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MASTER

COMPUTER-ASSISTED PLANNING OF A RESEARCH
AND DEVELOPMENT BUDGET

William A. Whitesell

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CONTENTS

	Abstract	iv
Chapter 1	– Introduction	1
Chapter 2	– Background Information	3
Chapter 3	– A Single-Phase Planning Method	12
Chapter 4	– A Three-Phase, Computer-Assisted Planning Sequence	18
Chapter 5	– Third-Generation Extensions	36
Appendix A	– A Single-Phase Program	45
	I – Flow Chart	46
	II – Listing	49
Appendix B	– Listings of the Three-Phase Programs	63
	I – PLN	64
	II – DSEF	69
	III – EF	76
Appendix C	– Excerpts of the FY74 Budget Preparation	85
	I – PLN Run Excerpts	86
	II – EF Run Excerpts	88
	III – Excerpts of the File /PAT/	91
	IV – Excerpts of the Second Version of the File /INC/	92
	V – The File /PAT3/	93
Appendix D	– A Detailed (Semi-Coded) Flow Chart of the Fund-Fitting Segment for STPI	95
Glossary of Terms		99

ABSTRACT

A business application of computer-science methods is presented. Manual planning methods and a computer-assisted system are described and compared, demonstrating improved planning and budget preparation. Extensions to the planning system are explored.

The business application is a three-year Research and Development (R&D) operating budget, directed toward project planning within limits of funding restraints and man-power availability. A three-phase budgeting system has been developed, fully implemented, and employed in planning and preparing the 1972 version of the R&D operating budget at Rocky Flats Division, Dow Chemical U.S.A.

The planning system uses three time-share computer programs, written in FORTRAN II, which employ look-up tables, linear and binary searches, and special routines to compute project costs over a three-year span, to combine costs and efforts into major endeavors and to distribute those costs and efforts over seventeen benefiting activities during the three-year period.

The improvement achieved in the quality of planning is due to a simplified, more logical sequence, induced by deliberate development of a computer system, and to the nearly instant iterative capability inherent in a computer system.

A second-generation, two-phase planning system is outlined which would automatically adjust the three-year budget to fit funding restraints and project priorities.

COMPUTER-ASSISTED PLANNING OF A RESEARCH AND DEVELOPMENT BUDGET

William A. Whitesell

CHAPTER 1 -- INTRODUCTION

The purpose of this report is to publish a computer planning system, which was developed at Rocky Flats Division, Dow Chemical U.S.A. The method of presentation should enable other contractors, with requirements similar to those at Rocky Flats, to use all or part of the system with a minimum of difficulty.

The system is directed toward the planning and preparing of the annual, three-year "process development" budget. The computer programs are fully implemented in FORTRAN II on the NOAA (Boulder, Colorado) XDS-940 time-sharing computer.

The objective of the programs is, in an iterative manner, to compute and manipulate man-power-effort and cost figures required in the annual preparation of the Research and Development, three-year operating budget.

This planning system was used in preparing the Research and Development (R&D) three-year operating budget in December 1971 and January 1972. The deliberate planning necessitated by a computer system development, and the sudden increase in data-manipulation capability, resulted in remarkable improvements in the budget planning procedures. The nearly instant iterative capability permitted effective previews while the budget was in preparation. It also permitted responsive reaction to last-minute changes, e.g., priorities, effort availability, and technology emphasis.

Once prepared, the "Process Development Budget" is forwarded to the AEC Weapons Development Division, Albuquerque Operations Office, Albuquerque, New Mexico. There, it is combined with similar budgets from the other prime contractors into a composite budget which accounts for and justifies the uses to which R&D funds will be put.

The finished budget is essentially a detailed presentation, both narrative and numerical, of what is being (and what will be) done, why, when, and how. The numerical portion of that presentation is the purpose of the system discussed in this report. Until the preparation of the "FY74 Process Development Budget," these computations had been achieved manually and constituted a major portion of the time and effort expended in the preparation of the total budget.

The essentials of the business environment and the budget preparation constraints and criteria are presented in Chapter 2. Chapter 3 outlines the pre-computer method of preparing a three-year "Process Development Budget" and presents a first-generation computer program which may be used to replace the manual procedures. In Chapter 4, the current (second-generation) three-phase, computer-assisted planning approach is presented, the conduct of the preparation of the FY74 budget is discussed, and a comparison between the pre-computer and computer-assisted methods is made. Chapter 5 presents thoughts and proposals on methods to extend and improve the current planning package. The proposals presented in Chapter 5 include detailed (but unimplemented) segments of a two-phase sequence which would automatically adjust the project plans to fit restraints imposed by AEC funding limitations and by project priorities.

CHAPTER 2 -- BACKGROUND INFORMATION

To comprehend the improvements achieved in budgeting practice and planning techniques through the computer-assisted measures described in this report, a basic understanding of both the R&D organization involved and the Process-Development-Budgeting criteria is necessary.

At Rocky Flats, the Research and Development Department is composed of four functional groups totalling approximately 385 personnel and a five-man staff (Business & Plans Group). The functions of the four groups are directed principally toward support of factory production. The four functional groups of Research and Development are Materials Technology, Chemistry, Product, and Mechanical. Their functions are within the disciplines of metallurgy, chemistry, physics and testing, and mechanical engineering, respectively.

Under the four groups are 22 functional subgroups consisting of from 4 to 33 persons. The subgroups serve as control centers for project performance and cost accounting. The broad range of disciplines of the subgroups can be deduced from the titles as shown in Figure 1. Each subgroup has a distinctive 200-series account number (indicated above each subgroup rectangle in Figure 1) which relates transactions (such as purchases, time-card charges and other expenses) to that cost center. Personnel levels are authorized by management for each subgroup and are based on predicted levels of work and funding.

The principal function of R&D at Rocky Flats is production support, but almost half of the R&D effort is directed toward developmental work and research projects. The R&D activities are supported by the following three AEC categories of funding:

Production, Production Support (PPS) applies to both the production organizations and to such activities within R&D as day-to-day machine-shop trouble shooting, special tooling studies, and waste recovery problems.

Development, Development Support--Process Development (DDS"E") covers developmental activities further removed from the production floor, and directed toward either present or future production needs. The separation between PPS and DDS"E" is broad and gray.

Development, Development Support--Nuclear R&D (DDS"F") is concerned primarily with basic research of the actinide elements.

Funding and activities (and therefore personnel levels) are planned for the three categories and for special contracts with the design laboratories (Los Alamos Laboratory, Lawrence Livermore Laboratories, and Sandia Laboratories), other governmental agencies, and occasionally commercial companies.

A full description of the accounting system employed at Rocky Flats for project cost accounting is beyond the scope of this report. Briefly, a six-digit project number is assigned to each significant effort employing the following implied meanings of the first two digits:

- 91XXXX - a contract with Lawrence Livermore Laboratories
- 92XXXX - a contract with Los Alamos Laboratories
- 93XXXX - a contract from another source
- 94XXXX - a DPA (Development Project Authorization,
i.e., DDS)
- 95XXXX - an MPA (Manufacturing Project Authorization,
i.e., PPS)

Transactions are keyed to the appropriate project number and stored in an IBM 360/50. Weekly and monthly project reports are printed out for each project. They show the origin of each charge and the totals of man hours and costs for the current period, for the fiscal year to date, and for the life of the project.

At the end of a fiscal year, the sum of all fiscal-to-date costs for all 94XXXX project numbers constitutes the DDS ("E" and "F") spending for that year. A similar total for the 95XXXX project numbers is the cost of Research and Development PPS activities for the year.

A comprehensive budget for the R&D Department is based on all the types of funding. The DDS-funded portion of the total R&D budget is the subject of the "Process Development Budget."

The "Process Development Budget," assembled by a five man staff, is an annual three-year plan designed to provide a detailed projection and forecast of effort levels to be applied to the DDS activities (including "E" and "F"), and to justify the associated costs. The plan is heavily influenced by day-to-day communications with the design laboratories and by annual compilations of guidance from each of those laboratories. Another major influence is derived from the needs anticipated by the Production Managers.

The budget cycle begins in October of each year with the issuance of the budget instructions from AEC, Weapons Development Division, Albuquerque, New Mexico. The three-year period spans the fiscal year (FY) in which the budget is prepared and the succeeding two years, i.e., the budget prepared during FY72 covered FY72 through FY74 and was titled the "FY74 Process Development Budget." The three years are referred to as prior year (year prepared), current year, and budget year.

Each year the budget confirms what is being done in the prior year, finalizes the plans for the current year (actually the year to follow), and initiates plans for the budget year. During the budget preparation, funding levels exist for the prior year and are speculative for the current and budget years. Manning levels for DDS work within R&D organizations are largely based on the speculative funding levels. The instructions issued from AEC include tentative funding levels for planning purposes.

DDS activities are viewed from two aspects in the Process Development Budget; according to the technology into which the work falls, and according to the purpose of the work.

A technology area is a major division of a field, e.g., "joining" is a technology area within the field of "process technologies." Each technology area is assigned a distinctive number within its respective field. All process-technology areas are prefixed with a "2.", e.g., the technology area number of "joining" is "2.6".

A group number, based on purpose, is assigned to an activity. All nuclear R&D efforts (DDS"F") are assigned a group number of 40. Plant-support activities are numbered 30; weapons-programs efforts, 20; and advanced development, 10.

The personnel who perform these activities are accounted for as either "direct" or "direct support"; primarily a difference of working directly on a few efforts, or effort being distributed over many activities. Within each of those categories, personnel are divided into two groups: "Scientific and Technical" and "Others." At Rocky Flats R&D the two groups are judged to correspond to salary and hourly personnel, respectively.

Costs are accounted for as direct costs and total costs. The direct costs include salaries of the "direct" workers and the expenses of materials which may be purchased. The total costs include the direct costs and the indirect costs (clerical and supervision) and the applied overhead. In a three-year budget plan, these costs must be predicted with empirically established man-year rates.

Activities within the frame work of the Process Development Budget are combined into "endeavors." Each endeavor is composed of related developmental activities which are within the same technology area and fall within the same group number (purpose of work). An attempt is made to limit the endeavor size to an effort level of about five man years per year.

The Process Development Budget contains a master list of the endeavors by endeavor number (sequentially in order), technology area number (sorted in ascending order), group number (as activities occur), title, brief scope, and each year's effort level (in man years) and the direct and total costs. Subtotals of efforts and costs are included by technology area. After a grand total of efforts and costs, a recapitulation is required which sorts out the yearly efforts and costs by group numbers, and summarizes the scientific and technical effort each year by DDS"E" and by DDS"F." A sample, illustrative master list is shown in Figure 2.

The tables which involve a considerable amount of computation are the "swerlpool tables." There is a total of four swerlpool tables required. Each swerlpool table is essentially three one-year matrices (of technology-area direct costs (or efforts) distributed over "beneficiary programs," three subtotals, and a grand total. Tables I and II show the two-page form which was used for the swerlpool tables in the FY74 Process Development Budget.

A program in this context is a major entity of work, such as Fairway, Advanced Technology and Plant Operations Improvements. There are three categories of programs: weapons programs, advanced development programs, and plant programs. As the name implies, a beneficiary program is any program which benefits from a given "endeavor."

A completed direct-cost swerlpool table contains, for each year, the direct dollars which are assignable to each program by technology area and totals. The method of arriving at those dollar values is discussed in Chapter 3. A completed direct-effort swerlpool table contains man-year figures assignable to the programs in a similar manner.

TABLE 4 "MASTER LIST"				LIST OF TECHNICAL ENDEAVORS									PLANT ROCKY FLATS		
PROCESS DEVELOPMENT PLANS				(Dollars in Thousands)									DATE January 26, 1972		
ENDVR NO.	TECHNOLOGY AREA AND CATEGORY	CODE NO.	NAME	ENDEAVOR TITLE AND BRIEF STATEMENT OF PURPOSE (ARRANGED BY TECHNOLOGY AREA)	DDS DIRECT SCIENTIFIC, ENGINEERING & OTHER TECHNICAL MAN YEARS, DIRECT COSTS, & TOTAL COSTS									PROGRAM	REASON OF NEED
					FY 19 72			FY 1973			FY 19 74				
					DIRECT MY'S	DIRECT COSTS	TOTAL COSTS	DIRECT MY'S	DIRECT COSTS	TOTAL COSTS	DIRECT MY'S	DIRECT COSTS	TOTAL COSTS		
1	40 S	1.1	BASIC MATERIALS	Anisotropic Properties of Pu to study	5.0	86.5	220.5	5.8	91.5	232.5	5.0	97.0	245.5	Adv. Tech.	6
2	40 S	1.1	Basic Materials												
1.1 SUB TOTALS					23.1	418.8	1081.9	24.2	462.3	1207.5	23.8	482.9	1259.4		
11	40 S	1.2	SPECIAL PHYSICS MATERIALS	Physical Metallurgy of Beryllium and Its Alloys To continue	2.0	34.6	109.2	2.0	36.6	115.6	2.0	38.8	121.7	Adv. Tech.	
3.9 SUB TOTALS					8.0	136.8	404.0	8.7	154.8	447.1	2.7	163.5	470.5		
GRAND TOTAL					115.0	2129.8	7146.2	115.0	2235.4	7589.5	115.0	2375.3	8029.8		
Group 10					9.2	169.8	598.4	10.5	209.8	745.5	10.3	219.2	774.9		
Group 20					69.0	1289.2	4559.3	68.0	1323.8	4756.0	67.8	1405.3	5020.1		
Group 30					21.3	364.0	1272.3	21.0	376.9	1322.6	21.4	406.4	1416.4		
Group 40					15.5	306.8	716.2	15.5	324.9	765.8	15.5	344.4	818.4		
Direct Scientific and Engineering Man-Years															
DDS"E"					81.7			82.3			82.6				
DDS"F"					13.5			13.5			13.5				
TOTALS					95.2			95.8			96.1				

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Figure 2. An Illustrative Master List

TABLE 3 (Page 1 of 2 Pages) "SWERLPOOL TABLE" (TECHNOLOGY/PROGRAM TABLE)		DIRECT EFFORT FOR NORMAL PROCESS DEV (03-09), & NUCLEAR R & D (03-25)																		PLANT							
FY 73/74 PROCESS DEV. PLANS		DIRECT COSTS										BY TECHNOLOGY AREA AND PROGRAM										DATE					
		DIRECT SCIENTIFIC, ENGR & OTHER TECHNICAL AVERAGE MAN YEARS										(Dollars in Thousands)															
CODE	TECHNOLOGY AREA	FY	ALLOCATIONS TO WEAPONS PROGRAMS - ENDEAVOR GROUP 20							PRODUC. & STOCK PILE	TOTAL	ALLOCATIONS TO ADVANCED DEVELOPMENT PROGRAMS - ENDEAVOR GROUPS 10 & 40										ALLOCATIONS TO PLT PGMS - ENDOV GP 30			GRAND TOTAL		
			W 66	W 70	W 71	W 74	W 75					WALTZ	ARV	FAIRWAY	YO-YO	WIPER	SAMBA	HYB		ADV TECH	TOTAL	PROCESS IMPROVE-MENT	PLANT OPNS IMPROVE.	TOTAL			
1.1	BASIC MATERIALS																										
1.2	SPECIAL PHYSICS MATERIALS																										
1.3	CARBON CARBIDE MATERIALS																										
1.4	PLASTICS																										
1.5	EXPLOSIVES																										
1.6	CERAMICS GLASS																										
1.7	ADHESIVES																										
1.8	INTERMETALLICS																										
1.9	COMPOSITE MATERIALS																										
1.10	INSULATION MATERIALS																										
1.11	COMMERCIAL MATERIALS																										
2.1	METAL FABRICATION																										
2.2	PLASTIC FABRICATION																										
2.3	HIGH EXPLOSIVE FABRICATION																										
2.4	COMPONENT FABRICATION																										
2.5	CERAMIC FABRICATION																										
2.6	JOINING BONDING																										
2.7	COATING																										

Table I. Page 1 of Swerlpool Form

TABLE 3 (Page 2 of 2 Pages) "SWERPOOL TABLE" (TECHNOLOGY/PROGRAM TABLE)		DIRECT EFFORT FOR NORMAL PROCESS DEV (03-09), & NUCLEAR R & D (03-25)																		PLANT				
FY 73/74 PROCESS DEV. PLANS.		BY TECHNOLOGY AREA AND PROGRAM																		DATE				
		DIRECT COSTS										DIRECT SCIENTIFIC, ENGR & OTHER TECHNICAL AVERAGE MAN YEARS												
		ALLOCATIONS TO WEAPONS PROGRAMS - ENDEAVOR GROUP 20										ALLOCATIONS TO ADVANCED DEVELOPMENT PROGRAMS - ENDEAVOR GROUPS 10 & 40								ALLOCATIONS TO PLT PGMS - ENDOV. GP 30		GRAND TOTAL		
CODE	TECHNOLOGY AREA	FY	W 66	W 70	W 71	W 74	W 75		PRODUC. & STOCK PILE	TOTAL	WALTZ	ARV	FAIRWAY	YO-YO	WIPER	SAMBA	HYB		ADV TECH	TOTAL	PROCESS IMPROVEMENT	PLANT OPNS IMPROVEMENT	TOTAL	GRAND TOTAL
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
2.0 PROCESS TECH'S (Continued)	2.8 MACHINING MATERIAL REMOVAL																							
	2.9 ASSEMBLY METHODS																							
	2.10 PURIFICATION RECOVERY																							
	2.11 SPECIAL PLANT TECHNOLOGIES																							
3.0 CERTIFICATION	3.1 GAGING																							
	3.2 NON-DESTRUCTIVE TESTING (NDT)																							
	3.3 ANALYSIS																							
	3.4 PROOF TESTING																							
	3.5 SURVEILLANCE																							
	3.6 TEST FIRING																							
	3.7 PRODUCT TESTERS																							
	3.8 MATERIAL TESTING																							
	3.9 COMPATIBILITY																							
	3.10 STANDARDS																							
COST TOTALS	TOTAL DIRECT COSTS 03-09 & 03-25 COMBINED																							
	TOTAL OVERHEAD COSTS APPLIED																							
	TOTAL ALL COSTS 03-09 & 03-25 COMBINED																							
	TOTAL DIRECT SCIENTIFIC, ENGR & OTHER TECH AVERAGE MAN YEARS																							

Table II. Page 2 of Swerlpool Form

CHAPTER 3 -- A SINGLE-PHASE PLANNING METHOD

This author's first experience with the Process Development Budget was as a contributor to the narrative portion of the FY72 budget. A year later, I was responsible for the manual computations necessary in the preparation of the FY73 budget. At the completion of that budget, a major effort began in February 1971 to overhaul the entire planning approach and to achieve computer assistance.

This chapter outlines the planning sequence and manual computing procedures employed in preparing those earlier budgets and presents a computer program which automates those procedures. Chapter 4 presents the computer-assisted methods employed in preparing the FY74 budget and will analyze the improvements resulting from that approach.

The single-phase method may be characterized as decentralized. The AEC instructions which initiate the planning cycle were altered and rephrased by the R&D staff to be compatible with the working-level frame of reference. These internal instructions were then issued to the account managers (supervisors of the subgroups) for appropriate response.

Based upon those instructions and the design laboratory guidance, the account managers grouped their ongoing and planned DNS projects (DPA's) into account-level endeavors and, using the top third of the endeavor form shown in Table III, indicated the levels of effort during the three years and the cost of extraordinary purchases they predicted during the last two years.

The group supervisors then reviewed all account-level endeavors from their respective subgroups, made changes necessary to fit manning limits and project priorities, and forwarded the endeavors (with Sections 1 and 2 of Table III completed) to the Business and Plans Group.

