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An Applied Model for Workload Planning and Budgeting

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A production plan and budget for FY-1974 and various sensitivity analyses are presented to illustrate the models' uses.

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1. The Naval Aircraft Rework Facility Study - An Applied Model for Workload Planning and Budgeting, directed by reference (a), is forwarded as enclosure (1), The study documents a five year planning model which produces detailed production plans and budgets for the entire Aircraft Depot Maintenance Program. Using the method of linear programming, the model determines minimum cost workload assignments which satisfy all depot maintenance requirements. Several physical and manpower capacity measures are used to ensure that plans are within the production capabilities of each rework facility. The model allows for multiple shift operations, changes in the size and distribution of the work force, and the assignment of work to non-Navy facilities. A production plan and budget for FY 1974 and various sensitivity analyses are presented to illustrate the model's uses.

2. The long range planning model presented by the study report is approved and will be utilized when the computer program has been furnished to NAVAIRSYSCOM to prepare production plans and budgets in order to reflect the impact of changes in level, mix and activity of naval aircraft on the rework system so that requirements can be met in a timely and efficient manner. It is an integral part of the current long range planning system. Some suggestions for future research are contained in the report.

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3. Since the model is in the process of being implemented and "debugged" at the Naval Electronics Laboratory Center (NELC), San Diego, the numerical data (including the resultant savings) displayed in the report are for illustrative use only. A prior version of this study report ((INS) 981-72 of 30 June 1972) was forwarded to the Secretary of Defense by reference (b). This study report differs principally in that it reflects refinements to the model since June 1972 and contains minor corrections to the results obtained in the earlier work.

4. The study is forwarded for illustrative use and for information only. Public release is authorized.

W H Bagley

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DIRECTOR, NAVY
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Study 38

NAVAL AIRCRAFT REWORK FACILITY STUDY
AN APPLIED MODEL FOR WORKLOAD PLANNING AND BUDGETING

June 1972

Richmond M. Lloyd, Study Director

The work reported here was conducted under the direction of the Center for Naval Analyses and represents the opinion of the Center for Naval Analyses at the time of issue. It does not necessarily represent the opinion of the Department of the Navy except to the extent indicated by the comments of the Chief of Naval Operations.

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ABSTRACT

The Navy's Aeronautical Depot Maintenance Program, at an annual cost of over $600 million, includes the rework of aircraft, engines, and components performed at seven Naval Aircraft Rework Facilities, commercial sources, and the rework facilities of the other services.

This study documents a five-year planning model which produces detailed production plans and budgets for the entire Depot Maintenance Program. Using the method of linear programming, the model determines minimum cost workload assignments which satisfy all depot maintenance requirements. Several physical and manpower capacity measures are used to ensure that plans are within the production capabilities of each rework facility. The model allows for multiple shift operations, changes in the size and distribution of the work force, and the assignment of work to non-Navy facilities.

A production plan and budget for FY-1974 and various sensitivity analyses are presented to illustrate the model's uses.

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PROBLEM

Changes in the level, mix, and activity of Naval aircraft forces affect the depot maintenance requirements for the Navy's Aircraft Rework Facilities. Navy managers must have the capability to prepare production plans and budgets which reflect the impact of these changes on the rework system, so that requirements are met in a timely and efficient manner.

OBJECTIVES

As set forth in the Study Directive (appendix A), the study's primary objective was the development of a long-range planning model for the Navy's Aeronautical Depot Maintenance Program which would:

- generate and evaluate alternative rework production plans under varying force levels
- include all depot maintenance activities such as aircraft, engine, and component reworks and general support functions
- reflect the production capability of all Naval Aircraft Rework Facilities

METHOD

A long-range planning model was developed using a mathematical optimization technique known as linear programming. The model determines for each year in a five-year planning horizon the workload assignment which minimizes total program costs, meets all depot maintenance requirements and is consistent with the rework system's capabilities. The model covers the entire Depot Maintenance Program which not only includes all depot maintenance for the Navy but also the work done by the Navy for the other services and other government agencies. Similarly, the model includes all alternative rework facilities to which the work can be assigned such as the seven Naval Aircraft Rework Facilities, the rework facilities of the other services, and commercial sources. Each of the Navy's rework facilities is modeled in detail to ensure that production plans are consistent with the rework system's capabilities. This includes consideration of shop capacities, the level and distribution of manpower, and multiple shift operations.

RESULTS

Three case studies were conducted to test the model and illustrate its uses. A production plan and budget for FY-1974 was developed for each case. The first case is an actual production plan and budget prepared by the Naval Air Systems Command's Long Range Planning Group. This plan serves as a base case to which the remaining cases are compared. The same data base and the same depot maintenance requirements were used for all three cases so that meaningful comparisons are possible.

The second and third cases are considered conservative uses of the model. For these cases, the model was allowed to deviate from NavAir's plan on only 28 percent of the total workload. In addition, for the workload assignments allowed to change, the amount of variation from NavAir's plan was restricted to 5 and 10 percent for Cases II and III, respectively. Even given these restrictions, the model produced savings of $2.22 million for Case II and $4.21 million for Case III. These savings resulted from the assignment of work to lower-cost facilities, changes in the amount and distribution of multiple shift operations and a reduction in the manpower adjustments required. With respect to manpower, Case II generated cost savings by eliminating the need to hire 108 men at one facility, and reducing the number to be separated at the remaining facilities by 155 men. Similarly, Case III reduced hiring requirements by 173 men and separation requirements by 228 men.

The model has an extensive parametric capability which allows quick evaluation of changes in:

- Requirements
- Capacities
- Manpower
- Workload assignments
- Basic data inputs

Thus, depot maintenance requirements may be varied over any specific range, and the model produces production plans and budgets for the entire range. This feature can be used to generate the information necessary for trade-offs between requirements and budgets. This feature can also be used to evaluate the effects of changes in the amount and distribution of shop capacity and manpower or changes in the allocation of work between the rework facilities. The parametric feature is used to illustrate the effects on total program costs of changes in depot maintenance requirements.

RECOMMENDATIONS

It is recommended that the model be used on a continuing basis within the Naval Air Systems Command's existing Aeronautical Depot Maintenance Long Range Planning and Programming System.

PREFACE

The Navy's interest in what is the proper level of support for its operating forces has increased sharply during the past year due to the continuing scarcity of funds. In the Fall of 1971, the Navy established the U. S. Naval Support Establishment Project under the general direction of DCNO Logistics. The purpose of the project was an extensive re-examination of support requirements to assist program decisions to be made the following Spring. Realizing that the support area is complex and difficult to measure, the CNO simultaneously directed the Director, Systems Analysis Division, Op-96 to conduct longer term research efforts in the development of methodologies for measuring the support required for the operating forces. The Naval Aircraft Rework Facility Study was one of several studies included in the CNO's FY-1972 Study Program. At the same time, the Office of Assistant Secretary of Defense, Systems Analysis, OASD(SA), also requested that the Navy conduct a Selected Analysis of its aircraft rework program. It was agreed that the NARF study could also serve as the Navy's response to OASD(SA)'s request. The Center for Naval Analyses began work on this study in mid-November 1971.

As set forth in the Study's Directive (appendix A), the study's primary objective was the development of a model suitable for the long range planning and budgeting of the Navy's Aeronautical Depot Maintenance Program. The model developed generates and evaluates alternative production plans and budgets for the entire Depot Maintenance Program which includes aircraft, engine and component reworks and general support functions required for Naval aircraft forces. This effort has required a heavy emphasis on methodological issues and development of the computer software necessary to implement the model.

This report is intended for those concerned with the overall problems of planning depot maintenance. The scope of the Depot Maintenance Program, the current planning system used for programming and budgeting, and several major policy issues are discussed first. This is followed by a non-technical discussion of the model along with a case analysis for FY-1974 illustrating the model's uses. This discussion is based upon an initial version of the model which has been revised and extended.

The most recent version is discussed in two additional documents, more technical in nature, which are intended for those who wish to use the model. A User's Manual (reference (b)) contains the instructions on how to use the computer program and a complete description of the mathematical formulation of the model. A Programmer's Manual (reference (c)) contains the detailed program listings, flow charts and other supporting information designed to facilitate program installation and modifications which may be desired in the future.

