-FIH	(\$/system)	Hardware cost of system fault isolation hardware (excluding built-in test equipment, which is included either in PT or as one of the LRA's).
56-CS	(\$)	Cost of system fault isolation test equipment software development.
57-CH	(\$/platform)	Cost of common system repair support and test equipment hardware.
58-P	(number)	Number of pages of technical documentation required for system overview (maintenance and operation).
59-P_f	(number)	Number of pages of technical documentation required for system repair (fault isolation, removal and replacement of LRA's).
60-P_r	(number)	Average number of pages of technical documentation required for the repair of a typical LRA.
61-SM	(mnhr/wk/system)	System scheduled maintenance requirement (per operating week).

i^{th} LRA SPECIFIC INPUT DATA

0-$UC_{i,\ell}$	(\$)	Estimated unit production cost of LRA at production lot size ℓ.
1-q_i	(number)	Number of appearances of LRA in the system.
2-$MTRR_i$	(hr)	Mean time to fault isolate, remove and replace the LRA.
3-$MTTR_i$	(hr)	Mean time to repair the LRA.
4-δ_i	($0<\delta_i<1$)	LRA duty cycle, i.e. the ratio of LRA operating hours to system operating hours.

Table 2.1 (cont.)

5-$MTBF_i$	(hr)	Meaning time between failure (average number of operating hours between LRA failure).
6-STE_i	($)	Cost of LRA specific support and test equipment.