Sections 3, 4 and 5 were then completed for each account-level endeavor. Each program (as defined in Chapter 2, page 8)

SECTION 1											
1. DESCRIPTIVE TITLE		LAST BUDGET SERIAL NO.		OPERATING ACCOUNT NUMBER		TYPE WORK (CHECK ONE)		EN-DEAVOR GROUP		TECHNOLOGY AREA NAME	
2. BRIEF STATEMENT OF PURPOSE		3.		4.		5.		6.		7.	
						DDS E ☐ DDS F ☐					

SECTION 2		PRIOR YR. PROJECTION		CURRENT YR. ESTIMATE		BUDGET YR. ESTIMATE		SECTION 3						
ESTIMATE OF DIRECT RESOURCES		MAN-YRS COST		MAN-YRS COST		MAN-YRS COST		PROGRAMS BENEFITED						
'B' LIST USE	1 EXEMPT DDS DIRECT MANPOWER							PROGRAM	PRIOR YR.		CURRENT YR.		BUDGET YR.	
	2 NONEXEMPT DDS DIRECT MANPOWER								TYPE PCT		TYPE PCT		TYPE PCT	
	3 HOURLY DDS DIRECT MANPOWER													
	4 OFF-SCHEDULE PURCHASES (PPS MAT'L'S)													
	5 OTHER DIRECT MATERIALS													
6 TOTAL DIRECT MANYEARS & MAT'L'S COSTS														
'A' LIST USE	7 EXEMPT DDS DIRECT MANPOWER													
	8 NONEXEMPT DDS DIRECT MANPOWER													
	9 HOURLY DDS DIRECT MANPOWER													
	10 OFF-SCHEDULE PURCHASES (PPS MAT'L'S)													
	11 OTHER DIRECT MATERIALS													
	12 TOTAL DIRECT MANYEARS & MAT'L'S COSTS													

LEAVE BLANK BELOW THIS LINE

SECTION 4													
		LAST BUDGET SERIAL NO.		LOCAL CONTROL NO.		OUTPUT ACTIVITY NO.		EN-DEAVOR GROUP		SPONSOR		REASON OF NEED	
		3.		4.		5.		6.		7.		8.	

SECTION 5		PRIOR YR. PROJECTION			CURRENT YR. ESTIMATE			BUDGET YR. ESTIMATE			SECTION 6	
ESTIMATE OF RESOURCES		MAN-YR RATE COST			MAN-YR RATE COST			MAN-YR RATE COST			KEY DATA	
A	EXEMPT DDS DIRECT MANPOWER										<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>	
B	NONEXEMPT DDS DIRECT MANPOWER											
C	HOURLY DDS DIRECT MANPOWER											
D	OFF-SCHEDULE PURCHASES (PPS MAT'L'S)											
E	OTHER DIRECT MATERIALS											
F	OTHER DIRECT COSTS											
G	TOTAL DDS DIRECT MANYEARS & COST											
H	EXEMPT DDS DIRECT SUPPORT MANPOWER											
I	NONEXEMPT DDS DIRECT SUPPORT MANPOWER											
J	APPLIED OVERHEAD											
K	TOTAL DDS MANYEARS & COST: RATE AVG.											

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Table III. Pre-Computer Endeavor Form

which would benefit from the process development work planned in the endeavor was listed in Section 3 along with judgments of each year's percentage of the endeavor's effort attributable to that program.

Effort levels and predicted extraordinary material purchases were transcribed from Section 2 to corresponding boxes within Section 5 for each year in rows A through E, respectively. Rates were entered for the particular account for each year by each type; i.e., exempt salary, nonexempt salary, and hourly. Man years and rates were then extended to costs by manual computation. A final extension of total direct man years times an "other direct cost" rate, for each year, completed the incremental direct costs which were then summed into row "G."

The next step was to classify the DDS"E" account-level endeavors as either direct or direct support. The costs of each direct-support endeavor were then distributed on a per-capita basis to all account-level endeavors which were judged to benefit from that direct-support endeavor. The population used in the per-capita approach was the planned number of man years in the supported endeavors. These incremental costs were computed on a worksheet (a given endeavor might benefit from more than one direct-support endeavor) and the final direct-support costs were entered in row "H."

An applied-overhead rate was entered for each year. When this was multiplied by that year's effort level, the overhead cost associated with that endeavor was predicted.

The sum of all these costs for each year would then be the total cost of the account-level endeavor in each year.

After the costs were computed for each DDS"E" and DDS"F" direct endeavor, the sums of the two types of endeavors were compared to the dollar limits set by AEC for each year. An adjustment usually followed to achieve a fit.

For DDS"F" endeavors, the adjustment involved scaling the effort levels uniformly among some of the endeavors. This was necessary because our basic research projects were not suitable to priority ranking.

Achieving a dollar fit for DDS"E" activities involved the review of project priorities and the possible reclassifying of some account-level endeavors as PPS. As discussed in Chapter 2, there is an overlap between DDS"E" and PPS activities.

In concert with the Director of the Budget at Rocky Flats, a review was conducted of all types of operating funding. This review sometimes caused shifting and cancelling of projects and reductions in planned personnel levels. This review resulted in official sanction of the three-year plan and a measure of the validity of the personnel levels planned for the next two years.

Having verified that the account-level endeavors were viable, the five-man staff was then ready to recast them into major activities consistent with the AEC definition of an endeavor. Typically, approximately 100 account-level endeavors would be converted to about 60 budget endeavors. This conversion was dictated by budget guidance and the content of account-level endeavors and was achieved by three means: merging account-level endeavors, fragmenting others, and in many cases renumbering the account-level endeavor as a budget endeavor. The first two means of conversion complicated the computational steps which followed. Throughout those steps, budget endeavors which were composed of several account-level endeavors had to be handled by their parts.

The next step was to prepare a draft master list, grouping all endeavors by technology area (see Figure 2). Efforts and costs for the three years for each budget endeavor were computed either by transcribing from the corresponding account-level endeavor or by summing up the appropriate figures in the contributing account-level endeavors. Subtotals and grand totals were calculated and entered. The number of direct man years in each year, in the category of "scientific and engineering," was best deduced by

difference; i.e., the number of hourly man years were counted within the account-level endeavors for a particular year and this number was subtracted from the total number of man years in that year.

After the master list was checked and cross checked, the computation of the swerlpools was begun. To manually compile the figures to be entered in the form shown in Tables I and II, huge scratch pads were required. We distributed direct costs on one pad, and direct man years on another, from each account-level endeavor by the program percentages entered in Section 3 of the endeavor form (Table III). As the figures from account-level endeavors were being distributed, they were placed in the correct technology area section of the scratch pad. After distributing all direct cost and man year figures, the incremental figures were summed and entered as elements of the 3x33x21 matrices. At Rocky Flats, only 17 of the 33 rows have non-zero figures since all technology areas are not represented in our activities.

Manually achieving an error-free swerlpool was a very difficult task. Each distribution of an endeavor had to be corrected for round-off error because the figures are entered to the nearest \$100 and 0.1 of a man year.

When the grand total of man years and direct costs agreed with the corresponding figures in the master list, the final six cells in the "grand total" column (at the bottom of Table II, opposite "total overhead costs applied" and "total all costs") were completed. The grand total of the "all costs" came directly from the master list. The difference between the grand total of "all costs" and the grand total of "direct costs" resulted in the grand total of "overhead costs." "Overhead costs" in columns 11, 21 and 24 were computed by pro-rating the grand total of "overhead costs" on the basis of the individual "total direct costs." This method was employed realizing it resulted in approximations of the total overhead costs applied to the three program categories (columns 11, 21 and 24). To rigorously compute these dollar values manually was judged to require too much time and effort.

In a typical single-phase budget preparation sequence, a long list of non-numerical activities were proceeding concurrently with the steps outlined above; e.g., comparing guidance with narrative input from the account managers, reviewing the narrations for completeness and accuracy, obtaining additional and clarifying guidance from the design laboratories, and reviewing with AEC and the design laboratories the main thrust of the 3-year plan which was being formulated.

A severe limitation to the outlined sequence was that the computing was completed at about the same time as the completion of the non-numerical portion--just in time for managerial review and the print-shop deadline. This timing made iteration of the plan totally impractical. The rigidity of the planning in this sequence made adjustments to minor changes in guidance or priorities very difficult. A major change desired by top management, and which would affect the master list or swerlpool tables, could only be implemented at the cost of a one-week delay. The usual conclusion by management was that the matter did not justify that kind of delay.

As a first step toward achieving computer assistance in the Process Development Budget preparation, a large algorithmic program was written that duplicated the steps outlined above. This program essentially takes all the predigested data and produces the master list and two swerlpools. A flow chart and the program listing are presented in Appendix A.

CHAPTER 4 -- A THREE-PHASE, COMPUTER-ASSISTED PLANNING SEQUENCE

The principal premise in overhauling the planning sequence, described in Chapter 3, was that a clear path must exist between account-level projects (PA's) and the R&D operating budget.

From the point of view of the budgeter, this would create a direct link between PA's and budget endeavors (hereafter simply "endeavors") and would improve performance monitoring, since cost accounting is at the PA level. A fundamental benefit is the elimination of an unnecessary step in the sequence. For the account manager, this would relieve him of the procedural budgetary aspects and allow him to address his planning to working level considerations.

As a first step toward eliminating the account-level endeavors, a PA numbering scheme was devised. Of the six digits in a PA number, it was observed that the third was nonfunctional since the number of projects is considerably less than 999; i.e., all PA's were either 940XXX or 950XXX. In the new numbering, the following meanings were to be implied by the first three digits of a PA number:

- 940XXX - a direct-effort DDS"E" project
- 948XXX - a direct-support-effort DDS"E" project
- 949XXX - a direct-effort DDS"F" project
- 950XXX - a PPS project

An additional feature of the numbering scheme is that the last three digits of a PA number are unique to that project. This was imposed to accommodate the shifting of projects within the gray zone between DDS"E" and PPS activities, clearly labeling the project throughout its life. This also allows for the gradual evolution of a research project (initially 949123) to a process-development project (then 940123) and on to a production-support effort (finally 950123).

A second fundamental aspect which was to be built into the new planning sequence was a staging, iterating approach to achieve a more logical, responsive planning period. The planning sequence was arbitrarily divided into three phases:

Phase I - Develop a three-year overall operating plan including all types of funding activities, costing out all ongoing and planned projects (DDS and PPS).

Phase II - Prepare a draft master list reflecting the Phase I plan, to be used in early review by management, AEC officers, and personnel of the design laboratories.

Phase III - Adjust the plan as dictated by changes resulting from Phase II liaison, cost out all projects in their final form and prepare a master list and the swerlpool tables.

An incidental change which caused a disproportionate amount of simplification had to do with naming the first two years of the three-year span; i.e., "prior" became "this" and "current" became "next." We now refer to the three as "this year, next year and budget year." In the Process Development Budget, the names remain unchanged.

The three computer programs which are the backbone of this three-phase planning sequence are shown schematically in Figure 3; they are "PLN," "DSEF" and "EF," all written in FORTRAN II. Listings of program codes and excerpts of the FY74 budget printout are presented in Appendices A and B.

The purpose of PLN is to cost out all R&D PA's and at the discretion of the user set up a disc file containing all costed DDS projects. This is achieved with an algorithmic program

Figure 3. Three-Phase Planning System, Concept Flow Chart

which accepts the number of projects to be processed, reads two files which provide project data and account man year rates, computes each year's direct and total costs, prints out the costed projects by account with sub totals by account, wing and R&D, asks if the results fit the plan (that is, are these results worth keeping), and if the answer is "yes" writes the 94XXXX PA's onto a disc file.

The simple virtual machine employed by PLN is shown in Figure 4. The two files which PLN reads are PAT and RTS. PAT contains basic PA data; i.e., PA number, account number, and each year's planned efforts in tenths of man years by either salary and hourly classification. These content are read into the first eight columns of the 400x14 array, NPAS. The remaining six columns receive the direct and total costs for each of the three years as they are computed. The contents of RTS are transcribed into the table, MNRTS, so that each of the 30 rows contains an account number (in ascending numerical order) and successively each year's rate, in \$100's, for salary, hourly, other direct, and applied overhead.

It may be noted that there are 22 accounts in our R&D structure and MNRTS provides for 30. The extra eight rows are made up of two spares (because of an organizational change) and six rows which are needed to contain the DDS"F" rates. Because of the nature of work performed in Nuclear R&D projects at Rocky Flats, a man year in any of the accounts costs less on a 949-type project than on the other types of projects. The DDS"F" rates are held at the bottom of MNRTS as 300-type accounts; e.g., account 215 has rates in rows numbered 8 (with "215" in column one) and 24 (with "315" in column one). The ascending numerical order of the account numbers is essential to the binary search in the function LOC within PLN.

A topical Flow Chart of PLN and its function LOC is shown in Figure 5.

The program DSEF converts the direct support, DDS"E" and DDS"F" costed PA's, contained in the PLN-generated file PAT,

Figure 4. Virtual Machine of PLN

Figure 5. Topical Flow Chart of PLN and LOC

Figure 5. (continued)

into a draft master list, prints out the results and at the discretion of the user sorts and serially writes the endeavors onto a file for later use by the program EF.

DSEF uses a two-table virtual machine similar to that of PLN. The table NPAS holds the costed PA data read from the file PAT and incremental data from a manually generated file, INC. The incremental data, by PA, are: technology area, tentative group number, parent endeavor (i.e., the endeavor to which the PA contributes), a code to indicate if the PA receives direct support from another PA and codes to indicate which direct-support PA's support it. The table ICUM serves as an array of accumulating registers for subtotals and grand totals.

A topical flow chart of DSEF with its overlay CRN is shown in Figure 6. After reading the requested number of PA's into NPAS, from PAT and INC, DSEF distributes the total direct cost for each year of each direct-support PA over all of the supported PA's. The fully costed out 940- and 949-type PA's are then written to a holding file, PAT2. DSEF proceeds to cull out the direct-support PA's; to accumulate efforts and costs of PA's by parent endeavor, technology area, total and group number; to print out each endeavor with endeavor number, technology area, group number and the three years of effort, direct costs and total costs; and to print out the effort and cost data by technology area, total, group and salary effort.

If the user chooses to save these data, the overlay CRN reads the holding file, compacts the PA's into sequential endeavors and writes them into a disc file (PAT3) to be used by the program EF.

The purposes of EF are to compute and print the two swerlpool tables and to print a final master list.

When called, EF reads the requested number of endeavors from PAT3 into the table called NDVRS, reads incremental data for each endeavor from INC into NDVRS and into a vector (NPRGS), and reads technology area numbers from TAREAS into column one of the cost-swerlpool-table work sheet called LSWLP.

Figure 6. Topical Flow Chart of DSEF & CRN

Figure 6. (continued)

The incremental data from INC are (for each endeavor): final group number, number of beneficiary programs and each beneficiary index number (pointing to the corresponding column in the swerlpool table form, see Table I) and the three years' percentages of benefit. These data, through the first beneficiary program, are read into NDVRS; the remaining beneficiary programs, if any, are read into NPRGS.

The virtual machine employed by EF is shown in Figure 7. In addition to the tables and vector mentioned above, LSWLPM holds the computed, and distributed direct man years for all three years, and ISUD, ISUM and LMP are used during the swerlpool computation to correct for truncation error.

Figure 8 presents a topical flow chart of EF with its two overlays TTP and MLT.

This three-phase planning sequence was implemented during the summer of 1971 and subjected to a full-scale run using the FY73 budget data during August. Once debugged, the system checked out satisfactorily.

Implicit in the use of the FY73 budget data was a complete mapping from PA's to endeavors. This mapping laid the basis for the FY74 budget cycle.

The FY74 budget cycle began with an overall R&D three-year manning plan at both group and subgroup levels. Once this plan was approved by the Rocky Flats Director of the Budget, each account manager was sent a three-year "Budget-Project Efforts" sheet, as shown in Table IV, with all ongoing PA's listed, grouped by type (E, F and PPS), indicating the manning limits for each category.

The account manager filled in his three-year estimate of effort by project, adding new project numbers as required, and returned the form for computation.

As the forms were returned, we began generating the file, PAT, directly from their contents. Each record in PAT consists of a PA number, an account number and three years of effort by salary and hourly. The distinction between exempt and nonexempt

ITNØ

ISUD

ISUM

LMP

NT

NPRGS(1200)

1	PROGRAM INDEX
2	THIS YEAR %
3	NEXT YEAR %
4	BUDGET YEAR %
5	PROGRAM INDEX
6	THIS YEAR %
7	NEXT YEAR %
8	BUDGET YEAR %
9	PROGRAM INDEX

1198	---
1199	---
1200	---

PAT 3
ENDEAVOR
DATA

INC
INCREMENTAL
DATA

1		
2		
3		
4		

13		
14		
15		
16		

LSWLPM (16 x 64)

ENDEAVOR NO.	TECH AREA NO.	GRP NO.	SALARY	HOURLY	SALARY	HOURLY	SALARY	HOURLY	NO OF PROGRAMS	M YEARS	DIR COST	TOTAL \$	M YEARS	DIR COST	TOTAL \$	M YEARS	DIR COST	TOTAL \$	BUDGET YEAR	1ST PROC. INDEX	THIS YEAR	NEXT YEAR	BUD. YEAR	%
1																								
2																								
3																								
4																								
5																								
97																								
98																								
99																								
100																								

NDVRS (100 x 24)

TECH AREA NO.	PRG.1			PRG.2			PRG.3			PRG.4			PRG.19			PLT TOTAL			GRAND TOTAL		
	T YR.	N YR.	B YR.	T YR.	N YR.	B YR.	T YR.	N YR.	B YR.	T YR.	N YR.	B YR.	T YR.	N YR.	B YR.	T YR.	N YR.	B YR.	T YR.	N YR.	B YR.
1																					
2																					
3																					
4																					
5																					
13																					
14																					
15																					
16																					

LSWLPM (17 x 64)

Figure 7. Virtual Machine of Program EF

Figure 8. Topical Flow Chart of EF, TTP & MLT

ACCT _____

Project Totals					
Supervision					
Clerical					
Total Funded					
Special Orders					
Sales to Production					
Total Planned					
TOTAL APL					

Table IV. Three-Phase Effort Form

had become unnecessary when a rate review resulted in a common rate for the two categories of salaried personnel. The practice of predicting levels of extraordinary purchases also stopped because of that rate review. Records showed that the average level of purchasing per man year of effort within a given account remained reasonably consistent and that accounts usually predicted about the same level of "extraordinary" purchases each year. A proper rate for "other direct" costs should predict this expense accurately.

When all the planning sheets were returned and the file, PAT, was completed, program PLN was run. The costed project listing, segmented by organization, was included in a "Phase II" instruction package to account managers.

The "Phase II" instructions outlined reasons for and methods of changing predicted project levels and included a "Three-Year Project Forecast" form (as shown in Table V) for each PA being planned during the budget period. The completed project-forecast form, combined with a final effort sheet by the particular account manager, constituted the complete input for that PA.

As the project forecasts were received, we began making judgments and decisions regarding parent endeavors, group numbers, technology areas, and direct support relations. When these matters were decided, the file INC was manually generated and the program DSEF was run. The resulting draft master list was used in liaison with group supervisors, the R&D Director, local AEC officers, and representatives of all the design laboratories.

These early talks using actual figures precipitated a number of changes. As a matter of fact, changes continued right up to the typing-imposed deadline for the entire budget preparation. The two most significant changes were a major shift in effort in technology areas from "joining/bonding" to "metal fabrication," and a last-minute major change in design agency guidance. Either of these changes would have severely taxed us in previous years, but this year it was a routine matter to accommodate them.

THREE-YEAR PROJECT FORECAST		FY74 BUDGET
PA NUMBER _____	ACCT. NUMBER _____	
TITLE _____		
PROGRAMMATIC APPLICATIONS:		
RECENT ACCOMPLISHMENTS:		
CAPITAL EQUIPMENT (YR REQUIRED & TEC):		
THIS YEAR'S PLANS:		
NEXT YEAR'S PLANS:		
BUDGET YEAR'S PLANS:		
RELEVANT PUBLICATIONS:		

Table V. Three-Phase Project Forecast Form

The actual conduct of the budgeting cycle was a series of iterations, with one or more of the three programs. More than three versions of the swerlpool tables were prepared in the process. A measure of the office efficiency realized in the computer-assisted planning system is the fact that no overtime was required in this annual effort nor did numerical errors exist in the tabulations.

A comparison between this planning period and the method described in Chapter 3 reveals a marked improvement in quality and efficiency. One might contend that many of the improvements could have been achieved without computer assistance. This is true to a very limited extent; the principal premise of the new planning sequence (a direct link between PA's and endeavors) could have been realized in a totally manual preparation. However, the three-phase iterative capability is completely beyond the scope of a manual method. Where other features of the three-phase sequence fall between these two extremes is a matter of judgment.

All these improvements were made because of a computer-directed overhaul of an existing planning sequence. The improvements resulted directly from the deliberate planning necessitated by the development of a computer system.

The principal benefit from the three-phase system is the nearly instant iterative capability which is completely beyond manual methods. This capability enabled us to address our attention to truly responsive planning.

As a computer system, the three-phase sequence falls far short of perfection. No attempt has been made (nor is planned) to achieve optimization. No decision-making capability exists. The initial overall R&D plan was generated essentially by hand. The PA properties of technology-area and direct-support relations were explicitly placed in the file INC, manually. Endeavor data relevant to beneficiary programs were also placed manually.