CHAPTER I

INTRODUCTION

BACKGROUND

The immediate past has been a period of reduced funding and dramatic reductions in Naval forces. The following is from the Chief of Naval Operations statement before the Senate Armed Services Committee concerning FY-1973 Military Posture and Budget of the United States Navy:

> In actual strength, too, the budget you are considering provides for forces that are reduced below the levels of 1965, that is, before the Vietnam buildup:
>
> ships - down 37 percent
> aircraft - down 18 percent
> military personnel - down 10 percent

Reductions in Naval activity to meet reduced budget constraints have been accomplished mainly through the above force reductions; corresponding reductions in the Navy's support structure have not been as significant. Since additional economies will be difficult to achieve through further force reductions, the Navy has focused its attention on its support establishment. Concern over what is the proper level of support is not new, but clearly, it has taken on increased importance.

The crucial questions which must be addressed are:

> What specific support activities can be reduced?
>
> To what level can these support activities be adjusted and still maintain an effective fighting force?

These are not trivial problems since support includes a large number of complex and heterogeneous activities, many of which are hard to quantify and difficult to relate to force effectiveness.

Effective planning and management of the aircraft support establishment is even more crucial now that aircraft inventories are low. The number of aircraft in the Navy's inventory is not as important as the number of aircraft capable of performing their mission, which is determined by the level of support provided. The average NORS/NFE (Not Operationally Ready Supply/Not Fully Equipped) rate for all Navy aircraft has ranged up to 20 percent during the past two years. A 20 percent rate implies one out of every five aircraft cannot perform its primary mission. During this time the Navy also has been forced to delay the rework of approximately 13 percent of its aircraft beyond their normal rework intervals. In addition, this percentage has been increasing over the time period.

There are three levels of maintenance for Naval aircraft:

- Organizational
- Intermediate
- Depot

The functions performed increase in complexity from the first level to the third, requiring more specialized skills, tools, equipment, and facilities. The first two levels are in direct support of operating squadrons.

The day-to-day maintenance of an aircraft is accomplished by squadron maintenance personnel at the organizational level. This includes flight preparations and checks, calendar inspections, preventive maintenance, repair of downed aircraft and trouble-shooting.

The intermediate maintenance activity jointly serves the squadrons deployed on a carrier or at a Naval Air Station. The intermediate maintenance activity performs maintenance functions beyond the capability of the organizational level; a major portion of their work is the repair of failed components which have been removed from the aircraft.

Depot maintenance includes major maintenance functions, such as rework and overhaul of aircraft, engines, and components. These functions are mainly performed in the United States at large industrial facilities.

The planning of the Depot Maintenance Program is the subject of this report.

AERONAUTICAL DEPOT LEVEL MAINTENANCE

All depot level maintenance can be described in terms of the 10 major programs displayed in table 1. The first five programs are the most important and account for 90-95 percent of the cost of depot maintenance. A few of the sub-programs or specific rework activities which are performed are shown under each major program. The complete set of sub-programs which includes 44 different activities is given in appendix B.

The aircraft program includes all standard aircraft reworks such as progressive aircraft rework (PAR), inspect and repair as necessary (IRAN), overhaul, modernization, modification, conversion, analytical rework and crash/battle damage overhaul. The PAR is the largest activity in the aircraft program. An aircraft is returned to the depot for a PAR several times during its service life. The PAR involves a complete examination and evaluation, disassembly, rework of components, assembly, and test. The work is quite extensive and can require several months to complete. The term "progressive" serves to indicate that the work performed is tailored to the specific time in an aircraft's service life when it is undergoing PAR. Modification is the alteration of the physical make-up of an aircraft to include technical improvements. A conversion is more extensive, changing the mission, performance or capability of an aircraft to such an extent as to effect a change in its Type/Model/Series (T/M/S) designation, e.g., F4-B to F4-N.

TABLE 1

MAJOR PROGRAMS
DEPOT LEVEL MAINTENANCE

1.	Aircraft:	standard aircraft rework programs: progressive aircraft rework, modifications, conversions, crash damage overhaul...
2.	Engines:	engine repair, overhaul,...
3.	Aircraft & engine accessories and components:	depot level repair and rework of repairable components
4.	Electronics and communication equipment:	
5.	Other support:	field rework for force and general support requirements: aircraft in-service repair, modernization/modification, preservation/depreservation, field teams, salvage, fleet training, Naval Engineering Support programs, ground support equipment program, technical assistance...
6.	Special support:	non-programmed aircraft and engines, accessories and components, electronic and communications equipment, force support, test equipment calibration and indirect NARF support
7.	Other maintenance programs:	special federal personnel programs, special systems support, deep freeze, attaches, Defense Intelligence Agency,...
8.	Armament	missile-oriented repair, ordnance and targets...
9.	Manufacturing:	NARF in-house fabrication and manufacturing for stores and modification.
10.	Contingency reserve:	activation and inactivation, storage and renovation of aircraft

The engine program includes the overhaul and repair of aircraft engines. Engines are returned periodically to the depot, on the basis of flying hours, for an overhaul. Similarly, engines which have failed in the fleet and are beyond the repair capabilities of the organizational and intermediate maintenance activities are returned for repair.

The third and fourth programs together constitute what is commonly termed the component rework program. The distinction between the third and fourth programs is based on the type of component that is reworked. The component rework program is especially important since the grounding of an aircraft is usually caused by the failure of a component and the lack of a spare to replace it. Because components are expensive, it is usually profitable to repair them; the recovery rate ranges from 80 to 90 percent. Thus, after the initial outfitting of an aircraft, the replacement components received by the supply department for squadron support are predominantly components which have been reworked at either the intermediate or depot maintenance level.

The magnitude of the Depot Maintenance Program is evident from the actual FY-1971 program costs given in table 2. The table summarizes the costs incurred at the seven Naval Aircraft Rework Facilities. The total cost of this effort was $574 million, with the aircraft, engine and component programs accounting for 36, 18, and 26 percent of the costs respectively. All other program costs, representing 20 percent of total costs, are included in the other category. A predominant portion of the work, $465 million, was paid for by Operations and Maintenance, Navy funds. The remaining $108 million includes some other Navy work and the work performed for non-Navy customers.

TABLE 2

COST SUMMARY*
NAVAL AIR REWORK FACILITIES
FY-1971

(Millions of dollars)

	Fund Source			
Program	O&MN	Other (Navy & non-Navy)	Total	Percent
Aircraft	180. 94	26. 13	207. 07	36. 2
Engines	87. 92	15. 62	103. 54	18. 0
Components	135. 95	10. 58	146. 53	25. 5
Other support	60. 57	56. 41	116. 98	20. 3
Total	465. 38	108. 74	574. 12	100. 0

*From: Performance Summary Report for Naval Air Rework Facilities, Annual, FY-1971, Depot Management Division, Asst. Cdr. Logistics Fleet Support, NavAirSysCom, Wash., D. C. 20360

Depot level maintenance for the Navy is accomplished not only at its own rework facilities, but also at the rework facilities of the other services, and at commercial sources. The complete set of alternative rework facilities used by the Navy is as follows:

- Naval Air Rework Facilities (NARFs)
  - Alameda
  - Cherry Point
  - Jacksonville
  - Norfolk
  - North Island
  - Pensacola
  - Quonset Point

- Army

- Air Force

- Commercial

  - CONUS
  - XCONUS

The distribution of the FY-1971 Depot Maintenance Program over the Navy's seven rework facilities is given in table 3. The NARFs are arranged in terms of expenditures, beginning with the largest, North Island, and ending with the smallest, Cherry Point. There are two NARFs on the West Coast and five NARFs on the East Coast accounting for 44 percent and 56 percent of the costs respectively. All the NARFs perform work in each of the major programs, but each NARF has its own specialized capabilities to support specific aircraft, engines and components. For example, Pensacola emphasizes training aircraft while Alameda and Norfolk alone perform missile reworks.

Table 4 summarizes the cost of depot maintenance for FY-1971 which was accomplished at commercial sources. The total cost of this effort was $127 million with $97 million or 77 percent of the total performed in CONUS. The decision to assign work commercially depends on many factors, the most important of which are cost, quality, and availability of specialized skills or facilities. Also emphasized is the assignment of work on non-mission essential weapon systems. In addition to the above, commercial work performed outside the United States includes the support of permanently deployed aircraft for which high transportation costs and significant out-of-service transit times would result if returned to a CONUS depot.