Chapter 5 discusses improvements to the existing planning system. Algorithms are presented which would achieve automatic adjustment of PA efforts and categories to meet funding restraints. A default implication of technology area and direct support relation by account number is explored.

CHAPTER 5 -- THIRD-GENERATION EXTENSIONS

As noted at the end of the preceding chapter, the subject computer-assisted system is in no way perfected. Whether or not it should be improved upon is debatable because of its infrequent use and the limited return to be realized in efficiency and economy.

This final chapter explores possible improvements and extensions to the three-phase planning system described in Chapter 4.

A review of the topical flow charts and the input data leads to a list of desirable improvements. The most needed improvement is a decision-making ability to fit the overall plan to funding restraints automatically. The existing system assists in this first step of the cycle through repeated runs of PLN, but it is essentially a manual process.

There appears to be an excessive amount of manual placement of data for each PA and endeavor in the two versions of the file INC; i.e., technology area number, group number, parent endeavor, direct support data, and the beneficiary programs with percentages. With few exceptions, there exist implied relations between two properties (technology area numbers and direct support receiving PA's) and the account number associated with the PA. For example, every DDS"E" PA within the joining groups (221, 222 and 230) is in the joining/bonding technology area and most of them receive direct support from the same direct support PA's. This suggests a default relationship between account numbers and technology area numbers, and another between direct support PA's and supported accounts.

The process involved in determining which programs are benefited by an endeavor and assigning the percentage of benefit for each of the three years has been analyzed in considerable detail. Attempts to quantify the process have failed. The approach is such a matter of subjective judgment that a sophisticated, heuristic program would be required to automate the procedure.

The number of attributes associated with each program and each endeavor suggests either an extensive mathematical model or an associative memory approach. Attributes of a program consist of materials, shapes, strengths, special properties, components, schedules, and design alternates. Determining the benefiting programs for a particular endeavor is a matter of comparing the purpose and timing of that endeavor with the needs and timing of each program. Establishing the percentage of benefit for each year, to each program, involves a high degree of judgment and intuition. To outline an approach to automate this process is beyond the scope of this report.

In the balance of this chapter, an improved program is outlined which would merge PLN and DSEF into a more interactive, efficient, fund-fitting system called STPI.

The concept of the resulting two-phase planning system is shown in Figure 9. The first phase (STPI) would achieve a three-year plan for all categories of projects (within the funding restraints), would store costed PA's (in the same format as that achieved by PLN) and would print a draft master list by PA (delaying the conversion of PA's into endeavors until STPII). STPII would be essentially the same as EF.

STPI would interactively report to the user if a conflict should exist between the cost totals and the funding limits and would request guidelines as to "favored" accounts; i.e., accounts whose projects should not be reduced if the totals exceed the limits and whose projects should be increased if the totals are less than the limits.

The virtual machine employed in conceiving STPI is shown in Figure 10. The first fourteen columns of NPAS are identical to NPAS as used in PLN. Column 15 either contains a nondefault technology area number or a zero (meaning that the default number applies to that particular PA). Column 16 indicates whether the PA receives support from direct support PA's. The "grade 4"

Figure 10. Virtual Machine of STPI

flag placed in column 17 indicates PA's which may be either PPS or DDS"E" because of their nature of work. The default technology area for each account number is contained in column 14 of the rates table MNRTS. The table IDS contains the accounts whose PA's are normally supported by each direct support PA.

The costs of a direct support PA may then be spread over the supported PA's on an account-number basis. The direct support PA number would be found in the table IDS. Its row would list the accounts whose PA's should share the cost if they have a "yes" in column 16 of NPAS.

The "grade 4" flag would be applied to both DDS"E" and PPS PA's to permit automatic shifting of PA's from one category to the other to fit DDS"E" costs to the funding limits. The arrays I4E and I4P are used to point to "grade 4" PA's of given accounts and for later use in fitting PPS effort to funding limits. The seven 3-element vectors are used to hold funding limits and tolerances on those limits and to accumulate funding levels in the costed PA's.

The concept of STPI is represented in Figure 11. After reading in all the data and costing out all projects the category totals are compared to the funding limits. If all are within tolerance, STPI proceeds to finish the tasks performed by PLN and DSEF. If there is an "F" funding problem, each DDS"F" PA is scaled down (or up) in effort and costs. The incremental change in man years of effort for each year is transferred to (or from) a DDS"E" PA which belongs to the same account number and has the same technology area as the scaled DDS"F" PA. Category totals are correspondingly adjusted.

The DDS"E" funding fit is then checked. If there is a misfit, each "grade 4" DDS"E" PA is scaled down (or up) a proportionate amount to correct the misfit and a PPS PA (with grade 4), which has the same account number as the scaled DDS"E" PA, is increased (or decreased) an equal amount of effort.

Figure 11. Concept Flow Chart of STPI

After the DDS"E" and PPS totals are adjusted, the PPS totals are compared to the funding limits. If any year is out of tolerance, the excess (or deficiency) is converted to man years and the user is notified, interactively, and asked to select account numbers which should be favored in the necessary reduction (or increase) in PPS project effort. The "unfavored" (or favored) account projects are scaled down (or up) to achieve a total-to-limit agreement which is acceptable.

Once funding restraints have been satisfied, a listing of costed projects is printed out. PPS PA's are culled out and the DDS PA's are packed into NPAS. After the direct support PA's have had their costs distributed and have been culled out, the final data of DDS"E" and DDS"F" PA's are stored in a disc file for later use by STPII. The final purpose of STPI is to print out the draft master list, by PA.

Figure 12 presents a more detailed flow chart of the main segment of STPI (through the printing of costed PA's shown in concept in Figure 11). A semi-coded, detailed flow chart of the same segment is presented in Appendix D.

Although the two-phase planning system described above has not been fully coded nor implemented, the logic and detailed flow chart may be extended to a full two-program system in a straight-forward manner.

The initial run of STPI would achieve a draft of project efforts and costs reasonably final at the group and subgroup levels, but requiring fine tuning of individual projects by the account managers. A second run, with account manager adjustments and management-induced changes, would result in a firm plan and draft master list for preview meetings.

Compiling the draft master list by PA has the advantage of preserving the clear link between account-level projects and budget planning. Liaison and negotiation with the design laboratories would be enhanced by talking in terms of individual account efforts.

In summary, the effect of this two-phase planning system would be to further improve the logic and quality of planning achieved with the three-phase system which has been implemented.

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APPENDIX A
A SINGLE-PHASE PROGRAM

I -- FLOW CHART

II -- LISTING

A-II

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C      A PROGRAM TO CONVERT INDIVIDUAL R&D ENDEAVORS INTO
C      A DIRECT-COST SWERLP00L, A DIRECT MAN-YEAR SWERLP00L
C      AND A MASTERLIST FOR THE PRIOR YEAR, CURRENT YEAR
C      AND BUDGET YEAR.
C      TABLES USED AND THEIR PURPOSES ARE:
C      IALSTS--HOLDS RAW DATA AND COMPUTED DATA
C      MNRTS--HOLDS THE PROJECTED THREE-YEAR MAN-YEAR RATES,
C      BY ORGANIZATIONAL ACCOUNTS
C      LSWLP--HOLDS COMPUTED, DISTRIBUTED DIRECT COSTS
C      LSWLPM--HOLDS COMPUTED, DISTRIBUTED DIRECT MAN YEARS
C      NPRGS--HOLDS PROGRAM CODES AND 3-YEAR PERCENTAGES
C      DIMENSION IALSTS(111,36),MNRTS(18,16),LSWLP(17,64),
C      LSWLPM(16,64),NPRGS(1200),ITN0(3)
C      COMMON IALSTS,MNRTS,LSWLP,LSWLPM,NAC,LIM,LMN,INDX,NPRGS
C      KNT=0
C      LMN=1
C      INDX=1
C      SET THE NUMBER OF ENDEAVORS(LIM)
C      TYPE 200
200    FORMAT(/SHOW MANY ENDEAVORS DO YOU WANT PROCESSED?$/ )
      ACCEPT 9900,LIM
9900    FORMAT(I)
      IF(LIM-131) 201,201,800
800    TYPE 202
202    FORMAT($YOUR NUMBER OF ENDEAVORS EXCEEDS THE $
C      $PRESENT LIMIT OF 131$/ )
      GO TO 121
C
C      SET THE NUMBER OF ORGANIZATIONAL ACCOUNTS(NAC)
201    NAC=17
C      READ INTO IALSTS THE R&D ENDEAVORS
      OPEN(2,INPUT,/ENDPT/)
      DO 101 I=1,LIM
      READ (2,9901) (IALSTS(I,J),J=1,18)
9901    FORMAT(12I3,6I4/)
      READ (2,9902) IALSTS(I,19),(IALSTS(I,J),J=29,36)
9902    FORMAT(1I,8I3/)
      IF(IALSTS(I,30)-100) 803,801,801
801    IF(IALSTS(I,31)-100) 803,802,802
802    IF(IALSTS(I,32)-100) 803,101,101
C      AND PLACE EXTRA BENEFICIARY PROGRAMS INTO NPRGS
803    ITN0(1)=IALSTS(I,30)
      ITN0(2)=IALSTS(I,31)
      ITN0(3)=IALSTS(I,32)
749    M=LMN+19
      READ (2,9903)(NPRGS(J),J=LMN,M)
9903    FORMAT(20I3/)
      L=LMN+4
      M=LMN+16
      DO 30 J=L,M,4
      IF(NPRGS(J)) 30,36,30
30      CONTINUE
      K=LMN
      DO 751 L=1,3
      K=K+1
      J=K+16
      DO 750 M=K,J,4
750    ITN0(L)=ITN0(L)+NPRGS(M)
751    CONTINUE
      LMN=LMN+20
      DO 752 J=1,3
      IF(ITN0(J)-100) 749,752,752
752    CONTINUE
      GO TO 753
C      RESET LMN TO J TO PACK DATA IN NPRGS
36      LMN=J
753    IF(I-60) 101,101,754
754    CONTINUE
101    CONTINUE

```

```

C      READ INTO MNRTS THE MAN-YEAR RATES
      OPEN(3,INPUT,/'MNRTS/')
      DO 102 I = 1,NAC
      READ (3,9906) (MNRTS(I,J),J=1,11)
9906   FORMAT(13,10I4/)
      READ (3,9907) (MNRTS(I,J),J=12,16)
9907   FORMAT(5I4/)
102    CONTINUE
C
C      READ INTO COLUMN 1 OF LSWLP THE TECH AREA NUMBERS
      OPEN(4,INPUT,/'TAREAS/')
      READ (4,9908) (LSWLP(I,1),I=1,15)
9908   FORMAT(15I3)
      CLOSE
C      ZERO OUT COLUMNS IN IALSTS TO BE USED TO COLLECT
C      EACH YEAR'S DIRECT AND TOTAL COSTS
      DO 104 I=1,LIM
      DO 103 J=4,10,3
      IALSTS(I,J+17)=0
      IALSTS(I,J+18)=0
C      AND TOTAL UP EACH YEAR'S MAN-YEAR EFFORT
103    IALSTS(I,J+16)=IALSTS(I,J)+IALSTS(I,J+1)+IALSTS(I,J+2)
104    CONTINUE
C      TRANSFER TECH AREA NUMBERS TO COLUMN 1 OF LSWLPM
C      AND ZERO OUT ALL ENTRIES IN BOTH TABLES
      DO 105 I=1,16
      LSWLPM(I,1)=LSWLP(I,1)
105    CONTINUE
      DO 107 I=1,16
      DO 106 J=2,64
      LSWLP(I,J)=0
106    LSWLPM(I,J)=0
107    CONTINUE
      DO 109 J=1,64
      LSWLP(17,J)=0
109    CONTINUE
C
C      COST OUT ALL DIRECT-SUPPORT ENDEAVORS
C
      I=0
      I=I+1
C      STOP IF WE'VE CHECKED THEM ALL
      IF(I-LIM) 804,804,5
C      IF NOT A DIRECT SUPPORT ENDVR GET NEXT ONE
804    IF((IALSTS(I,3)-50) ) 1,805,805
C      ELSE COST IT OUT
805    IGRP=IALSTS(I,3)
C      DETERMINE THE TOTAL NUMBER OF M-YRS IN SUPPORTED ENDVRS
C      FOR EACH YEAR
      CALL NDS(IGRP,ITN0(1),ITN0(2),ITN0(3))
      IF(KNT-IALSTS(I,1)) 806,20,806
806    KNT=IALSTS(I,1)
C      L GETS THE ROW NUMBER OF THIS ACCOUNT IN THE RATE TABLE
      L=L0C(KNT)
C      COST OUT THIS DIRECT SUPPORT ENDVR
20    CALL FNDGST(I,L)
C      DISTRIBUTE THESE COSTS OVER THE SUPPORTED ENDVRS
      II=0
C      INCREMENT IALSTS ROW COUNTER
2    II=II+1
C      IF ALL HAVE BEEN TESTED, LOOK FOR NEXT DIRECT SUPPORT ENDVR
      IF(II -LIM) 807,807,1
C      IF THIS ENDVR DOES NOT GET DIRECT SUPPORT, TRY NEXT ONE
807    IF(IALSTS(II,19)-1) 2,808,2

```

```

C      ELSE TEST TO SEE IF THIS ENDVR GETS SUPPORT FROM THE DIRECT
C      SUPPORT ENDVR BEING COSTED
808    IJ = 0
3      IJ=IJ+1
C      IF NOT CODED FOR SUPPORT FROM THIS DS ENDVR, GET NEXT ONE
      IF(IJ-3) 809,809,2
809    L=33+IJ
      IF(IALSTS(IJ,L)-IALSTS(I,3)) 3,810,3
C      ELSE, PLACE PERCAPITA COSTS IN THIS ENDVR
810    L=0
      J=19
C
4      L=L+1
      J=J+3
      IF(L-3) 811,811,2
811    IF(ITN0(L)) 812,4,812
812    IALSTS(IJ,J)=IALSTS(IJ,J)+IALSTS(IJ,J-2)/ITN0(L)
      *IALSTS(I,J)
C
      GO TO 4
C
C      COST OUT ALL DDS ENDEAVORS AND DISTRIBUTE DATA TO SWERLP00LS
C
5      KNT=0
      DO 7 I=1,LIM
C      IF THIS ENDEAVOR IS NOT A DDS ONE, GET NEXT ONE
      IF(IALSTS(I,3)-50) 813,7,7
C      ELSE, COST THIS ONE OUT AND SPREAD OVER SWERLP00LS
813    IF(KNT-IALSTS(I,1)) 814,6,814
814    KNT=IALSTS(I,1)
      L=L0C(KNT)
6      CALL FNDCST(I,L)
C
7      CONTINUE
C
      CHAIN (/TOTUP/)
121    CONTINUE
      END
C
      SUBROUTINE NDS(IW,IX,IY,IZ)
C
C      THIS ROUTINE SUMS UP, FOR A PARTICULAR DIRECT SUPPORT
C      ENDEAVOR, THE NUMBER OF DIRECT MAN YEARS, IN EACH YEAR,
C      SUPPORTED.
C
C      IW IS THE CODED GROUP NUMBER FOR THE PARTICULAR DS ENDVR
C      IX,IY,AND IZ SUM UP EACH YEARS NUMBER OF SUPPORTED MAN YEARS
C
      DIMENSION IALSTS(111,36),MNRTS(18,16),LSWLP(17,64),
C      LSWLPM(16,64),NPRGS(1200)
C      COMMON IALSTS,MNRTS,LSWLP,LSWLPM,NAC,LIM,LMN,INDX,NPRGS
      IX=0
      IY=0
      IZ=0
      I=0
C      SEARCH THRU THE TABLE OF ENDVRS TO FIND THE DDS ENDVRS WHICH
C      HAVE THE CODED IGRP NO IN COLUMN 34, 35 OR 36
51    I=I+1
C      IF NOT DONE, TEST NEXT ENDVR
      IF(I-LIM) 52,52,800
C      ELSE
800    RETURN
C      IF THIS ENDVR IS NOT A DS RECEIVER, GET NEXT ONE
52    IF(IALSTS(I,19)-1) 51,801,51

```

```

C      ELSE, CHECK IN COLUMNS 34, 35, AND 36
801    J=0
53     J=J+1
      IF(J-3) 802,802,51
802    K=J+33
C      IF NO MATCH, KEEP TRYING TIL ALL THREE CHECKED
      IF(IALSTS(I,K)-IW) 53,803,53
C      ELSE, SUM UP THE MAN YEARS
803    IX=IX+IALSTS(I,20)
      IY=IY+IALSTS(I,23)
      IZ=IZ+IALSTS(I,26)
C      AND GET NEXT ENDVR
      GO TO 51
      END

C
C
SUBROUTINE FND CST(I,J)
C      THIS ROUTINE COMPUTES THE COST OF A PARTICULAR ENDEAVOR, FOR
C      ALL THREE YEARS. IF THE ENDEAVOR IS A DDS TYPE, THE EFFORTS
C      AND COSTS ARE DISTRIBUTED OVER THE TWO SWERLPOOLS.
      DIMENSION ISUD(3),ISUM(3),LMP(3),NT(3)
C      "I" IS THE ROW NUMBER OF THE ENDVR IN IALSTS.
C      "J" IS THE ROW NUMBER OF THE ACCOUNT NO. IN RATES TABLE
      DIMENSION IALSTS(111,36),MNRTS(18,16),LSWLP(17,64),
C      LSWLPM(16,64),NPRGS(1200)
      COMMON IALSTS,MNRTS,LSWLP,LSWLPM,NAC,LIM,LMN,INDX,NPRGS
      DO 50 L=1,3
        ISUD(L)=0
        ISUM(L)=0
        LMP(L)=0
        NT(L)=0
50    CONTINUE
C      ISUD AND ISUM COLLECT THE SUMS OF DOLLARS AND MANYEARS
C      DISTRIBUTED TO PROGRAMS IN THE SWERLPOOLS
C      LMP COLLECTS THE SUMS OF "TOTAL APPLIED OVERHEAD" DOLLARS
C      DISTRIBUTED TO THE SECTIONS OF THE SWERLPOOL TABLE,
C      I.E., WEAPONS, ADVANCED DEVELOPMENT AND PLANT
C      ISUD, ISUM AND LMP VALUES ARE USED TO CORRECT INTEGER
C      TRUNCATION ERRORS GENERATED IN COMPUTING PERCENTAGES
C      TO BE DISTRIBUTED TO THE TABLES.
C      NT ACCUMULATES THE PERCENTAGES, IN EACH YEAR, USED TO
C      DISTRIBUTE COSTS AND IS USED TO TELL WHEN DONE.
C      SET INITIAL VALUES OF INDEXES
      L=1
      M=-3
      N=11
C      COMPUTE THE DIRECT COSTS FOR ALL THREE YEARS AND PLACE
C      THEM IN THE IALSTS TABLE.
      DO 61 K=21,27,3
        L=L+3
        M=M+5
        N=N+2
        IALSTS(I,K)=((IALSTS(I,L)*MNRTS(J,M)+
C          IALSTS(I,L+1)*MNRTS(J,M+1)+
C          IALSTS(I,L+2)*MNRTS(J,M+2)+
C          IALSTS(I,L+16)*MNRTS(J,M+3))/10
C          +IALSTS(I,N)+IALSTS(I,N+1))
C
C      CONTINUE
C      AND THEN THE TOTAL COSTS
      L=1
      DO 62 K=22,28,3
        L=L+5
C      IALSTS(I,K)=IALSTS(I,K)+IALSTS(I,K-1)+
C      IALSTS(I,K-2)*MNRTS(J,L)/10
C
C      CONTINUE
52 62

```