The seven Naval Air Rework Facilities also perform depot maintenance for a large number of non-Navy customers. The complete list of customers is given in table 5; this includes the active and reserve forces for both the Navy and the Marine Corps, Army, Air Force, Military Assistance Programs, other government agencies, and foreign governments. Inter-service and inter-agency work agreements are emphasized to eliminate unnecessary duplications of skills and facilities.

TABLE 3

COST SUMMARY*
BY
NAVAL AIR REWORK FACILITY
FY-1971

(Millions of dollars)

	NARF West Coast				NARF East Coast			
Program	North Island	Alameda	Norfolk	Pensacola	Jacksonville	Quonset Point	Cherry Point	Total
Aircraft	47.88	38.94	28.82	35.29	22.60	20.73	12.82	
Engines	18.48	17.81	24.48	9.24	15.74	10.32	7.48	
Components	36.50	37.08	17.89	19.34	11.67	10.78	13.28	
Other	27.90	29.52	24.10	12.58	9.54	5.97	7.39	
Total	130.76	123.35	95.29	76.45	59.55	47.80	40.97	574.17
Percent	22.77	21.48	16.60	13.31	10.37	8.33	7.14	100

*From: Performance Summary Report for Naval Air Rework Facilities, Annual, FY-1971, Depot Management Division, Asst. Cdr. Logistics Fleet Support, NavAirSysCom, Wash., D.C. 20360.

TABLE 4

COST SUMMARY*
COMMERCIAL DEPOT MAINTENANCE
FY-1971

(Millions of dollars)

Programs	CONUS	XCONUS	Total	Percent
Aircraft	45.6	16.4	62.0	48.8
Engines	15.7	--	15.7	12.4
Components	36.1	10.2	46.3	36.5
Other	--	3.0	3.0	2.3
Total	97.4	29.6	127.0	100.0
Percent	76.7	23.3	100.0	

*From: Performance Summary Report for Naval Air Rework Facilities, Annual, FY-1971, Depot Management Division, Asst. Cdr. Logistics Fleet Support, NavAirSysCom, Wash., D. C. 20360

As indicated previously, the Depot Maintenance Program is funded mainly through the Operations and Maintenance, Navy account for Aircraft Reworks; this account also includes the majority of funds for the engine, component and support programs. There are several other accounts which supply funds directly or indirectly; the list of potential fund sources is given in table 6. Thus, the modification and conversion of aircraft is paid for by the Procurement of Aircraft and Missiles, Navy (PAMN) account. Similarly, replacement or expansion of facilities at the NARFs is funded through the Military Construction, Navy (MCN) account, while salaries for military personnel assigned to the NARFs are paid for with Military Personnel, Navy (MPN) funds.

In summary, the Depot Maintenance Program is a large and complex effort, in terms of both cost and the types of activities undertaken. The emphasis of long-range planning for this program must be at the most aggregate level to facilitate major policy trade-offs, but this first requires considerable attention to details. For example, it is necessary to know who the work is being done for and which accounts are to provide the funds. For budgetary purposes, work paid for by non-Navy funds must be identified so that it may be separated from the Navy's budget. Similarly, since the Navy is responsible for the management and control of its own rework facilities, the additional work placed on the NARFs, in support of the other services and agencies, must be included when developing the NARF's production plans. This is the only way to obtain a true picture of the total capacity and manpower needs of the Navy's rework facilities.

TABLE 5

DEPOT MAINTENANCE CUSTOMERS

- Operating forces
    - Combat forces
        - Navy
        - Marines
    - R & D Command
    - Training Command
    - Logistic Command
        - Navy
        - Marine
        - Attache
        - Deep Freeze
        - DIA
    - Military airlift commands
- Reserve forces
    - Navy
    - Marines
- National Guard units
- Supply system
- Other DoD components
    - Army
    - Air Force
- Military assistance programs
    - Navy
    - Army
    - Air Force
- Other departments and agencies
    - Department of Transportation
    - National Aeronautics & Space Agency
    - Atomic Energy Commission
    - Agency for International Development
    - General Services Administration
    - Post Office Department
    - Other
- Non-Federal activities
    - Colleges & universities
    - State and local governments
- Foreign governments

TABLE 6

FUND SOURCE

Navy:

- Operation and Maintenance, Navy (O&MN)
  - Aircraft rework
    - Operating forces
    - Reserve forces
  - Air Launches Weapon Systems
  - Calibration
  - Other
- Procurement of Aircraft and Missiles, Navy (PAMN)
- Other Procurement, Navy (OPN)
- Research, Development, Test and Evaluation, Navy (RDT&EN)
- Military Construction, Navy (MCN)
- Military Personnel, Navy (MPN)
- Navy Stock Fund (NSF)
- Navy Industrial Fund (NIF)

Marine Corps

Army

Air Force

Other DoD

Other

The remainder of this chapter is concerned with the depot maintenance planning process currently used by the Navy.

THE PLANNING PROCESS

Depot maintenance planning requires three major sets of decisions as shown in figure 1:

- First, the aircraft forces to be supported are determined. This includes specification of the level, mix, flying hour program, and deployment of the aircraft forces.

- Second, using maintenance policies, such as the frequency of aircraft reworks and engine overhauls, the specific rework activities or sub-programs implied by the chosen aircraft force levels are calculated.

- The third and final step is the development of a production plan and budget which meets the rework requirements. This includes the assignment of the workload to each rework facility, the resources required by each facility, the total costs of the production plan and the resulting depot maintenance budget.

As indicated in figure 1, rework plans are not developed by a simple one-time progression through each of the three steps. For example, the total cost of the rework program determined in step 3 may so exceed a budget constraint that reconsideration of aircraft force levels (step 1) and/or rework maintenance policies (step 2) may be necessary.

An organization chart showing the Navy offices concerned with the Depot Maintenance Program is given in figure 2. The Naval Air Systems Command (NavAir), as a subclaimant under the Naval Material Command (CNM), is directly responsible for the depot maintenance budget and supporting documents for the Five-Year Defense Program (FYDP). The consolidation and final development of plans are accomplished in two offices within the Depot Management Division of NavAir (Air-414). The first, the Resources Branch (Air-4142) is responsible for the development of the Naval Industrial Fund A-11 Budget which includes the Depot Maintenance Budget for the budget year, current year, and previous year. The second office, the Depot Level Maintenance Long Range Planning and Programming Group (Air-414A2) prepares the depot maintenance backup for the Five-Year Defense Program which includes a production plan and budget for each of the five years covered. As an example: During FY-1972, the Resources Branch works on the A-11 Budget for FY-1973, which also contains the budgets for FY-1971 and FY-1972. At the same time the Long Range Planning Group prepares the FYDP backup for FY-1972 through FY-1978.

There are a number of offices which supply data for the above planning functions; the most important inputs and their sources are listed in table 7. Information on aircraft rework requirements, for example, is provided to NavAir from the Aircraft Programs Branch (Op-512) in the form of three documents: U. S. Navy Aircraft Program-Resources, U. S. Navy Aircraft - Estimated Reworks, and the Aircraft Program Data File. Together, these documents include projections of all Navy aircraft in various inventory statuses, gains and losses, rework quantities by type/model/series and type of rework to be performed, their geographical distribution, and the flying hour program.

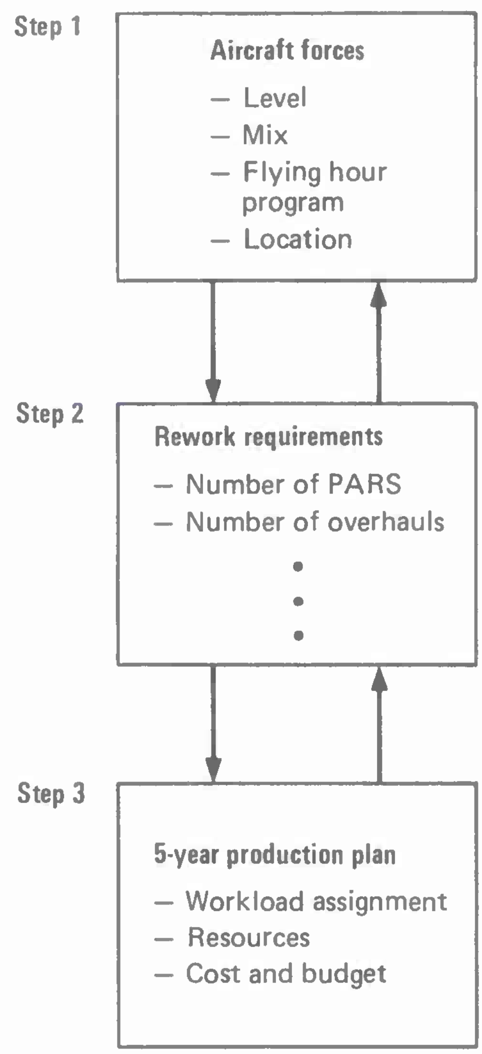

FIG. 1: REWORK PLANNING PROCESS

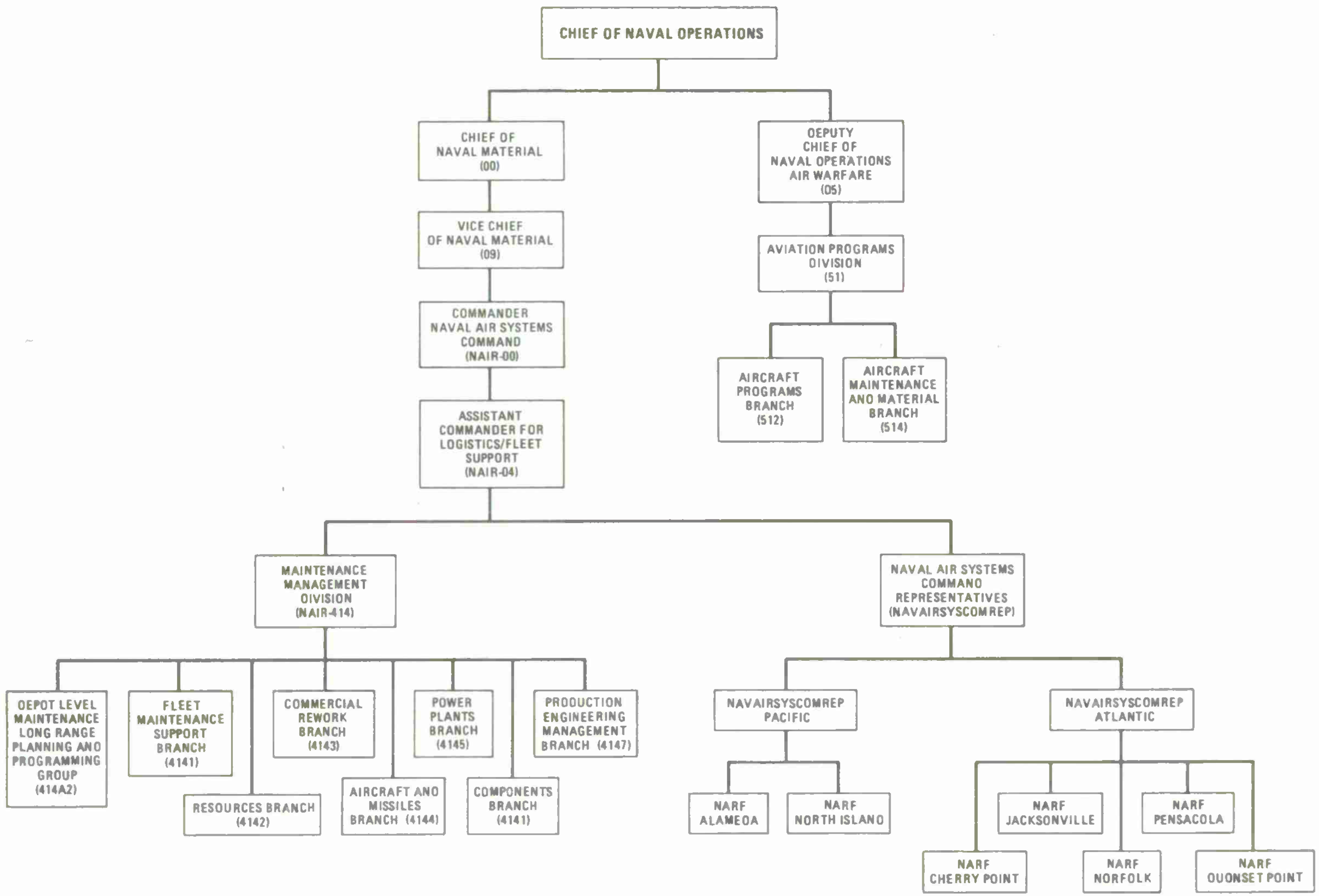

FIG. 2: DEPOT LEVEL MAINTENANCE ORGANIZATION CHART

TABLE 7

INPUT DATA AND SOURCE

1. U. S. Navy Aircraft Program-Resources (Exhibit A-II of Congressional budget submission): NOP-512

2. U. S. Navy Aircraft-Estimated Reworks (Exhibit A-VII of Congressional budget submission): NOP-512

3. Aircraft Program Data File (APDF): NOP-512

4. Operational Safety and Improvement Program Listing: NOP-506

5. Mission Essentiality Listing: NOP-512

6. Aircraft Engine Rework Requirements: NOP-51

7. Weapons System Planning Directive: NAIR-101

8. Depot Maintenance Interservice Support Agreements: NAIR-414 and interested services

9. Production Performance Reports and Summaries: NARFs and NAIR-414

10. NORM and Manhour Allocation Data: NAIR-414, workload conferences, NavAirReps Pacific and Atlantic

11. Navy Industrial Fund (NIF)A-11 Budget Data: NARFs and NAIR-414

12. Cost Volume Analysis Data: NARFs and NAIR-414

13. Facility Capacities: NARFs and NAIR-414

14. NORM Distribution: NARFs, NAIR-414, NavAirReps Pacific and Atlantic

The Depot Management Division of NavAir is organized into several branches, each responsible for one of the major Depot Maintenance Programs. Thus, the above information on aircraft rework requirements is refined further by the Aircraft and Missiles Branch (Air-4144), and an initial workload assignment is made. Similarly, aircraft engine rework requirements are detailed in the Power Plants Branch (Air-4145) from data supplied by Air-412 and Op-51. Finally, the above requirements and initial workload assignments for the entire Depot Maintenance Program are consolidated, analyzed, and modified as necessary by the Resources Branch and the Long Range Planning Group.

Two major sets of decisions have tentatively been made by the time inputs are received by the Resources Branch and the Long Range Planning Group: the level, mix and activity of aircraft forces have been specified (step 1), and the rework requirements implied by the chosen aircraft forces have been determined (step 2). Aggregation of these inputs into a production plan and budget for the entire Depot Maintenance Program inevitably highlights imbalances in the total program. A considerable amount of analysis, especially the structuring of several alternatives, is required at this point before a final plan is chosen. The Resources Branch and the Long Range Planning Group carry out this important function in close coordination with all the offices that have supplied the basic inputs.

The generation and evaluation of a rich set of alternatives during this third stage of the planning process is most important. In addition, it is crucial that plans be consistent over time. Thus, the major emphasis of this study is on the planning system used by the Long Range Planning Group.

THE DEPOT MAINTENANCE LONG RANGE PLANNING SYSTEM

NavAir's Long Range Planning and Programming System has been in existence for over five years, during which it has undergone many refinements and improvements. The need for such a system was highlighted in the mid-60's during the preparation of several major studies of the Depot Maintenance Program (reference (f)). The problems of obtaining accurate, consistent and timely data in a form that is easily processed were quite acute. NavAir's data base now provides complete and detailed coverage of the Depot Maintenance Program and is updated quarterly.

The purpose of the Long Range Planning System is development of the five-year depot maintenance production plans and budgets consistent with and in support of the FYDP. The system was designed to comply with DoD guidance for depot maintenance planning, especially DoD Instruction 4151. 15 and various amplifying guidelines. The system provides a complete overview of the total Depot Maintenance Program for review by top management, and yet the analysis begins from detailed information to ensure that requirements are complete, costs are accurate, and plans are feasible.