```

C      IF THERE ARE NO BENIFICIARY PROGRAMS, WE'RE DONE
      IF(IALSTS(I,29)) 800,69,800
C      ELSE, DISTRIBUTE COSTS AND EFFORTS
800      IF(LS-IALSTS(I,2)) 801,63,801
801      LS=IALSTS(I,2)
          LC=L0CS(LS)
          IF(LC) 63,700,63
700      TYPE 701, I
701      FORMAT(SENDEAVOR NO. $, I3, /)
C      LC POINTS TO THE TECH AREA ROW IN THE SWERLP00LS
C      K GETS THE COLUMN INDEX CORRESPONDING TO THE PROGRAM NUMBER
63      K=IALSTS(I,29)*3-1
          KK=29
          M=17
          LL=K+2
          L=0
          DO 99 IN=K,LL
              L=L+1
              M=M+3
              KK=KK+1
              LSWLP(LC,IN)=LSWLP(LC,IN)+IALSTS(I,M+1)*IALSTS(I,KK)/100
              LSWLPM(LC,IN)=LSWLPM(LC,IN)+IALSTS(I,M)*IALSTS(I,KK)/100
              ISUD(L)=ISUD(L)+IALSTS(I,M+1)*IALSTS(I,KK)/100
              ISUM(L)=ISUM(L)+IALSTS(I,M)*IALSTS(I,KK)/100
              NT(L)=NT(L)+IALSTS(I,KK)
99      CONTINUE
          IF(IALSTS(I,29)-7) 100,802,802
          IF(IALSTS(I,29)-17) 101,803,803
C      K AND LL GET COLUMN INDEXES FOR THE SECTION TOTALS
C      APPROPRIATE TO THE PROGRAM NUMBER.
803      K=7
          LL=9
          GO TO 102
100      K=1
          LL=3
          GO TO 102
101      K=4
          LL=6
102      M=18
          IS=K
          KK=09
          L=0
C      NOW ADD IN COSTS TO THE SECTION TOTALS
          DO 120 IN=K,LL
              L=L+1
              M=M+3
              KK=KK+1
              LSWLP(17,IN)=LSWLP(17,IN)+(IALSTS(I,M+1)-IALSTS(I,M))
C                  *IALSTS(I,KK)/100
              LMP(L)=LMP(L)+(IALSTS(I,M+1)-IALSTS(I,M))
C                  *IALSTS(I,KK)/100
120      CONTINUE
C
C      IF ALL PERCENTAGES ACCUM TO 100, WE'RE THRU
C
49      IF(NT(1)-100) 806,804,804
804      IF(NT(2)-100) 806,805,805
805      IF(NT(3)-100) 806, 66,66
806      K=NPRGS(INDX)*3-1
          KK=INDX
C      ELSE, SET INDEXES AND CONTINUE SPREADING COSTS AND MEN
          M=17
          LL=K+2
          L=0

```

```

D0 110 IN=K,LL
KK=KK+1
L=L+1
M=M+3
LSWLP(LC,IN)=LSWLP(LC,IN)+IALSTS(I,M+1)*NPRGS(KK)/100
LSWLP(M(LC,IN)=LSWLP(M(LC,IN)+IALSTS(I,M)*NPRGS(KK)/100
ISUD(L)=ISUD(L)+IALSTS(I,M+1)*NPRGS(KK)/100
ISUM(L)=ISUM(L)+IALSTS(I,M)*NPRGS(KK)/100
NT(L)=NT(L)+NPRGS(KK)
110 CONTINUE
IF(NPRGS(INDX)-7) 111,807,807
807 IF(NPRGS(INDX)-17) 112,808,808
808 K=7
LL=9
G0 T0 113
111 K=1
LL=3
G0 T0 113
112 K=4
LL=6
113 M=18
KK=INDX
L=0
D0 114 IN=K,LL
L=L+1
M=M+3
KK=KK+1
LSWLP(17,IN)=LSWLP(17,IN)+(IALSTS(I,M+1)-IALSTS(I,M))
C *NPRGS(KK)/100
114 LMP(L)=LMP(L)+(IALSTS(I,M+1)-IALSTS(I,M))*NPRGS(KK)/100
INDX=INDX+4
G0 T0 49
66 K=IALSTS(I,29)*3-2
M=17
IS=IS-1
D0 67 L=1,3
K=K+1
M=M+3
IS=IS+1
LSWLP(LC,K)=LSWLP(LC,K)+IALSTS(I,M+1)-ISUD(L)
LSWLP(M(LC,K)=LSWLP(M(LC,K)+IALSTS(I,M)-ISUM(L)
LSWLP(17,IS)=LSWLP(17,IS)+IALSTS(I,M+2)
C -IALSTS(I,M+1)-LMP(L)
67 CONTINUE
69 RETURN
END

```

```

      FUNCTION LOC(IX)
C      THIS ROUTINE FINDS THE ROW NUMBER OF AN ACCOUNT
C      NUMBER (IX) IN MNRTS (THE RATE TABLE), BY MEANS
C      OF A BINARY SEARCH.
C      IND GETS THE NUMBER OF ACCOUNTS IN MNRTS
      DIMENSION IALSTS(111,36),MNRTS(18,16),LSWLP(17,64),
C      LSWLPM(16,64),NPRGS(1200)
      COMMON IALSTS,MNRTS,LSWLP,LSWLPM,NAC,LIM,LMN,INDX,NPRGS
      IND=NAC
C      LOM IS A SEARCH LIMIT
      LOM=NAC/2+1
      IBAS=0
      L=0
      IFLG=0
201     L=L+1
      IF(L-LOM) 809,809,220
      IF(IFLG) 204,810,204
      IF(IND-1) 222,203,202
      IND=IND/2
      IBAS=IBAS+IND
      GO TO 210
204     IF(IND-1) 222,206,205
      IND=IND/2
      IBAS=IBAS-IND
210     IF(MNRTS(IBAS,1)-IX) 211,213,212
211     IFLG=0
      GO TO 201
212     IFLG=1
      GO TO 201
213     LOC=IBAS
      RETURN
220     TYPE 301, IX
301     FORMAT(I4,'NOT FOUND IN MNRTS TABLES')
C      BOMB OUT
222     CONTINUE
      RETURN
      END
      FUNCTION LOCS(IX)
C      THIS ROUTINE FINDS THE TECH AREA (IX) ROW NUMBER IN
C      THE SWERLP00L BY MEANS OF A LINEAR SEARCH.
      DIMENSION IALSTS(111,36),MNRTS(18,16),LSWLP(17,64),
C      LSWLPM(16,64),NPRGS(1200)
      COMMON IALSTS,MNRTS,LSWLP,LSWLPM,NAC,LIM,LMN,INDX,NPRGS
      I=0
1       I=I+1
      IF(I-15) 800,800,2
      IF(LSWLP(I,1)-IX) 1,801,1
800     LOCS=I
801     RETURN
2       TYPE 3, IX
3       FORMAT(I4,'NOT FOUND IN LSWLP TABLES')
      LOCS=0
      CONTINUE
      RETURN
      END

```

A-II

```

- /TOTUP/
C      THIS ROUTINE COMPUTES THE TOTALS FOR EACH TECH AREA AND
C      EACH COLUMN OF BOTH SWERLP00L TABLES AND PRINTS
C      BOTH TABLES
C      TOTUP ALL WEAPONS PROGRAMS COSTS AND EFFORTS FOR EACH YR
      DIMENSION IALSTS(111,36),MNRTS(18,16),LSWLP(17,64),
      C      LSWLPM(16,64)
      COMMON IALSTS,MNRTS,LSWLP,LSWLPM,NAC,LIM,LMN,INDX
      DO 10 I=1,15
      IK=1
      DO 2 J=20,22
      IK=IK+1
      JK=IK+15
      DO 1 K=IK,JK,3
      LSWLP(I,J)=LSWLP(I,J)+LSWLP(I,K)
      LSWLPM(I,J)=LSWLPM(I,J)+LSWLPM(I,K)
1      CONTINUE
2      CONTINUE
C      TOTUP ALL ADV DEV PROGRAMS COSTS AND EFFORTS FOR EACH YR
      IK=22
      DO 4 J=30,52
      IK=IK+1
      JK=IK+24
      DO 3 K=IK,JK,3
      LSWLP(I,J)=LSWLP(I,J)+LSWLP(I,K)
      LSWLPM(I,J)=LSWLPM(I,J)+LSWLPM(I,K)
3      CONTINUE
4      CONTINUE
C      TOTUP THE PLANT PROGRAMS COSTS AND EFFORTS FOR EACH YR
      IK=52
      DO 6 J=59,61
      IK=IK+1
      JK=IK+3
      DO 5 K=IK,JK,3
      LSWLP(I,J)=LSWLP(I,J)+LSWLP(I,K)
      LSWLPM(I,J)=LSWLPM(I,J)+LSWLPM(I,K)
5      CONTINUE
6      CONTINUE
C      TOTUP THE TOTALS INTO GRAND TOTALS
      K=19
      DO 7 J=62,64
      K=K+1
      LSWLP(I,J)=LSWLP(I,K)+LSWLP(I,K+30)+LSWLP(I,K+39)
      LSWLPM(I,J)=LSWLPM(I,K)+LSWLPM(I,K+30)+
      C      LSWLPM(I,K+39)
7      CONTINUE
10     CONTINUE
C      TOTUP TOTAL DIRECT COST AND EFFORT FOR EACH COLUMN
      DO 20 J=2,64
      DO 15 I=1,15
      LSWLP(16,J)=LSWLP(16,J)+LSWLP(I,J)
      LSWLPM(16,J)=LSWLPM(16,J)+LSWLPM(I,J)
15     CONTINUE
20     CONTINUE
C      TOTUP TOTAL APPLIED OVERHEAD BY SECTIONS
      I=19
      J=12
      DO 53 K=1,12
      J=J+1
      IF(K-4) 850,51,850
850    IF(K-7) 50,52,50
50     I=I+1
      LSWLP(17,J)=LSWLP(17,K)+LSWLP(16,I)
      GO TO 53
51     I=I+27
      GO TO 50
52     I=I+6
      GO TO 50
53     CONTINUE

```



```

TYPE 130
130  FORMAT($SWERLP00L COST FIGURES ARE:$)
      DO 120 I=1,15
      IF(LSWLP(I,62)) 856,851,856
851  IF(LSWLP(I,63)) 856,852,856
852  IF(LSWLP(I,64)) 856,120,856
856  TYPE 9909
9909  FORMAT(2//)
      TYPE 9910,LSWLP(I,1)
9910  FORMAT(I9/)
      TYPE 140
      TYPE 500, (LSWLP(I,J),J=2,22)
      TYPE 131
      TYPE 500, (LSWLP(I,J),J=23,52)
      TYPE 132
      TYPE 500, (LSWLP(I,J),J=53,61)
      TYPE 133
      TYPE 500, (LSWLP(I,J),J=62,64)
120  CONTINUE
140  FORMAT($WEAPONS PROGRAMS$/)
131  FORMAT(/$ADVANCED DEV PRGMS$/)
132  FORMAT(/$PLANT PRGMS$/)
133  FORMAT(/$GRAND TOTALS ARE: $/)
134  FORMAT($TOTAL DIRECT COSTS COMBINED ARE:$/)
      TYPE 9911
9911  FORMAT(2//)
      TYPE 134
      TYPE 500, (LSWLP(16,J),J=2,22)
      TYPE 500, (LSWLP(16,J),J=23,52)
      TYPE 500, (LSWLP(16,J),J=53,61)
      TYPE 500, (LSWLP(16,J),J=62,64)
      TYPE 9912
9912  FORMAT(2//)
      I=0
C      TOTUP TOTAL ALL COSTS BY SECTIONS
      DO 63 J=10,12
      I=I+1
      LSWLP(17,J)=LSWLP(17,I)+LSWLP(17,I+3)+LSWLP(17,I+6)
63  CONTINUE
      TYPE 141
      TYPE 9913,(LSWLP(17,J),J=1,12)
9913  FORMAT(12I6/)
141  FORMAT($TOTAL OVERHEAD COSTS APPLIED ARE:$/)
      I=9
      DO 64 J=22,24
      I=I+1
      LSWLP(17,J)=LSWLP(17,J)+LSWLP(17,I)
64  CONTINUE
      TYPE 9914
9914  FORMAT(2//)
      TYPE 135
135  FORMAT($TOTAL ALL COSTS COMBINED ARE:$/)
      TYPE 9913,(LSWLP(17,J),J=13,24)
      TYPE 9916
9916  FORMAT(2/,2/,2//)
      TYPE 142
142  FORMAT($SWERLP00L MAN-YEAR FIGURES ARE:$)
      DO 220 I=1,15
      IF(LSWLP(I,62)) 890,857,890
857  IF(LSWLP(I,63)) 890,858,890
858  IF(LSWLP(I,64)) 890,220,890
890  TYPE 9917
9917  FORMAT(2//)
      TYPE 9910,LSWLPM(I,1)
      TYPE 140
      TYPE 500, (LSWLPM(I,J),J=2,22)
      TYPE 131
      TYPE 500, (LSWLPM(I,J),J=23,52)

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```

TYPE 132
TYPE 500, (LSWLPM(I,J),J=53,61)
TYPE 133
TYPE 500, (LSWLPM(I,J),J=62,64)
220  CONTINUE
TYPE 9919
9919  FORMAT(2//)
TYPE 143
143  FORMAT($TOTAL DIRECT MAN YEARS(SC,ENGR,OTH TECH):$/ )
TYPE 500, (LSWLPM(16,J),J=2,22)
TYPE 500, (LSWLPM(16,J),J=23,52)
TYPE 500, (LSWLPM(16,J),J=53,61)
TYPE 500, (LSWLPM(16,J),J=62,64)
500  FORMAT(/1216/)
TYPE 9920
9920  FORMAT(2//)
CHAIN(/M3TRL5/)
END.

```

```

-/MSTRLS/
C      THIS ROUTINE RESORTS THE LIST OF ENDEAVORS IN IALSTS SO THAT
C      DIRECT SUPPORT ENDVRS ARE DROPPED OUT AND THE DDS
C      ENDVRS ARE GROUPED BY BUDGET NUMBERS (IN INCREASING
C      ORDER). THEN EFFORTS AND COSTS ARE COLLECTED BY BUDGET
C      NUMBER, TECH AREA NO., GRAND TOTALS, GROUP NUMBERS
C      AND BY HOURLY CATEGORY OF EFFORT.
C      READ IN THE NUMBER OF BUDGET NUMBERS
C      DIMENSION IALSTS(111,36),MNRTS(18,16),LSWLP(17,64),
C      LSWLPM(16,64)
C      COMMON IALSTS,MNRTS,LSWLP,LSWLPM,NAC,LIM,LMN,INDX
C      TYPE 9921
9921  FORMAT($HOW MANY BUDGET NUMBERS?$/)
C      ACCEPT 9922, NOE
9922  FORMAT(1)
C      PRINT MASTERLIST HEADING
C      TYPE 9923
9923  FORMAT(2//,2//,1/$MASTER LIST$,2//)
C      TYPE 502
502   FORMAT(2X,$BUD NO.  GRPS,2X,$TECH NO.$,3X,
C      $PRIOR YEARS$,5X,$CURRENT YEARS$,6X,$BUDGET YEARS$/)
C      TYPE 503
C      ZERO OUT MATRIX USED FOR SWERLP00L TABLE
C      DO 2 I=1,7
C      DO 1 J=3,14
1      LSWLP(I,J)=0
2      CONTINUE
503   FORMAT(20X,$M YR DIR  TOT$,5X,$M YR DIR  TOT$,5X,
C      $M YR DIR  TOT$)
C      TYPE 9924
9924  FORMAT(2//)
C      SET INITIAL VALUES OF ITCH(TECH AREA NO.), ISTOP(FLAG TO TELL
C      WHEN DONE) AND II(COUNTER FOR COLLECTING COSTS AND EFFORTS)
C      ITCH=11
C      ISTOP=0
C      II=0
C      REARRANGE COLUMN CONTENTS OF IALSTS
C      COLUMN 1 GETS BUDGET NUMBER OF ENDEAVOR
C      COLUMN 18 GETS TECH AREA NO.
C      COLUMN 19 GETS GROUP NO.
C      COLUMNS 29-31 GET HOURLY MAN YRS FOR THREE YEARS
C      DO 3 I=1,LIM
C      IALSTS(I,1)=IALSTS(I,33)
C      IALSTS(I,18)=IALSTS(I,2)
C      IALSTS(I,19)=IALSTS(I,3)
C      IALSTS(I,29)=IALSTS(I,6)
C      IALSTS(I,30)=IALSTS(I,9)
C      IALSTS(I,31)=IALSTS(I,12)
3      CONTINUE
C      INITIALIZE COUNTERS TO CULL OUT DS ENDVRS (WITH 0 IN COL 1)
C      I=0
C      JMP=0
4      I=I+1
C      IF CHECKED ALL, CONTINUE
C      IF(I-LIM) 800,800,7
C      ELSE IF A DDS ENDVR, SKIP TO SET VALUE OF K
800   IF(IALSTS(I,1)) 5,801,5
C      ELSE INCREMENT JUMP COUNTER AND GET NEXT ENDVR
801   JMP=JMP+1
C      GO TO 4
C      K POINTS TO THE ROW WHERE THE NEXT DDS ENDVR IS TO BE PLACED
5      K=I-JMP
C      MOVE ALL PERTINENT ELEMENTS OF ENDVR
C      DO 6 J=18,31
C      IALSTS(K,J)=IALSTS(I,J)
6      CONTINUE
C      IALSTS(K,1)=IALSTS(I,1)
C      AND GET NEXT ENDVR
C      GO TO 4

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```

C      ADJUST LIM TO EQUAL NO. OF DDS ENDVRS
7      LIM=LIM-JMP
C      SET COUNTERS
      I=0
      L=0
      J=0

C      AND START SORTING BY BUDGET NO. WHICH WILL RESULT IN ALL ENDVB
C      WITH SAME BUDGET NO. GROUPED TOGETHER IN INCREASING ORDER
8      I=I+1
C      IF I=NOE, ONLY LAST BUDGET NO. ENDVRS REMAIN, SO WE'RE DONE
      IF(I-NOE) 9,20,9
C      ELSE, INCREMENT POINTER WHICH SHOWS NEXT ENDVR TO BE CHECKED
9      J=J+1
C      IF THERE ARE MORE TO BE CHECKED, CONTINUE CHECKING
      IF(J-LIM) 10,10,802
C      ELSE, RESET THE POINTER
802     J=L
0      AND GET NEXT BUDGET NO.
      GO TO 8
C      IF NOT RIGHT BUDGET NO. GET NEXT ENDVR
10     IF(IALSTS(J,1)-I) 9,803,9
C      ELSE, INCREMENT POINTER WHICH SHOWS WHERE TO PLACE NEXT ENDVR
803     L=L+1
C      IF ENDVR ALREADY THERE, GET NEXT ONE
      IF(J-L) 804,9,804
C      ELSE, EXCHANGE ROWS
804     DO 11 M=18,31
          IALSTS(LIM+1,M)=IALSTS(L,M)
          IALSTS(L,M)=IALSTS(J,M)
          IALSTS(J,M)=IALSTS(LIM+1,M)
11     CONTINUE
          IALSTS(LIM+1,1)=IALSTS(L,1)
          IALSTS(L,1)=IALSTS(J,1)
          IALSTS(J,1)=IALSTS(LIM+1,1)
C      AND GET NEXT ENDVR
      GO TO 9
C      INITIALIZE IB, WHICH HOLDS THE CURRENT BUDGET NUMBER
20     IB=1
C      INCREMENT TO POINT TO THE NEXT ENDVR
22     II=II+1
C      IF ALL HAVE BEEN CHECKED, SET ISTOP TO 1 AND PRINT TOTS
      IF(II-LIM) 805,805,31
C      ELSE, IF WRONG BUDGET NO., PRINT TOTS
805     IF(IALSTS(II,1)-IB) 32,23,32
C      ELSE, SET TECH AREA NO. AND GROUP NO. FOR LATER PRINTING
23     LSWLP(1,1)=IALSTS(II,19)
          LSWLP(1,2)=IALSTS(II,18)
C      AND COLLECT EFFORTS AND COSTS BY BUDGET NO. AND TECH AREA NO.
      DO 24 J=3,11
          LSWLP(1,J)=LSWLP(1,J)+IALSTS(II,J+17)
          LSWLP(2,J)=LSWLP(2,J)+IALSTS(II,J+17)
24     CONTINUE
C      AND SET POINTER I AS TO GROUP NO OF 10, 20, 30, OR 40
      IF(LSWLP(1,1)-20) 26,27,50
      IF(LSWLP(1,1)-40) 28,29,51
C      IF THE GROUP NO. IS NONE OF THESE, GET OUT -- ERROR!
51     TYPE 101, LSWLP(1,1)
101    FORMAT(18,$ IS AN INVALID GROUP NO.$)
      GO TO 999
26     I=4
      GO TO 30
27     I=5
      GO TO 30
28     I=6
      GO TO 30
29     I=7

```