To accomplish the above, the planners begin with the depot maintenance requirements and workload assignments supplied to them. Each requirement is associated to a:

- Program
- Sub-Program
- Type Equipment Code
- Type/Model/Series
- Customer
- Fund Source

A specific example of a requirement and its workload assignment is the following:

Program: Aircraft
Sub-Program: PAR
TEC: AFPH

T/M/S: F-4J
Customer: Navy
Fund: OMN

	FY-1974	1975	1976	1977	1978
Total quantity to be reworked	80	80	80	80	80
Workload assignment:					
North Island	40	40	40	40	40
Cherry Point	40	40	40	40	40

This calls for 80 F-4J's to undergo Progressive Aircraft Rework for each of the years shown. This work is being done for the Navy and is to be paid for with Operations and Maintenance, Navy funds. The Type Equipment Code in this case designates an F-4J. If this work were for engine overhauls, instead, the Type Equipment Code would designate the specific type of engine to be reworked while the Type/Model/Series would be the aircraft which is to generate the engine rework requirement. Using this level of detail, the total set of requirements for a given year can range from 1500-1800 different items.

Attention to such detail is warranted for several reasons.

First, since depot maintenance activities are so diverse and differ in complexity, the budget would be seriously overestimated or underestimated unless each activity's specific features are taken into account. For example, the PAR of an A-7A costs about $74, 000 while the cost of an F-4J PAR is approximately $125, 000.

Second, even the same function can have a different cost depending on where the work is performed, thus the reason for emphasizing production planning in conjunction with the development of the budget. As an example, an F-4J PAR costs approximately $125, 000 at North Island and $117, 000 at Cherry Point.

Finally, in the aggregate, the combined production plan can imply multiple shift operations, expansion or under-utilization of facilities, and the hiring and laying off of personnel, all of which can be quite costly. There are many ways to accomplish the same work package; the problem is to find the best way.

In order to evaluate a given plan, the Long Range Planning Group has a series of computer programs which generate an extensive set of reports; the most important reports are:

- Planning and Programming Worksheets
- Program Cost Reports
- Workload Variance Reports
- Civilian Ceiling Reports
- Basic Data Reports

The Planning and Programming Worksheets are the basic documents input to the Long Range Planning System. They include all of the depot maintenance requirements and their workload assignments. These requirements are then costed and a series of Program Cost Reports are produced with varying levels of detail. The total cost of the Depot Maintenance Program broken down into the major programs, sub-programs and fund sources is available. In addition, costs are also recapped for the workload assigned to each alternative rework facility. The Workload Variance Reports and Civilian Ceiling Reports augment the Program Cost Report for each rework facility. The Workload Variance Report shows the distribution of manhours to each rework facility's nine shop categories implied by the workload assignment. These manhours are compared to each shop's capacity with under and overloads indicated and a percent utilization of the shop's capacity. This is an important document useful for smoothing the distribution of work so as to avoid uneven and costly allocations of work. The Civilian Ceiling Reports provide the same type of information, but here the workload is compared to manpower ceilings. Again, the intent is to avoid unnecessary hiring or laying off of personnel and the satisfaction of manpower ceilings. Finally, the Basic Data Reports contain all the workload and cost data used in the generation of the other reports.

ALTERNATIVES AND CONSTRAINTS

No matter how good are the initial set of requirements and workload assignments, these must be considered as a point of departure. The evaluation of several alternatives is necessary before a good plan results. This section highlights the major questions which reoccur during each planning cycle, the alternatives and constraints requiring analysis, and the manner in which the model proposed in this study can enhance depot maintenance planning.

A major problem in the past has been that the cost of the initial set of requirements exceeds the budget constraints placed on the Depot Maintenance Program. This forces an immediate re-evaluation of all requirements to determine how best they can be reduced to satisfy fiscal guidance without seriously impairing force effectiveness. This problem is made more difficult by the fact that no one is quite sure of the effects on aircraft readiness and operating costs that would result from varying degrees of depot maintenance. Clearly to be avoided are policy changes which merely pass maintenance costs to the organizational and intermediate maintenance activities, giving the false impression of a cost savings. The problem is further compounded by the scope of the Depot Maintenance Program; the 1500-1800 different rework activities imply an extensive number of potential alternatives. Reductions might be achieved by completely phasing out an old aircraft, postponing depot maintenance for a class of aircraft or across the board reductions. For each set of requirements, a new workload assignment must be prepared before the plan can be evaluated. This is a laborious and time-consuming process with the result that only a limited number of alternatives are considered.

Since the above is a recurring problem, the model which has been developed includes a parametric feature designed to facilitate the trade-off between requirements and the budget. The model allows for sets of requirements to be varied over any specified range. Thus, the rework activities for a specific type/model/series or class of aircraft can be varied. The model then determines the minimum cost production plan which meets each level of requirements within the specified range. This greatly increases the number of alternatives that are evaluated since the planner no longer is required to construct the workload assignments for each level of requirements. In addition, if the requirements exceed the capacity of the rework system, the model provides this information and pinpoints the specific shops which limit production. This is especially useful for mobilization planning where increased requirements can strain the rework system to its capacity.

To further facilitate the selection of specific requirements for parametric analysis, the model provides the expected cost savings which would result from reductions in each requirement. Thus, a ranking of rework requirements in terms of potential cost savings is possible. It is not suggested that planners begin with the highest cost rework activities and make reductions until a budget constraint is met. Clearly, the highest cost activities usually relate to the Navy's most important first line aircraft. However, using such a ranking in conjunction with information on the mission essentiality of an aircraft, strategic objectives, and the value of specific activities in terms of the support provided can facilitate the hard choices which must be made. Depot maintenance personnel and fleet commanders could then structure sets of requirements for parametric analysis.

Once requirements and the budget have been brought in balance, there are still many options which should be considered to determine the best work package. As stressed earlier, no matter how good the workload assignments for each individual requirement are, in the aggregate they may imply a production plan that necessitates costly use of multiple shift operations, extensive changes to shop capacities, or drastic increases or decreases in the workforce. Under the current planning system, a considerable effort is required to force production plans to fall within manpower and capacity limits of the rework facilities. As discussed earlier, the Workload Variance Reports and Civilian Ceiling Reports are used to facilitate the process. However, any imbalances found require the generation of a new workload assignment. Analysis of this new assignment may just show that the previous imbalance has been shifted to other shops within a rework facility or from one rework facility to another. An alternative approach is to explicitly include in a model all the manpower and capacity constraints and have the model generate all possible assignments which conform to these constraints. The model which has been developed has this feature. Thus, one run with the model guarantees that the resulting production plan reflects the production capability of the rework system, and in addition, a large number of plans are evaluated with the minimum cost plan the result.

The above provides the planner with a richer set of alternatives and allows more time for emphasizing major trade-off issues. For example, in the short run, shop capacities are fixed and production plans must be consistent with these capacities. In the long run, however, these capacities may be adjusted. The model produces estimated cost savings for changes in each shop's capacity, which may then be compared with the cost of changing that capacity. This allows consideration of capacity changes for selected shops within a rework facility, and consideration of the long run effects of a redistribution of capacity between rework facilities.

Similarly, manpower policies, whether imposed by the Navy itself or by external sources, can be evaluated. This could include a determination of the effects of a manpower ceiling on the total rework system, the allocation of this ceiling to each rework facility, and the distribution of the workforce between the shops within a facility.

Of current interest are DoD policies which are concerned with the distribution of the depot maintenance workload between the Navy's rework facilities and commercial sources. No one is sure what the appropriate mix should be nor what the effects will be of the specific distribution chosen. Again, the model can assist in the evaluation of various mixes of organic and commercial rework.

A review of the basic structure of the rework system including a determination of the appropriate number and size of the rework facilities is useful as requirements change significantly over time. For example, base closure analysis is possible by simply reducing the capacity of a specified rework facility to zero. This forces the model to allocate the workload among the remaining facilities. It is not possible to include in a model all the one-time costs and savings which arise from a base closure decision, but the model can highlight those shop, manpower and facility constraints which must be adjusted to achieve the closure. The costs of these adjustments would then be determined outside the model to complete the analysis.

In summary, the major emphasis of this study has been the development of a model which produces a complete range of alternatives and provides the decision maker with guidance as to how those constraints under his control may best be changed in either the short or long run.

CHAPTER II

A NEW APPROACH TO PLANNING

THE BASIC PROBLEM

The existing planning problems highlight the need for a model having the capability to generate all possible alternative production plans and evaluate each with respect to its total cost and feasibility. The details of the model developed by this study are explained in this chapter. The model produces yearly production plans and budgets for up to five years which encompass all the rework activities of the Depot Maintenance Program and all alternative facilities to which the work can be assigned. In addition, an extensive parametric capability is included in the model so that major trade-off issues concerning requirements, budgets, manpower and capacity can be addressed.

The model utilizes a mathematical optimization technique known as linear programming to generate and evaluate the different production plans. Linear Programming has been used extensively for over 20 years with its most important applications in the areas of medium-range and long-range planning for a wide variety of industries.

The linear programming model is used to produce least cost production plans for each year within a five-year planning horizon. The optimization problem which is solved for each year under consideration has the following general form:

Determine the workload assignment which:

- minimizes total costs
- meets all requirements
- is consistent with the rework system's capabilities

In mathematical terms, the problem is simply the minimization of a total cost function subject to a set of constraints. The total cost function includes the cost of performing each rework activity at all alternative facilities as well as the costs of multiple shift operations and adjustments to manpower. Besides insuring all depot maintenance requirements are met, the constraints also restrict the workload assignments to conform to the manpower and capacity limitations of each facility in the rework system. The total cost function and the various constraints used in the model are discussed in the following sections.

THE TOTAL COST EQUATION

The objective of the model is to determine the workload assignment which minimizes total cost. The total cost equation is the sum of the rework costs for all depot maintenance requirements, the cost of multiple shift operations, and the cost of adjusting the size of the workforce. Each of these costs is considered below.

Rework Costs

The calculation of total rework costs begins with the unit cost of producing each depot maintenance requirement or rework activity. Since a specific rework activity may be accomplished at several different facilities, a unit cost is specified for each facility to be considered as a potential assignment point. The total rework costs are obtained by extending the quantities of work assigned to a facility by their appropriate unit costs, and then summing these costs over all the rework facilities.

The unit cost of a rework activity at a specific facility is derived from the following five basic data elements:

- Number of Direct Labor Hours required per unit (NORM)
- Direct Material Cost per unit (DMC)
- Direct Labor Rate per hour (DLR)
- Production Overhead Rate per hour (POR)
- General and Administrative Overhead Rate per hour (GAR)

The cost of producing one unit of a rework activity is:

$$\text{Unit Cost} = \text{DMC} + (\text{DLR} + \text{POR} + \text{GAR}) \cdot \text{NORM}$$

The unit cost is the sum of the per unit cost of direct material, direct labor, production overhead, and general and administrative overhead. The direct material cost, DMC, is given on a per unit basis. The unit cost of direct labor is the product of the number of direct labor hours required per unit, the NORM, and the cost of a direct labor hour, DLR. Similarly, Production and General Administrative overhead costs are allocated in terms of the number of direct labor hours required.

Table 8 shows the per unit cost calculations for an F-4J PAR at North Island and Cherry Point. It should be noted that the NORM, material costs and the various rates can all differ for the same work performed at different rework facilities. Thus, the direct labor rate may differ since some rework facilities are located in high cost labor markets while others are in low cost markets or because the skill mix differs between facilities.

Even within one facility there are differences in the basic data which must be accounted for when computing unit costs. Clearly, the NORM and material costs vary for the different rework activities assigned to a facility. Similarly, a different labor rate and production overhead rate is established for each of the 10 major work programs since different mixes or skills are required for each program. Associating each rework activity to a program ensures the use of the appropriate rate.

TABLE 8

PER UNIT COST OF F-4J PAR
FY-74

	North Island	Cherry Point
Direct Labor Rate (DLR)	$6.68/hr	$6.22/hr
Production Overhead Rate (POR)	$2.50/hr	$2.60/hr
General and Administrative Rage (GAR)	$4.42/hr	$3.50/hr
Direct Material Cost (DMC)	$10,644/unit	$15,297/unit
NORM	8400 hours	8300 hours

Cost = (DLR + POR + GAR) · NORM + DMC

Cost of one F-4J PAR at North Island

$$= \left(\frac{\$6.68}{\text{hr.}} + \frac{\$2.50}{\text{hr.}} + \frac{\$4.42}{\text{hr.}}\right) \; 8400 \text{ hr.} + \$10,644$$

$$= \$114,240 + \$10,644 = \$124,884$$

Cost of one F-4J PAR at Cherry Point

$$= \left(\frac{\$6.22}{\text{hr.}} + \frac{\$2.60}{\text{hr.}} + \frac{\$3.50}{\text{hr.}}\right) \; 8300 \text{ hr.} + \$15,297$$

$$= \$102,256 + \$15,297 = \$117,553$$

In addition, the general and administrative overhead rate is tailored to each rework facility. The same rate, however, is applied to all jobs within a rework facility. Finally, since overhead costs can vary with the total workload of a rework facility, adjustments are made in the overhead rates to account for this. How these adjustments are accomplished is discussed further in chapter III.

Multiple Shift Costs

The rework costs discussed in the previous section include all costs which are directly attributable to each rework activity. There are other costs, however, which are a function of the total work assigned to a facility. Each rework activity contributes to these costs, but it is more meaningful to identify them separately at the aggregate level.

The multiple shift costs are those additional or incremental costs which must be borne if the total work assigned to a rework facility necessitates use of a second or third shift. Each rework facility is described in terms of nine shop categories. The first shift capacity of each shop is specified in terms of the total direct labor hours of work which could be sustained on the basis of a standard 40-hour work week. If the work assigned to a facility necessitates more direct labor hours of work for a specific shop than can be performed on the first shift, then the cost of the additional shifts is charged. The model will allow multiple shift operations only if the additional costs are warranted.

That is, after considering all alternative workload assignments, the decision to use multiple shifts is made only if it implies that the total cost of the Depot Maintenance Program is minimized.

Manpower Adjustment Costs

The capacities of a NARF's shops may be sufficient to accomplish a workload assignment, but the current or planned manpower assigned to the NARF may not be sufficient. The purpose of the manpower adjustment costs is to properly account for hiring and/or lay-off costs which must be paid if a workload assignment requires a major change in the size or distribution of the work force. Again, a workload assignment which implies an adjustment to the manning level is only considered if total costs are minimized.

In summary, the total cost equation includes all costs attributable to the rework activities assigned, and the costs of multiple shift operations and manpower adjustments. A further discussion of multiple shift operations and manpower adjustments is contained in the succeeding sections of this chapter.

THE CONSTRAINTS

Several hundred constraints are used in the model to ensure that workload assignments are consistent with the production capabilities of the seven Naval Air Rework Facilities. There are five basic categories of constraints:

- Requirements
- Shop capacity
- Manpower
- Production bounds
- Other

The requirement constraints simply force the model to assign all the depot maintenance requirements which are specified as inputs by the planner. The shop capacity constraints ensure that workloads are consistent with the capabilities of all shops within each NARF. They further facilitate the proper costing of multiple shift operations. Similarly, the manpower constraints force production plans to coincide with the size and distribution of the workforce and to cost workforce adjustments which are found beneficial. The production bounds restrict the allocation of specific rework activities to ensure these assignments conform to the particular capabilities of the rework facilities performing these functions. Finally, since linear programming is a general purpose optimization method, it is possible to include other constraints as deemed necessary.

Each of the above types of constraints is discussed below.

Requirement Constraints

The requirement constraints insure that the total quantity of a rework activity assigned is equal to the total requirement for that activity. There is one requirement constraint for every depot maintenance requirement or rework activity. For example, suppose 80 F-4J PAR's are to be performed for the Navy in FY-1974 and North Island and Cherry Point are identified as the only rework facilities with the capabilities to accomplish this work. Then the requirement constraint for F-4J PAR's simply specifies that the number of F-4J PAR's assigned to North Island plus the number assigned to Cherry Point must equal 80, the total depot maintenance requirement for F-4J PAR's.

Shop Capacity Constraints

The shop capacity constraints serve two purposes. First, they constrain the amount of work assigned to a facility to fall within its shop's capacities. Second, they facilitate the proper costing of multiple shift operations. Before discussing these two functions, it is necessary to understand how the total workload of a NARF is distributed over its shops.

Each NARF is described in terms of the following nine shop categories:

- Airframes
- Engines
- Accessories and components
- Electronics, communications and armament
- Armament
- Support equipment
- Manufacture and repair
- Test and calibration
- Other

The airframe shop includes such work functions as the stripping, disassembly, refinishing and systems checks performed for such rework activities as PAR, modification, crash and battle damage overhaul. Similarly, the components removed during a PAR are reworked in the third and fourth shop categories. A complete description of each shop category including the types of work performed is given in appendix B.