```

C      COLLECT DATA BY GROUP NUMBER
30      DO 102 J=3,14
        LSWLP(1,J)=LSWLP(1,J)+IALSTS(11,J+17)
102     CONTINUE
C      AND GET NEXT ENDVR
        GO TO 22
31      ISTOP=1
C      PRINT TOTS
32      TYPE 501,IB,(LSWLP(1,J),J=1,11)
C      IF STOP FLAG IS ON, PRINT OUT ALL THE FINAL TOTALS
        IF(ISTOP-1) 806,60,806
C      ELSE, IF STILL SAME TECH AREA NO. GET NEXT BUDGET NO.
806     IF(IALSTS(11,18)-ITCH) 807,52,807
C      ELSE, PRINT TECH AREA TOTALS
807     TYPE 9925,ITCH
9925    FORMAT(19$ 'SUBTOTALS$')
        TYPE 500, (LSWLP(2,J),J=3,11)
        TYPE 9926
9926    FORMAT(2//)
        DO 33 J=3,11
        LSWLP(3,J)=LSWLP(3,J)+LSWLP(2,J)
33     CONTINUE
C      AND RESET VALUE OF ITCH TO THE NEW TECH AREA NO.
        ITCH=IALSTS(11,18)
C      AND ZERO OUT THE TECH AREA DATA ROW
        DO 34 J=3,11
        LSWLP(2,J)=0
34     CONTINUE
C      GET THE NEXT BUDGET NUMBER
52     IB=IB+1
C      AND ZERO OUT THE BUDGET NUMBER DATA ROW
        DO 53 J=3,11
        LSWLP(1,J)=0
53     CONTINUE
C      AND GO COLLECT DATA BY BUDGET NO. AND TECH AREA NO.
        GO TO 23
C      WE'RE THRU COLLECTING DATA, SO UP DATE ALL TOTALS AND
C      PRINT THE REST OF THE RESULTS

```

```

60      D0 61 J=3,11
        LSWLP(3,J)=LSWLP(3,J)+LSWLP(2,J)
61      CONTINUE
        II=II-1
        ITCH=IALSTS(II,18)
        TYPE 9927,ITCH
9927    FORMAT(19$ SUBTOTALS$/)
        TYPE 500, (LSWLP(2,J),J=3,11)
        TYPE 9928
9928    FORMAT($GRAND TOTALS$/)
        TYPE 500, (LSWLP(3,J),J=3,11)
        TYPE 9929
9929    FORMAT($03-09$/)
        TYPE 9930
9930    FORMAT($GROUP 10$/)
        TYPE 500, (LSWLP(4,J),J=3,11)
        TYPE 9931
9931    FORMAT($GROUP 20$/)
        TYPE 500, (LSWLP(5,J),J=3,11)
        TYPE 9932
9932    FORMAT($GROUP 30$/)
        TYPE 500, (LSWLP(6,J),J=3,11)
        D0 62 J=3,14
        LSWLP(8,J)=LSWLP(6,J)+LSWLP(5,J)+LSWLP(4,J)
62      CONTINUE
        TYPE 9933
9933    FORMAT($TOTALS 03-09$/)
        TYPE 500, (LSWLP(8,J),J=3,11)
        TYPE 9934
9934    FORMAT($03-25$/)
        TYPE 500, (LSWLP(7,J),J=3,11)
        J=0
        D0 63 K=12,14
        J=J+3
        LSWLP(7,K)=LSWLP(7,J)-LSWLP(7,K)
        LSWLP(8,K)=LSWLP(8,J)-LSWLP(8,K)
        LSWLP(6,K)=LSWLP(7,K)+LSWLP(8,K)
63      CONTINUE
        TYPE 9935
9935    FORMAT(2//)
        TYPE 9936
9936    FORMAT($DIR SC & ENGR MAN YEARS $/)
        TYPE 9937, (LSWLP(8,J),J=12,14)
9937    FORMAT($03-09 $,3I9/)
        TYPE 9938, (LSWLP(7,J),J=12,14)
9938    FORMAT($03-25 $,3I9/)
        TYPE 9939, (LSWLP(6,J),J=12,14)
9939    FORMAT($TOTALS$,3I9/)
500     FORMAT(/18X,9I6/)
501     FORMAT(/12I6/)
999     CONTINUE
        END

```

APPENDIX B
LISTINGS OF THE THREE-PHASE PROGRAMS

I -- PLN

```

      DIMENSION NPAS(400,14),MNRTS(30,13)
      COMMON NPAS,MNRTS,NAC,LIM
C      SET THE NUMBER OF PROJECTS(LIM)
      TYPE 200
200    FORMAT(/SHOW MANY PROJECTS DO YOU WANT PROCESSED?$/ )
      ACCEPT 9900,LIM
9900    FORMAT(1)
C      CAN WE HANDLE THAT MANY?
      IF(LIM-400) 201,201,800
800    TYPE 202
C      IF NOT, TELL HIM AND GET OUT!
202    FORMAT($YOUR NUMBER OF PROJECTS EXCEEDS THE $
C      $PRESENT LIMIT OF 400$/ )
      GO TO 121
C      ELSE
C      SET THE NUMBER OF ORGANIZATIONAL ACCOUNTS(NAC)
201    NAC=30
C      READ INTO NPAS THE PA NOS, ACCT NOS & 3-YR EFFORTS
      OPEN(2,INPUT, /PAT/)
      DO 101 I=1,LIM
      READ (2,9901) (NPAS(I,J),J=1,8)
9901    FORMAT(X,16,X,7I3/)
101    CONTINUE
C      READ INTO MNRTS THE MAN-YEAR RATES FOR ALL THREE YEARS
      OPEN(3,INPUT, /RTS/)
      DO 102 I = 1,NAC
      READ (3,9906) (MNRTS(I,J),J=1,13)
102    CONTINUE
9906    FORMAT(13,12I4/)
C
C      COST OUT ALL PROJECTS
C
      KNT=0
      DO 7 I=1,LIM
C      IF IT'S A DDS"F" PROJECT, SET KNT TO A SPECIAL "ACCT NO"
C      TO PICK UP AN "F" RATE
      IF(NPAS(I,1)-950000) 811,813,813
811    IF(NPAS(I,1)-949000) 813,812,812
812    KNT=NPAS(I,2)+100
      GO TO 815
C      IF WE LAST DEALT WITH THIS ACCT, FIND PROJECT COST
813    IF(KNT-NPAS(I,8)) 814,6,814
C      ELSE SET KNT TO ACCT NO.
C      AND SET L TO POINT TO THE CORRESPONDING ROW IN MNRTS
814    KNT=NPAS(I,2)
815    L=LQC(KNT)
6      CALL FNDCST(I,L)
C
7      CONTINUE
C
C      TITLE THE LISTING OF COSTED PROJECTS
      TYPE 8998
8998    FORMAT(14X,$THIS YEARS,11X,$NEXT YEARS,9X,$BUDGET YEARS/)
      TYPE 8999
8999    FORMAT($PROJECT$,X,3($ MAN YRS DRCT TCST$/ )
      TYPE 8968
8968    FORMAT(8X,3($ (1/10) (100'S) $)/)
C      INITIALIZE COUNTERS AND FLAG
      K=0
      L=0
      M=0
      ISTP=0
C      THE FIRST GROUP HAS 4 ACCOUNTS
      KNT=4

```



```

C      TRANSFER ACCT NOS TO COLUMN 13 OF MNRTS, BY GROUP STRUCTURE
D0 47 J=1,13
47     MNRTS(J,13)=MNRTS(J,1)
      MNRTS(14,13)=MNRTS(23,1)
D0 48 J=15,23
48     MNRTS(J,13)=MNRTS(J-1,1)
C      ZERO OUT GRP AND R&D ACCUMS
D0 50 I=5,12
D0 49 J=1,9
49     MNRTS(I,J)=0
50     CONTINUE
C      ZERO OUT ACCOUNT ACCUMS
51     D0 53 I=1,4
      D0 52 J=1,9
52     MNRTS(I,J)=0
53     CONTINUE
      K=K+1
C      IF WE'VE FINISHED, PRINT R&D TOTALS
55     IF(K-NAC+7) 56,56,80
C      ELSE, IF WE'VE DONE ALL IN GRP, PRINT GRP TOTALS
56     IF(K-KNT) 71,71,81
C      ELSE, START PRINTING KTH ACCT PA'S
71     TYPE 9910, MNRTS(K,13)
9910    FORMAT(I3,$ PROJECTS$//)
72     M=M+1
C      IF ANY PA'S LEFT TO CHECK, GET NEXT ONE
      IF(M-LIM) 76,76,73
C      ELSE, PRINT OUT ACCT TOTALS
73     M=0
75     TYPE 9911
9911    FORMAT(/$ACCOUNT TOTALS ARE:$//)
      TYPE 9912, (MNRTS(1,J),J=1,9)
9912    FORMAT($DDS(E) $,3(2X,14,2X,2I6)//)
      TYPE 9913, (MNRTS(2,J),J=1,9)
9913    FORMAT($DDS(F) $,3(2X,14,2X,2I6)//)
      TYPE 9914, (MNRTS(3,J),J=1,9)
9914    FORMAT($PPS $,3(2X,14,2X,2I6)//)
      TYPE 9915, (MNRTS(4,J),J=1,9)
9915    FORMAT($TOTALS $,3(2X,14,2X,2I6)//)
C      AND START NEXT ACCOUNT
      GO TO 51
C
C      IF THIS PA NOT FROM KTH ACCT, GET NEXT ONE
76     IF(NPAS(M,2)-MNRTS(K,13)) 72,77,72
C      ELSE SET KI VALUES AS TO "E", "F" OR "PPS"
C      KI VALUES PLACE DATA IN PROPER ROWS OF ACCUMS
77     IF(NPAS(M,1)-949000) 900,79,79
79     IF(NPAS(M,1)-950000) 901,902,902
900     K0=1
      K4=9
      K5=3
      GO TO 860
901     K0=2
      K4=10
      K5=2
      GO TO 860
902     K0=3
      K4=11
      K5=1
C      K1, K2 AND K3 HOLD THE TOTAL MAN YEARS FOR EACH YEAR
860     K1=NPAS(M,3)+NPAS(M,4)
      K2=NPAS(M,5)+NPAS(M,6)
      K3=NPAS(M,7)+NPAS(M,8)

```

```

      D0 910 I=K0,K4,4
      MNRTS(I,1)=MNRTS(I,1)+K1
      MNRTS(I+K5,1)=MNRTS(I+K5,1)+K1
      D0 851 J=2,3
      MNRTS(I,J)=MNRTS(I,J)+NPAS(M,J+7)
851  MNRTS(I+K5,J)=MNRTS(I+K5,J)+NPAS(M,J+7)
      MNRTS(I,4)=MNRTS(I,4)+K2
      MNRTS(I+K5,4)=MNRTS(I+K5,4)+K2
      D0 853 J=5,6
      MNRTS(I,J)=MNRTS(I,J)+NPAS(M,J+6)
853  MNRTS(I+K5,J)=MNRTS(I+K5,J)+NPAS(M,J+6)
      MNRTS(I,7)=MNRTS(I,7)+K3
      MNRTS(I+K5,7)=MNRTS(I+K5,7)+K3
      D0 855 J=8,9
      MNRTS(I,J)=MNRTS(I,J)+NPAS(M,J+5)
855  MNRTS(I+K5,J)=MNRTS(I+K5,J)+NPAS(M,J+5)
910  CONTINUE
      C      AFTER PLACING IN ACCT, GRP AND R&D ACCUMS
      C      PRINTOUT PROJECT FIGURES
903  TYPE 9916,NPAS(M,1),K1,NPAS(M,9),
      C NPAS(M,10),K2,NPAS(M,11),NPAS(M,12),
      C K3,NPAS(M,13),NPAS(M,14)
9916 FORMAT(I7,X,3(2X,I4,2X,2I6)/)
      C      AND GET NEXT PA
      GO TO 72
      C      SET ISTEP TO "1" WHEN DONE
80   ISTEP=1
      C      PRINT OUT GROUP TOTALS
81   TYPE 9917
9917 FORMAT($A-LIST TOTALS ARE:$//)
      TYPE 9912,(MNRTS(5,J),J=1,9)
      TYPE 9913,(MNRTS(6,J),J=1,9)
      TYPE 9914,(MNRTS(7,J),J=1,9)
      TYPE 9915,(MNRTS(8,J),J=1,9)
      IF(ISTP) 970,940,970
      C      RESET GROUP ACCUMS TO ZERO
940  D0 942 I=5,8
      D0 941 J=1,12
941  MNRTS(I,J)=0
942  CONTINUE
      C      TITLE NEXT ACCT PROJECT LISTING
      TYPE 9910, MNRTS(K,13)
      C      ADVANCE KNT TO NEXT VALUE
      C      KNT IS FLAG TO TELL WHEN ALL ACCTS OF GROUP ARE DONE
      IF(KNT-4) 943,944,943
      IF(KNT-9) 946,945,946
943  KNT=9
      GO TO 72
945  KNT=14
      GO TO 72
946  KNT=23
      C      AND START CHECKING PAS AT TOP OF TABLE
      GO TO 72
      C      PRINT OUT R&D TOTALS
970  TYPE 9918
9918 FORMAT($R&D TOTALS ARE:$//)
      TYPE 9912,(MNRTS(9,J),J=1,9)
      TYPE 9913,(MNRTS(10,J),J=1,9)
      TYPE 9914,(MNRTS(11,J),J=1,9)
      TYPE 9915,(MNRTS(12,J),J=1,9)
198  TYPE 9919
9919 FORMAT(4//,SD0 THESE FIGURES FIT THE PLAN?1=YES,2=NO.$//)
      ACCEPT 9900,KNT
      C      IF WE'VE GOT TROUBLES, GET OUT
      IF(KNT-1) 121,980,121
980  CLOSE

```

```

C      ELSE, WRITE DDS=TYPE PAS TO FILE /PAT/
      OPEN(2,OUTPUT,/PAT/)
      KNT=LIM
      DO 986 I=1, LIM
C      CULLING OUT PPS PAS
      IF(NPAS(I,1)-950000) 981,985,985
981    WRITE 2,9920,NPAS(I,1),(NPAS(I,J), J=3,14)
9920  FORMAT(16,6I3,6I4)
      GO TO 986
C      DECREMENT KNT EACH TIME A PPS PA IS SKIPPED
985    KNT=KNT-1
986    CONTINUE
C      REPORT NUMBER OF DDS PAS FILED AWAY
      TYPE 9921, KNT
9921  FORMAT(2/$ THE FILE /PAT/ NOW CONTAINS COSTED DATA $
C      $FOR $,14,$DDS=TYPE PROJECTS $/)
121  C CONTINUE
C      AND WE'RE DONE!!
      END
C
C
      SUBROUTINE FND CST(I,J)
C      THIS ROUTINE COSTS OUT A PROJECT (PA)
C      "I" IS THE ROW NUMBER OF THE PA IN NPAS
C      "J" IS THE ROW NUMBER OF THE ACCOUNT NO. IN RATES TABLE
      DIMENSION NPAS(400,14),MNRTS(30,13)
      COMMON NPAS,MNRTS,NAC,LIM
C      SET INITIAL VALUES OF INDEXES
      L=1
      M=-2
C      COMPUTE THE DIRECT COSTS FOR ALL THREE YEARS AND PLACE
C      THEM IN THE NPAS TABLE.
      DO 61 K=9,13,2
      L=L+2
      M=M+4
      NPAS(I,K)=(NPAS(I,L)*MNRTS(J,M)+
C      NPAS(I,L+1)*MNRTS(J,M+1)+
C      (NPAS(I,L)+NPAS(I,L+1))*MNRTS(J,M+2))/10
61    CONTINUE
C      AND THEN THE TOTAL COSTS
      L=1
      DO 62 K=10,14,2
      L=L+4
C      NPAS(I,K)=NPAS(I,K)+NPAS(I,K-1)+
C      (NPAS(I,K-7)+NPAS(I,K-6))*MNRTS(J,L)/10
62    CONTINUE
69    RETURN
      END

```

```

      FUNCTION LOC(IX)
C      THIS ROUTINE FINDS THE ROW NUMBER OF AN ACCOUNT
C      NUMBER (IX) IN MNRTS (THE RATE TABLE), BY MEANS
C      OF A BINARY SEARCH.
      DIMENSION NPAS(400,14),MNRTS(30,13)
      COMMON NPAS,MNRTS,NAC,LIM
C      ISTEP GETS THE NUMBER OF ACCOUNTS IN MNRTS
      ISTEP=NAC
C      LOM IS A SEARCH LIMIT
      LOM=NAC/2+1
C      CLEAR BASE POINTER AND THE NEGATIVE FLAG
      IBAS=0
      L=0
      IFLG=0
201    L=L+1
      IF(L-LOM) 809,809,220
C      IF FLAG IS SET, GO DECREASE BASE
809    IF(IFLG) 204,810,204
C      ELSE, CHECK ISTEP FOR VALUE OF ONE
810    IF(ISTEP-1) 222,203,202
C      IF ISTEP NOT ONE, HALF ISTEP AND ADD THAT AMOUNT TO BASE
202    ISTEP=ISTEP/2
203    IBAS=IBAS+ISTEP
      GO TO 210
C      CHECK ISTEP FOR VALUE OF ONE
204    IF(ISTEP-1) 222,206,205
C      IF ISTEP NOT ONE, HALF ISTEP AND SUBTRACT FROM BASE
205    ISTEP=ISTEP/2
206    IBAS=IBAS-ISTEP
C      IF WE'VE FOUND ACCT NO., SET LOC AND RETURN
210    IF(MNRTS(IBAS,1)-IX) 211,213,212
C      ELSE, SET FLAG AND LOOK AGAIN
211    IFLG=0
      GO TO 201
212    IFLG=1
      GO TO 201
213    LOC=IBAS
      RETURN
220    TYPE 301, IX
301    FORMAT(14,ENOT FOUND IN MNRTS TABLES/)
C      BOMB OUT
222    CONTINUE
      RETURN
      END

```

II -- DSEF

```

C      THIS ROUTINE DISTRIBUTES THE COSTS OF ALL DIRECT-SUPPORT
C      PA'S OVER THE SUPPORTED PA'S, COMPUTES AND PRINTS A
C      DRAFT MASTER LIST AND AT THE USER'S CHOICE COMBINES
C      THE "E" AND "F" PA'S INTO ENDEAVORS AND PLACES THEM
C      IN A DISC FILE, PAT3
DIMENSION NPAS(300,23),ICUM(8,14),ITN0(3)
COMMON NPAS,LIM,L0M,N0E
KNT=0
LMN=1
C      SET THE NUMBER OF PROJECTS(LIM)
TYPE 200
200  FORMAT(/SHOW MANY PROJECTS DO YOU WANT PROCESSED?S/)
ACCEPT 9900,LIM
9900  FORMAT(I)
IF(LIM-300) 201,201,800
800  TYPE 202
202  FORMAT($YOUR NUMBER OF PROJECTS EXCEEDS THE $
C      $PRESENT LIMIT OF 300S/)
GO TO 121
201  OPEN(2,INPUT,/PAT/)
OPEN(3,INPUT,/INC/)
DO 101 I=1,LIM
READ(2,9901) NPAS(I,1),(NPAS(I,J),J=4,9),NPAS(I,12),
C  NPAS(I,13),NPAS(I,15),NPAS(I,16),NPAS(I,18),NPAS(I,19)
READ(3,9902) NPAS(I,2),NPAS(I,3),NPAS(I,10),
C  (NPAS(I,J),J=20,23)
101  CONTINUE
9901  FORMAT(16,6I3,6I4)
9902  FORMAT(6X,I4,I3,I2,4I3/)
DO 104 I=1,LIM
L=2
DO 103 J=4,10,3
L=L+2
C      AND TOTAL UP EACH YEAR'S MAN-YEAR EFFORT
103  NPAS(I,J+7)=NPAS(I,L)+NPAS(I,L+1)
104  CONTINUE
C      DISTRIBUTE ALL DIRECT-SUPPORT PROJECTS
C
I=0
1  I=I+1
C      STOP IF WE'VE CHECKED THEM ALL
IF(I-LIM) 804,804,5
C      IF NOT A DIRECT SUPPORT PA GET NEXT ONE
804  IF((NPAS(I,3)-50) ) 1,805,805
C      ELSE DISTRIBUTE IT
805  IGRP=NPAS(I,3)
C      DETERMINE THE TOTAL NUMBER OF M-YRS IN SUPPORTED PAS
C      FOR EACH YEAR
CALL NDS(IGRP,ITN0(1),ITN0(2),ITN0(3))
C      DISTRIBUTE THESE COSTS OVER THE SUPPORTED PAS
II=0
C      INCREMENT NPAS ROW COUNTER
2  II=II+1
C      IF ALL HAVE BEEN TESTED, LOOK FOR NEXT DIRECT SUPPORT PA
IF(II -LIM) 807,807,1
C      IF THIS PA DOES NOT GET DIRECT SUPPORT, TRY NEXT ONE
807  IF(NPAS(II,10)-1) 2,808,2
C      ELSE TEST TO SEE IF THIS PA GETS SUPPORT FROM THE DIRECT
C      SUPPORT PA BEING COSTED
808  IJ = 0
3  IJ=IJ+1
C      IF NOT CODED FOR SUPPORT FROM THIS DS PA, GET NEXT ONE
IF(IJ-3) 809,809,2
809  L=20+IJ
IF(NPAS(II,L)-NPAS(I,3)) 3,810,3

```