Although a specific rework activity may utilize one shop more than the others, almost all of the rework activities require some work in each of the nine shops. To insure a workload assignment is consistent with all the shops' capacities, it is therefore necessary to determine the distribution of the workload over the shops. This is accomplished with the use of two basic data elements:

- NORM
- Distribution factors

The NORM is the total direct labor hours required to produce one unit of a rework activity, while the distribution factors are the percent of the NORM accomplished in each shop.

A sample calculation for an F-4J PAR at North Island is given in table 9. Only seven shops are used in this example. The NORM is 8,400 direct labor hours of which 62 percent or 5,208 direct labor hours are performed in the Airframe shop for each PAR. It should be noted that the distribution factors have been estimated specifically for each rework activity and for each facility. Thus, the distribution factors for an F-4J PAR at Cherry Point differ from those for North Island.

TABLE 9

WORKLOAD DISTRIBUTION

Example: F-4J PAR at NARF North Island

NORM = 8400 direct labor hours per PAR

Shop	Distribution factor (percent)	Workload per unit (norm x distribution factor)
1 - Airframe	62	5,208
2 - Engines	02	168
3 - Accessories and components	16	1,344
4 - Electronics armament	08	672
5 - Support equipment	00	
6 - Manufacture	05	420
7 - Other	07	588
Total		8,400

Using the above data, it is a simple matter to determine the total hours of work for each shop which are implied by any workload assignment. Thus, if 50 F-4J PAR's are assigned to North Island, then 420,000 (= 50 x 8,400) hours are required with 260,400 (= 50 x 5,208) of these occurring in the Airframe Shop. The total workload in the Airframe Shop is then found by summing the above calculations for all rework activities assigned to the NARF. The total hours for the other shops are defined similarly.

The NARF shop capacity constraints require that the total hours of work assigned to a shop must not exceed its first shift capacity unless the model finds it beneficial to pay the extra costs for a second or third shift operation. The first shift capacities are given in terms of the total direct labor hours of work which could be supported presuming a standard 40 hour work week and an efficient utilization of the shop's physical layout. There are actually three capacity constraints for each shop; one for each shift. Thus 27 constraints are needed to model one NARF and 189 constraints to model the shops of all seven NARFs.

Although the relationships between the three capacity constraints for each shop are somewhat complex in nature, figure 3 illustrates their basic functions. The graph represents the total costs for various levels of work assigned to a specific shop. Direct labor hours of work are measured along the horizontal axis. Indicated on the horizontal axis are the shop's capacities for a 1st shift operation, 1st plus 2nd shift operation and finally a full three shift operation. The cost curve changes its slope once the 1st shift capacity is reached to reflect the fact that additional work would require a 2nd shift operation at a higher hourly cost. This example assumes no second shift work is considered until the 1st shift capacity is exceeded. It is possible to place more complex loading schemes into the model if desired. Thus, one might wish to begin a partial loading of the second shift before the full 1st shift capacity is reached.

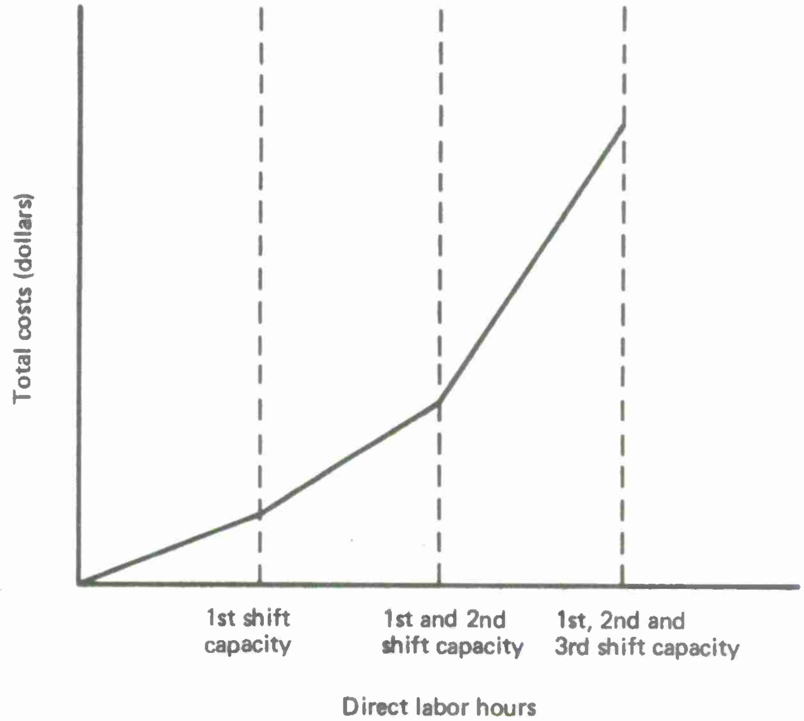

FIG. 3: TOTAL SHOP WORKLOAD COSTS

The model also takes into account differences in effectiveness between the various shifts. For example, Stanford Research Institute (reference (e)) found that second and third shift operations have lower effectiveness than first shift operations. This relationship is expressed in terms of an effectiveness factor. An effectiveness factor of 0.85 for the second shift means that one hour of work done on the second shift produces the same amount of output as could be produced in only 0.85 hours on the first shift.

Finally, the shop capacities, costs and effectiveness factors may be varied as desired to test the impact of such variations on the production plan and total costs. For example, a policy of restricting the use of 2nd and 3rd shift operations could be imposed by reducing the capacities submitted to the model. The resulting production plans and their costs may then be compared to those developed without such a restriction.

Manpower Constraints

The purpose of the manpower constraints is to ensure workload assignments that are consistent with the distribution of the workforce between all the rework facilities and the nine shops within each rework facility. The distinction between the manpower and shop capacity constraints is quite simple but most important. A shop capacity of 1 million manhours per year means that up to that amount of work could be supported by the shop if sufficient labor were provided. If the labor currently available in this shop is only sufficient for 0.5 million manhours of work per year, then a workload assignment which called for a complete loading of the shop would necessitate a significant redistribution of or increase to the workforce of the rework facility. Thus, taken together, the shop capacity and manpower constraints insure that the rework facility has both the physical capacity and the appropriate amount and distribution of labor to perform the work assigned.

There are two basic approaches which can be used to constrain manpower; both are available in the model. The first constraint changes in the workforce to fall within limits specified by the planner. The second approach allows for larger shifts in the workforce, but the costs of such changes are included in the total cost function which is minimized. Thus, major workforce changes will be chosen only if their additional costs are warranted by greater cost savings for the total Depot Maintenance Program. Manpower constraints may be specified for each shop within a NARF or just for each NARF. To simplify the presentation, only manpower constraints on the total workforce of a NARF are discussed here.

Consider the first method of constraining manpower. Suppose figure 4 represents the current manpower situation for a specific NARF. The point M on the horizontal axis represents the NARFs current manning level expressed in terms of the number of direct labor hours of work which could be performed per year. Also shown are upper and lower limits within which adjustments to the workforce will be allowed. Thus, only workload assignments which imply a manning level within this allowable range would be considered.