```

C      ELSE, PLACE PERCAPITA COSTS IN THIS PA
810    L=0
      J=10
C
4      L=L+1
      J=J+3
      IF(L-3) 811,811,2
811    IF(ITN0(L)) 812,4,812
812    NPAS(II,J)=NPAS(II,J)+NPAS(I,J)*NPAS(II,J-2)/ITN0(L)
      GO TO 4
C
C
5      CLOSE
      OPEN(2,OUTPUT,/PAT2/)
      LOM=LIM
      DO 411 I=1,LIM
      IF(NPAS(I,1)-949000) 4010,4020,4020
4010    IF(NPAS(I,1)-948000) 4020,410,410
4020    WRITE(2,7777),NPAS(I,1),NPAS(I,2), (NPAS(I,J),J=4,9),
      C      (NPAS(I,J),J=11,20)
      GO TO 411
410    LOM=LOM+1
411    CONTINUE
7777    FORMAT(16,7I3,3(13,2I4),I3)
      TYPE 1921
1921    FORMAT(SHOW MANY BUDGET NUMBERS?$/ )
      ACCEPT 9900, NOE
C      PRINT MASTERLIST HEADING
      TYPE 1923
1923    FORMAT(2//,2//,1/$MASTER LISTS,2//)
      TYPE 502
502    FORMAT(2X,$BUD NO.  GRP$,2X,$TECH NO.$,3X,
      C      $PRIOR YEARS$,5X,$CURRENT YEARS$,6X,$BUDGET YEARS/)
      TYPE 503
C      ZERO OUT ACCUMULATOR TABLE
      DO 302 I=1,8
      DO 301 J=3,14
301    ICUM(I,J)=0
302    CONTINUE
503    FORMAT(20X,$M YR DIR  TOT$,5X,$M YR DIR  TOT$,5X,
      C      $M YR DIR  TOT$)
      TYPE 1924
1924    FORMAT(2//)
C      SET INITIAL VALUES OF ITCH(TECH AREA NO.), ISTOP(FLAG TO TELL
C      WHEN DONE) AND II(COUNTER FOR COLLECTING COSTS AND EFFORTS)
      ITCH=11
      ISTOP=0
      II=0
C      REARRANGE COLUMN CONTENTS OF NPAS
C      COLUMN 1 GETS BUDGET NUMBER OF ENDEAVOR
C      COLUMN 9 GETS TECH AREA NO.
C      COLUMN 10 GETS GROUP NO.
C      COLUMNS 20-22 GET HOURLY MAN YRS FOR THREE YEARS
      DO 303 I=1,LIM
      NPAS(I,1)=NPAS(I,20)
      NPAS(I,20)=NPAS(I,5)
      NPAS(I,21)=NPAS(I,7)
      NPAS(I,22)=NPAS(I,9)
      NPAS(I,9)=NPAS(I,2)
      NPAS(I,10)=NPAS(I,3)
303    CONTINUE
C      INITIALIZE COUNTERS TO CULL OUT DS PAS(WITH 0 IN COL 1)
      I=0
      JMP=0

```

```

304 I=I+1
C IF CHECKED ALL, CONTINUE
IF(I-LIM) 400,400,307
C ELSE IF A DDS PA, SKIP TO SET VALUE OF K
400 IF(NPAS(I,1)) 305,401,305
C ELSE INCREMENT JUMP COUNTER AND GET NEXT PA
401 JNP=JNP+1
GO TO 304
C K POINTS TO THE ROW WHERE THE NEXT DDS PA IS TO BE PLACED
305 K=I-JNP
C MOVE ALL PERTINENT ELEMENTS OF PA
DO 306 J=9,22
NPAS(K,J)=NPAS(I,J)
306 CONTINUE
NPAS(K,1)=NPAS(I,1)
C AND GET NEXT PA
GO TO 304
C ADJUST LIM TO EQUAL NO. OF DDS PAS
307 LIM=LIM-JNP
C SET COUNTERS
I=0
L=0
J=0
C AND START SORTING BY BUDGET NO. WHICH WILL RESULT IN ALL PAS
C WITH SAME BUDGET NO. GROUPED TOGETHER IN INCREASING ORDER
C AS MASTER LIST ENDEAVORS
308 I=I+1
C IF I=NOE, ONLY LAST BUDGET NO. PAS REMAIN, SO WE'RE DONE
IF(I-NOE) 309,320,309
C ELSE, INCREMENT POINTER WHICH SHOWS NEXT PA TO BE CHECKED
309 J=J+1
C IF THERE ARE MORE TO BE CHECKED, CONTINUE CHECKING
IF(J-LIM) 310,310,402
C ELSE, RESET THE POINTER
402 J=L
C AND GET NEXT BUDGET NO.
GO TO 308
C IF NOT RIGHT BUDGET NO. GET NEXT PA
310 IF(NPAS(J,1)-1) 309,403,309
C ELSE, INCREMENT POINTER WHICH SHOWS WHERE TO PLACE NEXT PA
403 L=L+1
C IF PA ALREADY THERE, GET NEXT ONE
IF(J-L) 404,309,404
C ELSE, EXCHANGE ROWS
404 DO 311 M=9,22
NPAS(LIM+1,M)=NPAS(L,M)
NPAS(L,M)=NPAS(J,M)
NPAS(J,M)=NPAS(LIM+1,M)
311 CONTINUE
NPAS(LIM+1,1)=NPAS(L,1)
NPAS(L,1)=NPAS(J,1)
NPAS(J,1)=NPAS(LIM+1,1)
C AND GET NEXT PA
GO TO 309
C INITIALIZE IB, WHICH HOLDS THE CURRENT BUDGET NUMBER
320 IB=1
C INCREMENT TO POINT TO THE NEXT PA
322 II=II+1
C IF ALL HAVE BEEN CHECKED, SET ISTOP TO 1 AND PRINT TOTS
IF(II-LIM) 405,405,331
C ELSE, IF WRONG BUDGET NO., PRINT TOTS
405 IF(NPAS(II,1)-IB) 332,323,332
C ELSE, SET TECH AREA NO. AND GROUP NO. FOR LATER PRINTING
323 ICUM(1,1)=NPAS(II,10)
ICUM(1,2)=NPAS(II,9)

```

```

C      AND COLLECT EFFORTS AND COSTS BY BUDGET NO. AND TECH AREA NO.
D0 324 J=3,11
ICUM(1,J)=ICUM(1,J)+NPAS(11,J+8)
ICUM(2,J)=ICUM(2,J)+NPAS(11,J+8)
324  CONTINUE
C      AND SET POINTER I AS TO GROUP NO OF 10, 20, 30, OR 40
IF(ICUM(1,1)-20) 326,327,350
350  IF(ICUM(1,1)-40) 328,329,351
C      IF THE GROUP NO. IS NONE OF THESE, GET OUT -- ERROR!
351  TYPE 601, ICUM(1,1)
601  FORMAT(18,$ IS AN INVALID GROUP NO.$)
GO TO 121
326  I=4
GO TO 330
327  I=5
GO TO 330
328  I=6
GO TO 330
329  I=7
C      COLLECT DATA BY GROUP NUMBER
330  D0 602 J=3,14
ICUM(1,J)=ICUM(1,J)+NPAS(11,J+8)
602  CONTINUE
C      AND GET NEXT PA
GO TO 322
331  ISTOP=1
C      PRINT TOTS
332  TYPE 501,IB,(ICUM(1,J),J=1,11)
C      IF STOP FLAG IS ON, PRINT OUT ALL THE FINAL TOTALS
IF(ISTOP-1) 406,360,406
C      ELSE, IF STILL SAME TECH AREA NO. GET NEXT BUDGET NO.
406  IF(NPAS(11,9)-ITCH) 407,352,407
C      ELSE, PRINT TECH AREA TOTALS
407  TYPE 1925,ITCH
1925  FORMAT(19$ SUBTOTALS$)
TYPE 500, (ICUM(2,J),J=3,11)
TYPE 1924
D0 333 J=3,11
ICUM(3,J)=ICUM(3,J)+ICUM(2,J)
333  CONTINUE
C      AND RESET VALUE OF ITCH TO THE NEW TECH AREA NO.
ITCH=NPAS(11,9)
C      AND ZERO OUT THE TECH AREA DATA ROW
D0 334 J=3,11
ICUM(2,J)=0
334  CONTINUE
C      GET THE NEXT BUDGET NUMBER
352  IB=IB+1
C      AND ZERO OUT THE BUDGET NUMBER DATA ROW
D0 353 J=3,11
ICUM(1,J)=0
353  CONTINUE
C      AND GO COLLECT DATA BY BUDGET NO. AND TECH AREA NO.
GO TO 323

```



```

C      WE'RE THRU COLLECTING DATA, SO UP DATE ALL TOTALS AND
C      PRINT THE REST OF THE RESULTS
.360  DO 361 J=3,11
      ICUM(3,J)=ICUM(3,J)+ICUM(2,J)
.361  CONTINUE
      II=II-1
      ITCH=NPAS(II,9)
      TYPE 1927,ITCH
.1927  FORMAT(19$ SUBTOTALS/)
      TYPE 500, (ICUM(2,J),J=3,11)
      TYPE 1928
.1928  FORMAT($GRAND TOTALS/)
      TYPE 500, (ICUM(3,J),J=3,11)
      TYPE 1929
.1929  FORMAT($03-09$/)
      TYPE 1930
.1930  FORMAT($GROUP 10$/)
      TYPE 500, (ICUM(4,J),J=3,11)
      TYPE 1931
.1931  FORMAT($GROUP 20$/)
      TYPE 500, (ICUM(5,J),J=3,11)
      TYPE 1932
.1932  FORMAT($GROUP 30$/)
      TYPE 500, (ICUM(6,J),J=3,11)
      DO 362 J=3,14
      ICUM(8,J)=ICUM(6,J)+ICUM(5,J)+ICUM(4,J)
.362  CONTINUE
      TYPE 1933
.1933  FORMAT($TOTALS 03-09$/)
      TYPE 500, (ICUM(8,J),J=3,11)
      TYPE 1934
.1934  FORMAT($03-25$/)
      TYPE 500, (ICUM(7,J),J=3,11)
      J=0
      DO 363 K=12,14
      J=J+3
      ICUM(7,K)=ICUM(7,J)-ICUM(7,K)
      ICUM(8,K)=ICUM(8,J)-ICUM(8,K)
      ICUM(6,K)=ICUM(7,K)+ICUM(8,K)
.363  CONTINUE
      TYPE 1924
      TYPE 1936
.1936  FORMAT($DIR SC & ENGR MAN YEARS $/)
      TYPE 1937, (ICUM(8,J),J=12,14)
.1937  FORMAT($03-09 $,3I9/)
      TYPE 1938, (ICUM(7,J),J=12,14)
.1938  FORMAT($03-25 $,3I9/)
      TYPE 1939, (ICUM(6,J),J=12,14)
.1939  FORMAT($TOTALS$,3I9/)
      500  FORMAT(/13X,9I6/)
      501  FORMAT(/12I6/)
      TYPE 700
.700  FORMAT($IF THE ABOVE ROUGH MASTERLIST IS SATISFACTORY, $
C      $INDICATE BELOW WITH A "1".$/)
      TYPE 701
.701  FORMAT($THIS WILL CAUSE THE DDS PROJECTS TO BE COMBINED $
C      $INTO AEC ENDEAVORS AND$/)
      TYPE 702
.702  FORMAT($CAUSE A FILE /PAT3/ TO BE CREATED CONTAINING $
C      $THE COSTED PAS BY BUD. #$/)
      ACCEPT 9900,1
      IF(1) 703,121,703
.703  CHAIN (/CRNH/)
.121  CONTINUE
      END

```

```

C      SUBROUTINE NDS(IW,IX,IY,IZ)
C
C      THIS ROUTINE SUMS UP, FOR A PARTICULAR DIRECT SUPPORT
C      PROJECT, THE NUMBER OF DIRECT MAN YEARS, IN EACH YEAR,
C      SUPPORTED.
C
C      IW IS THE CODED GROUP NUMBER FOR THE PARTICULAR DS PA
C      IX,IY,AND IZ SUM UP EACH YEARS NUMBER OF SUPPORTED MAN YEARS
C
C      DIMENSION NPAS(300,23)
C      COMMON NPAS,LIM
C      IX=0
C      IY=0
C      IZ=0
C      I=0
C      SEARCH THRU THE TABLE OF PAS TO FIND THE DDS PAS WHICH
C      HAVE THE CODED IGRP NO IN COLUMN 34, 35 OR 36
51      I=I+1
C      IF NOT DONE, TEST NEXT PA
C      IF(I-LIM) 52,52,800
C      ELSE
800     RETURN
C      IF THIS PA IS NOT A DS RECEIVER, GET NEXT ONE
52      IF(NPAS(I,10)-1) 51,801,51
C      ELSE, CHECK IN COLUMNS 34, 35, AND 36
801      J=0
53      J=J+1
C      IF(J-3) 802,802,51
802      K=J+20
C      IF NO MATCH, KEEP TRYING TIL ALL THREE CHECKED
C      IF(NPAS(I,K)-IW) 53,803,53
C      ELSE, SUM UP THE MAN YEARS
803      IX=IX+NPAS(I,11)
C      IY=IY+NPAS(I,14)
C      IZ=IZ+NPAS(I,17)
C      AND GET NEXT PA
C      GO TO 51
C      END

```

```

-/CRN/
C      THIS OVERLAY COPIES PA DATA FROM DISC FILE, PAT2, TO
C      NPAS TABLE, COMPRESSES THE PA'S INTO ENDEAVORS AND
C      WRITES THE ENDEAVORS TO A DISC FILE, PAT3
      DIMENSION NPAS(300,23)
      COMMON NPAS,LIM,L0M,N0E
      CLOSE
      OPEN(2,INPUT, /PAT2/)
C      READ IN PA DATA
      DO 101 I=1,L0M
      READ(2,9901) (NPAS(I,J),J=2,17),NPAS(I,1)
101    CONTINUE
9901   FORMAT(6X,7I3,3(I3,2I4),I3)
C      I IS PA COUNTER, K IS ENDVR COUNTER, L FLAGS MULTI-PA ENDVRS
      L=0
      K=1
      I=0
C      GET NEXT PA
10    I=I+1
C      IF WE'RE NOT DONE, CHECK THIS PA
      IF(I-L0M) 20,20,15
C      ELSE, INC ENDVR COUNTER
15    K=K+1
C      IF WE'RE ALL THRU, GO WRITE TO PAT3
      IF(K-N0E) 17,17,110
C      ELSE, RESET PA COUNTER AND GET NEXT PA
17    I=K-1
      L=0
      GO TO 10
C      IF ENDVR NOT PARENT OF THIS PA, GET NEXT PA
20    IF(NPAS(I,1)-K) 10,22,10
C      ELSE, IF ENDVR ALREADY HAS A PA, GO ADD THIS ONE ON
22    IF(L) 30,24,30
C      ELSE, IF PA IS IN PROPER ROW FOR ENDVR, SET FLAG AND GET NEXT
24    IF(I-K) 28,26,28
26    L=1
      GO TO 10
C      RIPPLE PA'S INTO PROPER ROWS
28    DO 29 J=1,17
      NPAS(L0M+1,J)=NPAS(K,J)
      NPAS(K,J)=NPAS(I,J)
      NPAS(I,J)=NPAS(L0M+1,J)
29    CONTINUE
C      AND GO SET THE FLAG
      GO TO 26
C      ADD ON THIS PA DATA TO THE PARENT ENDVR AND GET NEXT PA
30    DO 31 J=3,17
31    NPAS(K,J)=NPAS(K,J)+NPAS(I,J)
      GO TO 10
110   CLOSE
C      WRITE THE ENDEAVORS TO PAT3, TELL HIM AND GET OUT
      OPEN(2,OUTPUT, /PAT3/)
      DO 105 I=1,N0E
      WRITE(2,9902), (NPAS(I,J),J=1,17)
105   CONTINUE
9902   FORMAT(8I3,3(I3,2I4)/)
      TYPE 9903,N0E
9903   FORMAT(13,$ ENDEAVORS HAVE BEEN FILED IN /PAT3/, IN ORDER OF $
C      $THEIR BUDGET NUMBERS,$/)
121   CONTINUE
      END

```

III -- EF

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C      NDVRS--HOLDS RAW DATA AND COMPUTED DATA
C      MNRTS--HOLDS THE PROJECTED THREE-YEAR MAN-YEAR RATES,
C      BY ORGANIZATIONAL ACCOUNTS
C      LSWLP--HOLDS COMPUTED, DISTRIBUTED DIRECT COSTS
C      LSWLPM--HOLDS COMPUTED, DISTRIBUTED DIRECT MAN YEARS
C      NPRGS--HOLDS PROGRAM CODES AND 3-YEAR PERCENTAGES
C      DIMENSION NDVRS(100,24),LSWLP(17,64),LSWLPM(16,64),ITN0(3),
C      NPRGS(1200),ISUD(3),ISUM(3),LMP(3),NT(3)
C      COMMON NDVRS,LSWLP,LSWLPM,LIM
C      LMN=1
C      INDX=1
C      SET THE NUMBER OF PROJECTS(LIM)
C      TYPE 200
200    FORMAT(/SHOW MANY PROJECTS DO YOU WANT PROCESSED?S/)
C      ACCEPT 9900,LIM
9900    FORMAT(I)
C      IF(LIM-100) 201,201,1800
1800    TYPE 202
202    FORMAT($YOUR NUMBER OF PROJECTS EXCEEDS THE $
C      $PRESENT LIMIT OF 100$/)
C      GO TO 121
C      READ INTO NDVRS THE R&D ENDEAVORS
201    OPEN(2,INPUT,/PAT3/)
C      OPEN(3,INPUT,/INC/)
C      OPEN(4,INPUT,/TAREAS/)
9901    FORMAT(8I3,3(I3,2I4)/)
9902    FORMAT(2X,I3,I2/)
9903    FORMAT(I2,3I3/)
C      DO 101 I=1,LIM
C      READ (2,9901) NDVRS(I,1), NDVRS(I,2), (NDVRS(I,J),J=4,9),
C      (NDVRS(I,J),J=11,19)
C      READ (3,9902) NDVRS(I,3),NDVRS(I,10)
C      IF(NDVRS(I,10)) 101,101,30
30      K=NDVRS(I,10)+1
C      READ(3,9903) (NDVRS(I,J),J=20,23)
C      IF(K) 101,101,31
31      K=K-1
C      READ(3,9903) (NPRGS(J),J=LMN,LMN+3)
C      LMN=LMN+4
C      IF(LMN-1200) 32,1334,1334
32      IF(K) 101,101,31
101      CONTINUE
C      READ (4,9908) (LSWLP(I,1),I=1,15)
9908    FORMAT(15I3)
C      GO TO 34
1334    TYPE 9904,I
9904    FORMAT(/$THE NUMBER OF EXTRA PROGRAMS EXCEEDS 300 AT $
C      $PROJECT NUMBERS,I4,/)
C      GO TO 121
C      TRANSFER TECH AREA NUMBERS TO COLUMN 1 OF LSWLPM
C      AND ZERO OUT ALL ENTRIES IN BOTH TABLES
34      DO 105 I=1,16
C      LSWLPM(I,1)=LSWLP(I,1)
105      CONTINUE
C      DO 107 I=1,16
C      DO 106 J=2,64
C      LSWLP(I,J)=0
106      LSWLPM(I,J)=0
107      CONTINUE
C      DO 109 J=1,64
C      LSWLP(17,J)=0
109      CONTINUE

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      DO 67 I=1,LIM
      DO 50 L=1,3
      ISUD(L)=0
      ISUM(L)=0
      LMP(L)=0
      NT(L)=0
50    CONTINUE
      C      ISUD AND ISUM COLLECT THE SUMS OF DOLLARS AND MANYEARS
      C      DISTRIBUTED TO PROGRAMS IN THE SWERLP00LS
      C      LMP COLLECTS THE SUMS OF "TOTAL APPLIED OVERHEAD" DOLLARS
      C      DISTRIBUTED TO THE SECTIONS OF THE SWERLP00L TABLE,
      C      I.E., WEAPONS, ADVANCED DEVELOPMENT AND PLANT
      C      ISUD, ISUM AND LMP VALUES ARE USED TO CORRECT INTEGER
      C      TRUNCATION ERRORS GENERATED IN COMPUTING PERCENTAGES
      C      TO BE DISTRIBUTED TO THE TABLES.
      C      NT ACCUMULATES THE PERCENTAGES, IN EACH YEAR, USED TO
      C      DISTRIBUTE COSTS AND IS USED TO TELL WHEN DONE.
800   IF(LS-NDVRS(I,2)) 801,63,801
801   LS=NDVRS(I,2)
      LC=L0CS(LS)
      IF(LC) 63,700,63
700   TYPE 701, I
701   FORMAT($PROJECT NO.$,I3,/)
      GO TO 121
      C      LC POINTS TO THE TECH AREA ROW IN THE SWERLP00LS
      C      K GETS THE COLUMN INDEX CORRESPONDING TO THE PROGRAM NUMBER
63    K=NDVRS(I,20)*3-1
      KK=20
      M=8
      LL=K+2
      L=0
      DO 99 IN=K,LL
      L=L+1
      M=M+3
      KK=KK+1
      LSWLP(LC,IN)=LSWLP(LC,IN)+NDVRS(I,M+1)*NDVRS(I,KK)/100
      LSWLPM(LC,IN)=LSWLPM(LC,IN)+NDVRS(I,M)*NDVRS(I,KK)/100
      ISUD(L)=ISUD(L)+NDVRS(I,M+1)*NDVRS(I,KK)/100
      ISUM(L)=ISUM(L)+NDVRS(I,M)*NDVRS(I,KK)/100
      NT(L)=NT(L)+NDVRS(I,KK)
99    CONTINUE
      IF(NDVRS(I,20)-7) 100,802,802
802   IF(NDVRS(I,20)-17) 401,803,803
      C      K AND LL GET COLUMN INDEXES FOR THE SECTION TOTALS
      C      APPROPRIATE TO THE PROGRAM NUMBER.
803   K=7
      LL=9
      GO TO 102
100   K=1
      LL=3
      GO TO 102
401   K=4
      LL=6
102   M=9
      IS=K
      KK=20
      L=0
      C      NOW ADD IN COSTS TO THE SECTION TOTALS
      DO 120 IN=K,LL
      L=L+1
      M=M+3
      KK=KK+1
      LSWLP(17,IN)=LSWLP(17,IN)+(NDVRS(I,M+1)-NDVRS(I,M))
      C      *NDVRS(I,KK)/100
      LMP(L)=LMP(L)+(NDVRS(I,M+1)-NDVRS(I,M))
      C      *NDVRS(I,KK)/100
120   CONTINUE

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C      IF ALL PERCENTAGES ACCUM TO 100, WE'RE THRU
C
49      IF(NT(1)-100) 806,804,804
804      IF(NT(2)-100) 806,805,805
805      IF(NT(3)-100) 806, 66,66
806      K=NPRGS(INDX)*3-1
      KK=INDX
C      ELSE, SET INDEXES AND CONTINUE SPREADING COSTS AND MEN
      M=8
      LL=K+2
      L=0
      D0 110 IN=K,LL
      KK=KK+1
      L=L+1
      M=M+3
      LSWLP(LC,IN)=LSWLP(LC,IN)+NDVRS(I,M+1)*NPRGS(KK)/100
      LSWLPM(LC,IN)=LSWLPM(LC,IN)+NDVRS(I,M)*NPRGS(KK)/100
      ISUD(L)=ISUD(L)+NDVRS(I,M+1)*NPRGS(KK)/100
      ISUM(L)=ISUM(L)+NDVRS(I,M)*NPRGS(KK)/100
      NT(L)=NT(L)+NPRGS(KK)
110     CONTINUE
      IF(NPRGS(INDX)-7)111,807,807
807     IF(NPRGS(INDX)-17)112,808,808
808     K=7
      LL=9
      G0 T0 113
111     K=1
      LL=3
      G0 T0 113
112     K=4
      LL=6
113     M=9
      KK=INDX
      L=0
      D0 114 IN=K,LL
      L=L+1
      M=M+3
      KK=KK+1
      LSWLP(17,IN)=LSWLP(17,IN)+(NDVRS(I,M+1)-NDVRS(I,M))
      *NPRGS(KK)/100
C      LMP(L)=LMP(L)+(NDVRS(I,M+1)-NDVRS(I,M))*NPRGS(KK)/100
114     INDX=INDX+4
      G0 T0 49
66     K=NDVRS(I,20)*3-2
      M=8
      IS=IS-1
      D0 67 L=1,3
      K=K+1
      M=M+3
      IS=IS+1
      LSWLP(LC,K)=LSWLP(LC,K)+NDVRS(I,M+1)-ISUD(L)
      LSWLPM(LC,K)=LSWLPM(LC,K)+NDVRS(I,M)-ISUM(L)
      LSWLP(17,IS)=LSWLP(17,IS)+NDVRS(I,M+2)
      -NDVRS(I,M+1)-LMP(L)
C
67     CONTINUE
2900    CLOSE
      CHAIN (/TTP/)
121     CONTINUE
      END

```

```

      FUNCTION L0CS(IX)
C      THIS ROUTINE FINDS THE TECH AREA (IX) ROW NUMBER IN
C      THE SWERLP00L BY MEANS OF A LINEAR SEARCH.
      DIMENSION NDVRS(100,24),LSWLP(17,64),LSWLPM(16,64),
C      ITN0(3),NPRGS(1200)
      COMMON NDVRS,LSWLP
      I=0
      I=I+1
1      IF(I-15) 800,800,2
800      IF(LSWLP(I,1)-IX) 1,801,1
801      L0CS=I
      RETURN
2      TYPE 3,IX
3      FORMAT(I4,'NOT FOUND IN LSWLP TABLES/')
      L0CS=0
      CONTINUE
      RETURN
      END

- /TTP/
C      THIS ROUTINE COMPUTES THE TOTALS FOR EACH TECH AREA AND
C      EACH COLUMN OF BOTH SWERLP00L TABLES AND PRINTS
C      BOTH TABLES
C      TOTUP ALL WEAPONS PROGRAMS COSTS AND EFFORTS FOR EACH YR
      DIMENSION NDVRS(100,24),LSWLP(17,64),LSWLPM(16,64)
      COMMON NDVRS,LSWLP,LSWLPM,LIM
      DO 10 I=1,15
      IK=1
      DO 2 J=20,22
      IK=IK+1
      JK=IK+15
      DO 1 K=IK,JK,3
      LSWLP(I,J)=LSWLP(I,J)+LSWLP(I,K)
      LSWLPM(I,J)=LSWLPM(I,J)+LSWLPM(I,K)
1      CONTINUE
2      CONTINUE
C      TOTUP ALL ADV DEV PROGRAMS COSTS AND EFFORTS FOR EACH YR
      IK=22
      DO 4 J=50,52
      IK=IK+1
      JK=IK+24
      DO 3 K=IK,JK,3
      LSWLP(I,J)=LSWLP(I,J)+LSWLP(I,K)
      LSWLPM(I,J)=LSWLPM(I,J)+LSWLPM(I,K)
3      CONTINUE
4      CONTINUE
C      TOTUP THE PLANT PROGRAMS COSTS AND EFFORTS FOR EACH YR
      IK=52
      DO 6 J=59,61
      IK=IK+1
      JK=IK+3
      DO 5 K=IK,JK,3
      LSWLP(I,J)=LSWLP(I,J)+LSWLP(I,K)
      LSWLPM(I,J)=LSWLPM(I,J)+LSWLPM(I,K)
5      CONTINUE
6      CONTINUE
C      TOTUP THE TOTALS INTO GRAND TOTALS
      K=19
      DO 7 J=62,64
      K=K+1
      LSWLP(I,J)=LSWLP(I,K)+LSWLP(I,K+30)+LSWLP(I,K+39)
      LSWLPM(I,J)=LSWLPM(I,K)+LSWLPM(I,K+30)+
C      LSWLPM(I,K+39)
7      CONTINUE
10     CONTINUE

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C      TOTUP TOTAL DIRECT COST AND EFFORT FOR EACH COLUMN
D0 20 J=2,64
D0 15 I=1,15
LSWLP(16,J)=LSWLP(16,J)+LSWLP(I,J)
LSWLPM(16,J)=LSWLPM(16,J)+LSWLPM(I,J)
15  CONTINUE
20  CONTINUE
C      TOTUP TOTAL APPLIED OVERHEAD BY SECTIONS
I=19
J=12
D0 53 K=1,12
J=J+1
IF(K-4) 850,51,850
850 IF(K-7) 50,52,50
50  I=I+1
LSWLP(17,J)=LSWLP(17,K)+LSWLP(16,I)
G0 T0 53
51  I=I+27
G0 T0 50
52  I=I+6
G0 T0 50
53  CONTINUE
TYPE 130
130 FORMAT($WEAPLPOOL COST FIGURES ARE: $)
D0 120 I=1,15
IF(LSWLP(I,62)) 856,851,856
851 IF(LSWLP(I,63)) 856,852,856
852 IF(LSWLP(I,64)) 856,120,856
856 TYPE 9909
9909 FORMAT(2//)
TYPE 9910,LSWLP(I,1)
9910 FORMAT(I9//)
TYPE 140
TYPE 500, (LSWLP(I,J),J=2,22)
TYPE 131
TYPE 500, (LSWLP(I,J),J=23,52)
TYPE 132
TYPE 500, (LSWLP(I,J),J=53,61)
TYPE 133
TYPE 500, (LSWLP(I,J),J=62,64)
120 CONTINUE
140 FORMAT($WEAPONS PROGRAMS$/ )
131 FORMAT(/$ADVANCED DEV PRGMS$/ )
132 FORMAT(/$PLANT PRGMS$/ )
133 FORMAT(/$GRAND TOTALS ARE: $/ )
134 FORMAT($TOTAL DIRECT COSTS COMBINED ARE: $/ )
TYPE 9911
9911 FORMAT(2//)
TYPE 134
TYPE 500, (LSWLP(16,J),J=2,22)
TYPE 500, (LSWLP(16,J),J=23,52)
TYPE 500, (LSWLP(16,J),J=53,61)
TYPE 500, (LSWLP(16,J),J=62,64)
TYPE 9913
9912 FORMAT(2//)

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      I=0
C      TOTUP TOTAL ALL COSTS BY SECTIONS
      DO 63 J=10,12
      I=I+1
      LSWLP(17,J)=LSWLP(17,I)+LSWLP(17,I+3)+LSWLP(17,I+6)
63      CONTINUE
      TYPE 141
      TYPE 9913,(LSWLP(17,J),J=1,12)
9913    FORMAT(12I6/)
141     FORMAT($TOTAL OVERHEAD COSTS APPLIED ARE:$/)
      I=9
      DO 64 J=22,24
      I=I+1
      LSWLP(17,J)=LSWLP(17,J)+LSWLP(17,I)
64      CONTINUE
      TYPE 9914
9914    FORMAT(2//)
      TYPE 135
135     FORMAT($TOTAL ALL COSTS COMBINED ARE:$/)
      TYPE 9913,(LSWLP(17,J),J=13,24)
      TYPE 9916
9916    FORMAT(2/,2/,2//)
      TYPE 142
142     FORMAT($SWERLP00L MAN-YEAR FIGURES ARE:$)
      DO 220 I=1,15
      IF(LSWLP(I,62)) 890,857,890
857     IF(LSWLP(I,63)) 890,858,890
858     IF(LSWLP(I,64)) 890,220,890
890     TYPE 9917
9917    FORMAT(2//)
      TYPE 9910,LSWLPM(I,1)
      TYPE 140
      TYPE 500,(LSWLPM(I,J),J=2,22)
      TYPE 131
      TYPE 500,(LSWLPM(I,J),J=23,52)
      TYPE 132
      TYPE 500,(LSWLPM(I,J),J=53,61)
      TYPE 133
      TYPE 500,(LSWLPM(I,J),J=62,64)
220     CONTINUE
      TYPE 9917
9919    FORMAT(2//)
      TYPE 143
143     FORMAT($TOTAL DIRECT MAN YEARS(SC,ENGR,OTH TECH):$/)
      TYPE 500,(LSWLPM(16,J),J=2,22)
      TYPE 500,(LSWLPM(16,J),J=23,52)
      TYPE 500,(LSWLPM(16,J),J=53,61)
      TYPE 500,(LSWLPM(16,J),J=62,64)
500     FORMAT(/12I6/)
      TYPE 9920
9920    FORMAT(2//)
      CHAIN(/MLT/)
      END

```

```

- /MLT/
C      EFFORTS AND COSTS ARE COLLECTED BY BUDGET
C      NUMBER, TECH AREA NO., GRAND TOTALS, GROUP NUMBERS
C      AND BY HOURLY CATEGORY OF EFFORT.
      DIMENSION NDVRS(100,24),LSWLP(17,64),LSWLP(16,64)
      COMMON NDVRS,LSWLP,LSWLP,LIM
      N0E=LIM
C      PRINT MASTERLIST HEADING
      TYPE 9923
9923  FORMAT(2//,2//,1//MASTER LISTS,2//)
      TYPE 502
502   FORMAT(2X,$BUD NO.  GRP$,2X,$TECH NO.$,3X,
C      $PRIOR YEARS$,5X,$CURRENT YEARS$,6X,$BUDGET YEARS/)
      TYPE 503
C      ZERO OUT MATRIX USED FOR SWERLP00L TABLE
      DO 2 I=1,7
      DO 1 J=3,14
1     LSWLP(I,J)=0
2     CONTINUE
503   FORMAT(20X,$M YR DIR  TOT$,5X,$M YR DIR  TOT$,5X,
C      $M YR DIR  TOT$)
      TYPE 9924
9924  FORMAT(2//)
C      SET INITIAL VALUES OF ITC(TECH AREA NO.), ISTOP(FLAG TO TELL
C      WHEN DONE) AND II(COUNTER FOR COLLECTING COSTS AND EFFORTS
      ITC=11
      ISTOP=0
      II=0
C      REARRANGE COLUMN CONTENTS OF NDVRS
C      COLUMN 1 GETS BUDGET NUMBER OF ENDEAVOR
C      COLUMN 9 GETS TECH AREA NO.
C      COLUMN 10 GETS GROUP NO.
C      COLUMNS 20-22 GET HOURLY MAN YRS FOR THREE YEARS
      DO 3 I=1,LIM
      NDVRS(I,20)=NDVRS(I,5)
      NDVRS(I,21)=NDVRS(I,7)
      NDVRS(I,22)=NDVRS(I,9)
      NDVRS(I,9)=NDVRS(I,2)
      NDVRS(I,10)=NDVRS(I,3)
3     CONTINUE
C      INITIALIZE IB, WHICH HOLDS THE CURRENT BUDGET NUMBER
20    IB=1
C      INCREMENT TO POINT TO THE NEXT ENDVR
22    II=II+1
C      IF ALL HAVE BEEN CHECKED, SET ISTOP TO 1 AND PRINT TOTS
      IF(II=LIM) 805,805,31
      ELSE, IF WRONG BUDGET NO., PRINT TOTS
805   IF(NDVRS(II,1)-IB) 32,23,32
C      ELSE, SET TECH AREA NO. AND GROUP NO. FOR LATER PRINTING
23    LSWLP(1,1)=NDVRS(II,10)
      LSWLP(1,2)=NDVRS(II,9)
C      AND COLLECT EFFORTS AND COSTS BY BUDGET NO. AND TECH AREA NO.
      DO 24 J=3,11
      LSWLP(1,J)=LSWLP(1,J)+NDVRS(II,J+8)
      LSWLP(2,J)=LSWLP(2,J)+NDVRS(II,J+8)
24    CONTINUE
C      AND SET POINTER I AS TO GROUP NO OF 10, 20, 30, OR 40
      IF(LSWLP(1,1)-20) 26,27,50
50    IF(LSWLP(1,1)-40) 28,29,51
C      IF THE GROUP NO. IS NONE OF THESE, GET OUT -- ERROR!
51    TYPE 101, LSWLP(1,1)
101   FORMAT(18,$ IS AN INVALID GROUP NO.$)
      GO TO 999

```

```

26      I=4
      GO TO 30
27      I=5
      GO TO 30
28      I=6
      GO TO 30
29      I=7
      C      COLLECT DATA BY GROUP NUMBER
30      DO 102 J=3,14
      LSWLP(I,J)=LSWLP(I,J)+NDVRS(II,J+8)
102     CONTINUE
      C      AND GET NEXT ENDVR
      GO TO 22
31      ISTOP=1
      C      PRINT TOTS
32      TYPE 501,IB,(LSWLP(1,J),J=1,11)
      C      IF STOP FLAG IS ON, PRINT OUT ALL THE FINAL TOTALS
      IF(ISTOP-1) 806,60,806
      C      ELSE, IF STILL SAME TECH AREA NO. GET NEXT BUDGET NO.
806     IF(NDVRS(II,9)-ITCH) 807,52,807
      C      ELSE, PRINT TECH AREA TOTALS
807     TYPE 9925,ITCH
9925    FORMAT(19$ SUBTOTALS$)
      TYPE 500,(LSWLP(2,J),J=3,11)
      TYPE 9926
9926    FORMAT(2//)
      DO 33 J=3,11
      LSWLP(3,J)=LSWLP(3,J)+LSWLP(2,J)
33     CONTINUE
      C      AND RESET VALUE OF ITCH TO THE NEW TECH AREA NO.
      ITCH=NDVRS(II,9)
      C      AND ZERO OUT THE TECH AREA DATA ROW
      DO 34 J=3,11
      LSWLP(2,J)=0
34     CONTINUE
      C      GET THE NEXT BUDGET NUMBER
52     IB=IB+1
      C      AND ZERO OUT THE BUDGET NUMBER DATA ROW
      DO 53 J=3,11
      LSWLP(1,J)=0
53     CONTINUE
      C      AND GO COLLECT DATA BY BUDGET NO. AND TECH AREA NO.
      GO TO 23

```

```

C      WE'RE THRU COLLECTING DATA, SO UP DATE ALL TOTALS AND
C      PRINT THE REST OF THE RESULTS
60      DO 61 J=3,11
        LSWLP(3,J)=LSWLP(3,J)+LSWLP(2,J)
61      CONTINUE
        II=II-1
        ITCH=NDVRS(II,9)
        TYPE 9927,ITCH
9927     FORMAT(19$ SUBTOTALS$/)
        TYPE 500, (LSWLP(2,J),J=3,11)
        TYPE 9928
9928     FORMAT($GRAND TOTALS$/)
        TYPE 500, (LSWLP(3,J),J=3,11)
        TYPE 9929
9929     FORMAT($03-09$/)
        TYPE 9930
9930     FORMAT($GROUP 10$/)
        TYPE 500, (LSWLP(4,J),J=3,11)
        TYPE 9931
9931     FORMAT($GROUP 20$/)
        TYPE 500, (LSWLP(5,J),J=3,11)
        TYPE 9932
9932     FORMAT($GROUP 30$/)
        TYPE 500, (LSWLP(6,J),J=3,11)
        DO 62 J=0,14
        LSWLP(8,J)=LSWLP(6,J)+LSWLP(5,J)+LSWLP(4,J)
62      CONTINUE
        TYPE 9933
9933     FORMAT($TOTALS 03-09$/)
        TYPE 500, (LSWLP(8,J),J=3,11)
        TYPE 9934
9934     FORMAT($03-25$/)
        TYPE 500, (LSWLP(7,J),J=3,11)
        J=0
        DO 63 K=12,14
        J=J+3
        LSWLP(7,K)=LSWLP(7,J)-LSWLP(7,K)
        LSWLP(8,K)=LSWLP(8,J)-LSWLP(8,K)
        LSWLP(6,K)=LSWLP(7,K)+LSWLP(8,K)
63      CONTINUE
        TYPE 9935
9935     FORMAT(2//)
        TYPE 9936
9936     FORMAT($DIR SC & ENGR MAN YEARS $/)
        TYPE 9937, (LSWLP(8,J),J=12,14)
9937     FORMAT($03-09 $,319/)
        TYPE 9938, (LSWLP(7,J),J=12,14)
9938     FORMAT($03-25 $,319/)
        TYPE 9939, (LSWLP(6,J),J=12,14)
9939     FORMAT($TOTALS$,319/)
500     FORMAT(/18X,9I6/)
501     FORMAT(/12I6/)
999     CONTINUE
      END

```

APPENDIX C
EXCERPTS OF THE FY74 BUDGET PREPARATION

-F08

I -- PLN RUN EXCERPTS

F08 4.1

LOAD MAIN FROM: /.PLN/

READY 2198 UNUSED

+JG

HOW MANY PROJECTS DO YOU WANT PROCESSED?

222

PROJECT	THIS YEAR				NEXT YEAR				BUDGET YEAR			
	MAN	YRS	DRGST	TCST	MAN	YRS	DRGST	TCST	MAN	YRS	DRGST	TCST
	(1/10)		(100'S)		(1/10)		(100'S)		(1/10)		(100'S)	

204 PROJECTS

940593	19	298	858	23	381	1091	23	404	1144
940595	10	157	452	12	199	569	12	211	597
940596	12	188	542	15	249	712	15	264	747
940597	16	251	723	10	166	475	10	176	498
940696	6	94	271	0	0	0	0	0	0
940697	5	78	225	0	0	0	0	0	0
950432	18	282	813	10	166	475	12	211	597
950433	18	282	813	13	915	616	10	176	470
950695	5	78	225	5	83	237	5	88	249
948001	2	31	90	5	83	237	5	88	249
948002	2	31	90	4	66	189	4	70	198
950431	8	125	361	4	66	189	5	88	249
957205	0	0	0	4	66	189	4	70	198
957206	0	0	0	1	16	46	1	17	49
957207	0	0	0	11	182	521	11	193	547
950000	2	31	90	2	33	94	2	35	99

ACCOUNT TOTALS ARE:

DDS(E)	72	1128	3251	69	1144	3273	69	1213	3433
DDS(F)	0	0	0	0	0	0	0	0	0
PPS	51	798	2302	50	827	2367	50	878	2486
TOTALS	123	1926	5553	119	1971	5640	119	2091	5919

205 PROJECTS

950646	5	73	208	1	15	64	0	0	0
950647	3	44	185	1	15	64	0	0	0
950648					201	847	13	214	895
950649					139	586	9	148	619
950650						47	11	181	757

T0

207 PROJECTS

950689								515	1638
950690	50						15	309	979
950691	25				163		45	927	2938

ACCOUNT TOTALS ARE:

DDS(E)	0	0	0	0	0	0	0	0	0
DDS(F)	0	0	0	0	0	0	0	0	0
PPS	85	1555	4972	85	1649	5253	85	1751	5549
TOTALS	85	1555	4972	85	1649	5253	85	1751	5549

GROUP TOTALS ARE:

DDS(E)	166	2473	7322	160	2499	7402	160	2638	7788
DDS(F)	0	0	0	0	0	0	0	0	0
PPS	241	3892	13406	230	3944	13518	230	4191	14270
TOTALS	407	6365	20728	390	6443	20920	390	6829	22058

211 PROJECTS

940639	30	513	1515	32	569	1644	32	601	1730
950429	10	171	505	10	178	514	10	188	541
950463	24	410	1211	35	623	1799	35	658	1893
950477	1	17	50	0	0	0	0	0	0
940430	20	342	1010	20	356	1028	20	376	1082
950317	20	342	1010	10	178	514	10	188	541
940486	2	34	100	0	0	0	0	0	0
940602	10	171	505	10	178	514	10	188	541
950460	20	342	1010	20	356	1028	20	376	1082
950461	15	256	757	15	267	771	15	282	811

ACCOUNT TOTALS ARE:

DDS(E)	62	1060	3130	62	1103	3186	62	1165	3353
DDS(F)	0	0	0	0	0	0	0	0	0
PPS	90	1533	4543	90	1602	4626	90	1692	4868
TOTALS	152	2593	7673	152	2705	7812	152	2857	8221

212 PROJECTS

950247	15	223	1038	16	257	1169	16	272	1235
950405	8			0	0	0	0	0	0
950436					123	877	12	204	926
950437						222	4	68	308
							2	34	154

TOTALS	209	3110	7139	209	2412	8268	209	2616	8323
--------	-----	------	------	-----	------	------	-----	------	------

230 PROJECTS

950562	20	410	1540	20	432	1624	20	460	1714
950325	20	410	1540	20	432	1624	20	460	1714
940574	4	82	308	5	108	406	3	69	257
940727	8	164	616	7	151	568	8	184	685
940728	2	41	154	2	43	162	3	69	257
950335	20	410	1540	20	432	1624	20	460	1714

ACCOUNT TOTALS ARE:

DDS(E)	14	287	1078	14	302	1136	14	322	1199
DDS(F)	0	0	0	0	0	0	0	0	0
PPS	60	1230	4620	60	1296	4872	60	1380	5142
TOTALS	74	1517	5698	74	1598	6008	74	1702	6341

GROUP TOTALS ARE:

DDS(E)	653	12769	40460	666	13608	43644	668	14549	46299
DDS(F)	68	1365	3032	68	1446	3221	68	1531	3422
PPS	571	11086	37354	535	11038	37093	535	11697	38766
TOTALS	1292	25220	80846	1269	26092	83958	1271	27777	88487

R&D TOTALS ARE:

DDS(E)	1129	20562	64367	1138	21723	68332	1138	23094	72197
DDS(F)	155	3068	7162	155	3249	7658	155	3444	8184
PPS	1686	28898	93507	1626	29446	94676	1628	31255	99635
TOTALS	2970	52528	165036	2919	54418	170666	2921	57793	180016

DO THESE FIGURES FIT THE PLAN? 1=YES, 2=NO.

1

THE FILE /PAT/ NOW CONTAINS COSTED DATA FOR 101DDS-TYPE PROJECTS

STOP

II -- EF RUN EXCERPTS

F0S 4.1

LOAD MAIN FROM: /EF/

READY 842 UNUSED

+1G

HOW MANY PROJECTS DO YOU WANT PROCESSED?

53

SWERLP00L COST FIGURES ARE:

11
WEAPONS PROGRAMS

0	0	0	114	0	0	243	300	310	377	567	596
---	---	---	-----	---	---	-----	-----	-----	-----	-----	-----

10	10	0	397	487	506	1146	1364	1412
----	----	---	-----	-----	-----	------	------	------

 ADVANCED DEV PRGMS

0	0	0	30	21	16	0	0	0	0	0	0
---	---	---	----	----	----	---	---	---	---	---	---

0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---

3022	3238	3399	3042	3259	3417
------	------	------	------	------	------

 PLANT PRGMS

0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---

 GRAND TOTALS ARE:

4188	4623	4829
------	------	------

12
WEAPONS PROGRAMS

0	0	0	0	0	0	69	109	116
---	---	---	---	---	---	----	-----	-----

0	0	0	140
---	---	---	-----

0	0	0	0	0
---	---	---	---	---

0	0	0	0	0
---	---	---	---	---

 TOTALS ARE:

1368	1548	1635
------	------	------

TOTAL DIRECT COSTS COMBINED ARE:

1104	1070	0	1087	0	0	2899	3433	4018	1246	2620	3267
------	------	---	------	---	---	------	------	------	------	------	------

885	737	0	2248	2330	2603	9469	10240	9888			
0	0	0	459	488	674	549	261	343	0	232	232

0	0	0	600	298	324	0	0	0	66	116	116
---	---	---	-----	-----	-----	---	---	---	----	-----	-----

6840	7368	8575	8514	8763	10264			
2845	2877	3086	470	474	515	3315	3351	3601
21298	22354	23753						

TOTAL OVERHEAD COSTS APPLIED ARE:

23511	25805	24685	18237	19130	22695	8416	8610	9165	50164	53545	56545
-------	-------	-------	-------	-------	-------	------	------	------	-------	-------	-------

TOTAL ALL COSTS COMBINED ARE:

32980	36045	34573	26751	27893	32959	11731	11961	12766	71462	75899	80298
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

SWERLPOOL MAN-YEAR FIGURES ARE:

11
WEAPONS PROGRAMS

0	0	0	6	0	0	14	16	16	23	31	30
0	0	0	22	26	25	65	73	71			
0	0	0	1	1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

165 168 166 166 169 167
PLANT PRGMS

0	0	0	0	0	0	0	0	0			
---	---	---	---	---	---	---	---	---	--	--	--

GRAND TOTALS ARE:

231 242 238

12
WEAPONS PROGRAMS

0	0	0	0	0	0	4	6				
0	0	0	0	0	0						

39
WEAPONS PROGRAMS

7	7	0	0	0	0	30					
2	2	0	5	7	7	49	54	45			
0	0	0	4	5	5	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

27 28 37 31 33 42
PLANT PRGMS

0	0	0	0	0	0	0	0	0			
---	---	---	---	---	---	---	---	---	--	--	--

GRAND TOTALS ARE:

80 87 97

TOTAL DIRECT MAN YEARS(SC, ENGR, OTH TECH):

56	51	0	55	0	0	143	172	186	67	125	147
42	31	0	144	142	146	512	521	479			
0	0	0	24	24	30	25	10	12	0	14	14
0	0	0	30	13	13	0	0	0	4	7	7
363	377	403	446	445	484						
161	155	157	31	29	30	192	184	187			
1150	1150	1150									

MASTER LIST

BUD NO.	GRP	TECH NO.	PRIOR YEAR		CURRENT YEAR		BUDGET YEAR				
			M	YR DIR	TOT	M	YR DIR	TOT	M	YR DIR	TOT
1	40	11	50	365	2205	50	915	2325	50	970	2455
2	40	11	20	410	916	20	434	990	20	460	1068
3	20	11	0	0	0	17	302	873	16	300	864
4	20	11	6	102	302	6	106	307	5	94	270
5	10	11	10	152	500	10	161	527	8	136	444
6	40	11	25	512	1144	25	542	1237	25	575	1335
7	40	11	10	178	420	10	188	445	10	200	472
8	40	11	24	482	1331	24	511	1425	24	542	1523
9	20	11	66	1141	2909	60	1098	2790	60	1164	2946
10	20	11	20	346	1092	20	366	1156	20	388	1217
11	SUBTOTALS										
			231	4188	10819	242	4623	12075	238	4829	12594
11	10	12								388	1217
12											
52	20					534	1542		30	564	1623
52	20					32	569	1644	32	601	1730
53	20	39	20	342	1010	25	445	1285	25	470	1352
39	SUBTOTALS										
			80	1368	4040	87	1548	4471	87	1635	4705
GRAND TOTALS											
			1150	21298	71462	1150	22354	75899	1150	23753	80298
03-09 GROUP 10											
			92	1698	5984	105	2098	7455	103	2192	7749
GROUP 20											
			670	12892	45593	680	13233	47560	678	14053	50201
GROUP 30											
			213	3640	12723	210	3769	13226	214	4064	14164
TOTALS 03-09											
			995	18230	64300	995	19105	68241	995	20309	72114
03-25											
			155	3068	7162	155	3249	7658	155	3444	8184
DIR SC & ENGR MAN YEARS											
			817	823	826						
			135	135	135						
TOTALS			952	958	961						

STOP

III -- EXCERPTS ON THE FILE /PAT/

C-III

940593	204	17	02	21	02	21	02
940595	204	08	02	10	02	10	02
940596	204	10	02	14	01	14	01
940597	204	13	03	10	0	10	0
940696	204	03	03	0	0	0	0
940697	204	04	01	0	0	0	0
950432	204	12	06	08	02	10	02
950433	204	16	02	12	01	09	01
950646	205	05	0	01	0	0	0
950647	205	03	0	01	0	0	0
950648	205	13	0	13	0	13	0
950649	205	15	0	09	0	09	0
940540	206	10	0	10	0	10	0
940543	206	9	2	10	4	12	4

950683	218	10	0	08	0	08	0
950684	218	10	0	07	0	07	0
950348	219	24	14	24	14	24	14
950349	219	20	15	20	15	20	15
950350	219	10	10	10	10	10	10
950999	235	15	0	15	0	15	0
940639	211	30	0	32	0	32	0
940640	215	20	0	25	0	25	0
950427	215	20	0	20	0	20	0
950429	211	10	0	10	0	10	0
950463	211	24	0	35	0	35	0
950477	211	01	0	0	0	0	0
950247	212	15	0	16	0	16	0
950405	212	08	0	0	0	0	0
950436	212	05	0	12	0	12	0
950241	213	05	0	05	0	05	0
950261	213	05	0	05	0	05	0

950314	222	10	0	10	0	10	0
950313	222	10	0	10	0	10	0
940545	206	10	0	10	0	10	0
950628	226	0	0	08	0	07	0
950351	235	10	0	10	0	10	0
950354	235	05	10	05	08	05	10
950430	235	03	0	07	02	07	05
950444	235	35	0	30	0	30	0
950612	235	05	10	08	05	12	10
950687	235	15	0	10	05	07	03
950703	235	07	10	05	10	04	02
940574	230	04	0	05	0	03	0
940727	230	08	0	07	0	08	0
940728	230	02	0	02	0	03	0
950335	230	20	0	20	0	20	0
948736	222	0	15	0	15	0	15
950737	222	10		7		6	0
950629	226			2		5	0

IV -- EXCERPTS OF THE SECOND VERSION OF THE FILE /INC/

1 40 1
16100100100
2 40 1
16100100100
3 20 4
16 20 20 20
3 20 20 20
4 30 30 30
6 30 30 30
4 20 5
16 20 20 30
3 20 20 20
5 10 10 0
6 30 30 30
9 20 20 20
5 10 1
16100100100
6 40 1
16100100100
7 40 1
16100100100
8 40 1
16100100100
9 20 5
4 30 40 40
3 20 20 20
16 20 20 20
2 10 0
6 20 20 20
10 20 3
6 40 40 40
16 50 50 50
4 10 10 10
11 10 5
4 20 20 20
3 20 30 30
10 30 0
16 10 50 50
13 20 0
12 30 1
18100100100
13 20 7
6 20 20 20
4 10 20
3 20 10 20
16 20 10 30
5 20 20 0
1 10 20 0
10 10 10 10

1	11	30	20	30	20	30	20	50	8652205	50	9152325	50	9702455
2	11	20	0	20	0	20	0	20	410 916	20	434 990	20	4601068
3	11	0	0	17	0	16	0	0	0 0	17	302 873	16	300 864
4	11	6	0	6	0	5	0	6	102 302	6	106 307	5	94 270
5	11	10	0	10	0	8	0	10	152 500	10	161 527	8	136 444
6	11	25	0	25	0	25	0	25	5121144	25	5421237	25	5751335
7	11	10	0	10	0	10	0	10	178 420	10	188 445	10	200 472
8	11	24	0	24	0	24	0	24	4821331	24	5111425	24	5421523
9	11	36	30	30	30	30	30	6611412909	6010982790	6011642946			
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11	12	10	10	10	10	10	10	20 3461092	20 3661156	20 3881217			
12	12	10	0	5	0	5	0	10 152 500	5 80 263	5 85 278			
13	11	10	0	10	0	10	0	10 173 441	10 183 465	10 194 491			
14	21	16	12	16	12	16	12	28 6542548	28 6942690	28 7382831			
15	21	12	10	12	10	12	10	22 5142004	22 5452116	22 5802226			
16	21	39	31	31	25	33	25	7016376375	5613885384	5815305868			
17	21	29	26	29	26	32	26	5512014703	5512734967	5814345531			
18	21	8	7	8	7	9	6	15 2201123	15 2331185	15 2471252			
19	21	23	22	46	28	44	26	45 6653385	7411605898	7011605884			
20	21	5	0	0	0	0	0	5 90 282	0 0 0	0 0 0			
21	26	34	0	37	0	38	0	34 6963258	37 7973650	38 8743950			
22	26	13	0	14	0	14	0	13 2661245	14 3011376	14 3221454			
23	26	19	0	20	0	20	0	19 3891823	20 4321977	20 4602081			
24	26	5	0	10	0	10	0	5 102 478	10 216 988	10 2301041			
25	26	19	0	19	0	19	0	19 3891819	19 4101872	19 4371973			
26	27	19	0	12	0	17	0	19 5061736	12 3541233	17 5301838			
27	27	18	0	18	0	18	0	18 500 827	18 531 896	18 561 967			
28	27	14	0	16	0	16	0	14 212 697	16 256 840	16 272 889			
29	27	10	0	15	0	15	0	10 278 962	15 4421540	15 4681622			
30	27	8	0	8	0	8	0	8 121 319	8 128 340	8 136 364			
31	28	13	3	10	0	10	0	16 251 723	10 166 475	10 176 498			
32	28	10	2	14	1	14	1	12 188 542	15 249 712	15 264 747			
33	28	8	2	10	2	10	2	10 157 452	12 199 569	12 211 597			
34	28	24	6	21	2	21	2	30 4701354	23 3811091	23 4041144			
35	28	2	0	5	0	5	0	2 30 99	5 80 263	5 85 278			
36	210	30	0	35	0	39	0	30 4551498	35 5631843	39 6632168			
37	210	11	0	16	0	16	0	11 221 784	16 3401202	16 3611268			
38	210	10	0	5	0	3	0	10 152 500	5 80 263	3 51 166			
39	210	45	0	40	0	40	0	45 8732993	40 8302858	40 8803013			
40	210	10	0	5	0	5	0	10 201 713	5 106 375	5 113 396			
41	31	10	0	10	0	10	0	10 146 454	10 155 503	10 163 533			
42	31	10	0	10	0	10	0	10 146 454	10 155 503	10 163 533			
43	31	9	2	10	4	12	4	11 135 474	14 163 651	16 204 796			
44	31	10	0	10	0	10	0	10 146 454	10 155 503	10 163 533			
45	31	8	0	5	0	5	0	8 116 362	5 77 250	5 81 265			
46	31	18	0	15	0	10	0	18 262 798	15 232 732	10 162 507			
47	32	92	0	72	0	70	0	9216124880	7213364117	7013034000			
48	33	20	0	20	0	20	0	20 356 926	20 376 976	20 4001030			
49	33	20	5	20	5	20	5	25 3721516	25 3951603	25 4201688			
50	38	20	0	20	0	20	0	20 3421010	20 3561028	20 3761082			
51	39	30	0	30	0	30	0	30 5131515	30 5341542	30 5641623			
52	39	30	0	32	0	32	0	30 5131515	32 5691644	32 6011730			
53	39	20	0	25	0	25	0	20 3421010	25 4451285	25 4701352			

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APPENDIX D
A DETAILED (SEMI-CODED) FLOW CHART
OF THE FUND-FITTING SEGMENT OF STPI

GLOSSARY OF TERMS

- CRN An overlay routine which compacts costed PA's into sequential endeavors and writes them to a disc file for later use by EF.
- DDS"E" A funding category which supports process development activities.
- DDS"F" A funding category which supports nuclear research and development activities.
- DSEF The second computer program in the three-phase system described in Chapter 4.
- DPA A development project authorization, i.e., a project directed toward process development or nuclear research and development.
- EF The third computer program in the three-phase system described in Chapter 4.
- IDS A lookup table used in STPI to associate direct-support projects with functional subgroups.
- INC A manually generated file which contains incremental data for project and endeavor tables, NPAS and NDVRS.
- LSWLP A table used in both the single-phase and three-phase computer programs to hold the direct cost swerlpool figures.
- LSWLPM A table used in both the single-phase and three-phase computer programs to hold the direct effort swerlpool figures.
- MNRTS A table used in both the single-phase and three-phase computer programs to hold the three-year man-year rates.

MPA A manufacturing project authorization, i.e., a project directed toward production support (PPS).

NDVRS A table used in EF to hold data for the endeavors.

NPAS A table used in both the single-phase and the three-phase programs to hold PA data.

NPRGS A vector used in both the single-phase and the three-phase programs to hold benefiting program codes and three-year percentages.

PA A project, either a DPA or an MPA.

PAT A disc file used in PLN and DSEF serving as a project authorization table of data.

PLN The first computer program in the three-phase system described in Chapter 4 which develops an overall plan.

PPS A funding category which supports activities directed at production assistance.

RTS A disc file used in PLN holding the three-year man-year rates.

STPI The first computer program (step I) in the third-generation system described in Chapter 5.