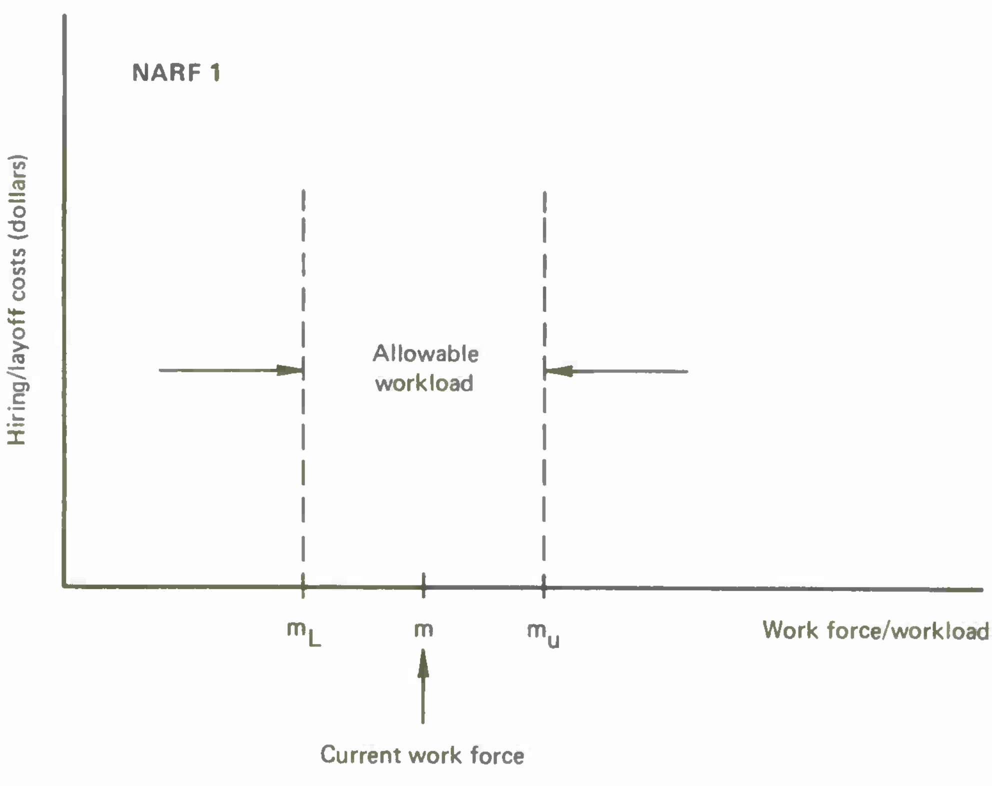

FIG. 4: MANPOWER CONSTRAINT

The following is one way of specifying the upper and lower limits for the allowable range. Suppose the NARF in question has an accession rate of 5 percent and a separation rate of 1 percent. These rates are on a per year basis and presume normal adjustments to the workforce. The accession rate reflects the NARF's ability to hire given the inherent problems of its local labor market. Similarly, the separation rate reflects voluntary layoffs which occur under normal, no-RIF conditions.

The net increase in manpower that the rework facility could accomplish is:

$$\text{net rate of increase} = \text{accession rate} - \text{separation rate}$$

$$= 5\% - 1\%$$

$$= 4\% .$$

Similarly, the maximum decrease in manpower that could be expected is:

$$\text{net rate of decrease} = \text{separation rate}$$

$$= 1\% .$$

This assumes no hiring is undertaken and the full decrease is accomplished through voluntary attrition. Thus, if the current manning level is M , the allowable range would be from $.99M$ to $1.04M$. The above is a fairly conservative approach which should involve only minor costs to accomplish the workforce adjustments. Of course, the planner is not restricted to the above; the lower and upper bounds may be as tight or as loose as the specific analysis warrants.

The second approach does not constrain manpower to fall within specified limits, but it includes the hiring and lay-off costs that must be paid for major workforce adjustments. Figure 5 shows the hiring and lay-off costs for a NARF as a function of its manning level. The current workforce is again given by M on the horizontal axis. As with the first approach, as long as adjustments are within the allowable range, no adjustment costs are charged. The curve to the right of the allowable range represents the one time hiring costs that are incurred as the workforce expands. The slope of this curve is the hiring cost per unit of labor added to the workforce. Similarly, the curve to the left of the allowable range represents the one time lay-off cost incurred when the workforce is contracted. Again, the slope of this curve is the cost per unit of labor involuntarily separated. Thus, if a particular workload assignment requires the workforce to be expanded to M_1 then a total hiring cost of A would be charged. Since the hiring and lay-off costs can be significant, the model will only adjust the workforce if the benefits of such an adjustment exceed its cost.

The above discussion has been in terms of manpower constraints for a single year. The model also allows for the development of a full five-year plan simultaneously. In this case the yearly manpower constraints of a NARF are related in the following fashion. If in year 1 the model increases the NARF's workforce, then the manpower constraint for year 2 is adjusted to reflect this change in the workforce. Similarly, any change in manpower for the second year is used to adjust the manpower constraint in year 3. This allows

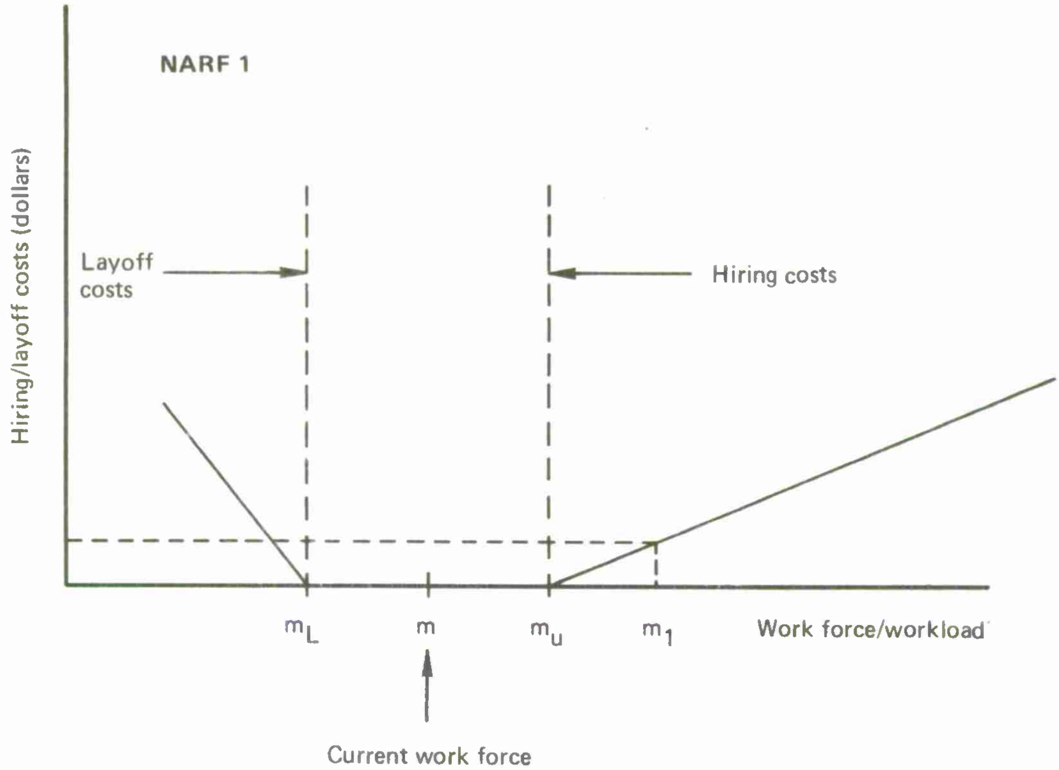

FIG. 5: MANPOWER ADJUSTMENT COSTS

the model to consider workforce adjustments and their costs over the full five-year period. By using this method, the model avoids production plans which require extreme fluctuations in the workforce such as 5000 men in year 1, 3000 in year 2 and 5000 in year 3 .

In summary, several approaches to manpower planning are available in the model. They ensure plans are consistent with the workforce of the rework facilities and eliminate production plans which would have extreme effects on the size and distribution of the workforce for a given year and over time.

Production Bounds

The capacity and manpower constraints restrict the workloads assigned to conform to the aggregate capabilities of each rework facility. Of course, it is impossible to capture in a single measure, such as shop capacity, all of the particular capabilities and limitations of a specific shop. Clearly, each rework requirement or activity requires specific skills, tools, equipment and facilities, all of which may not be available in sufficient amounts to sustain a particular assignment.

One approach which could be used to ensure that workload assignments are fully compatible with the rework system is to model each skill, equipment or facility available at every NARF and the quantities of these resources required by each rework activity. Unfortunately, such an approach is so detail oriented as to be self defeating, especially since many of these relationships are difficult to quantify, data is not available, and the model would become too large and cumbersome. This is more appropriate for detailed production planning for monthly or quarterly periods at a specific rework facility. When concerned with five-year plans at the aggregate level, an alternative approach is necessary.

Fortunately, there is a way of capturing this kind of detail in a straightforward manner, namely, through the use of production bounds. Production bounds are specified for each rework activity such as a PAR in order to further constrain the specific assignment of each activity. For example, suppose 80 F-4J's are to be PAR'd with North Island and Cherry Point as the only alternative assignment points. Without any additional restrictions, the model would consider assigning from 0 to 80 PAR's to North Island with the remaining going to Cherry Point. North Island or Cherry Point for that matter may not have the resources to produce all 80 PAR's. Thus, the model allows the planner to specify upper and lower limits, the production bounds, on the assignments which the model is to consider. For this example, these bounds might be:

	Production Bounds	
	Lower	Upper
North Island	45	55
Cherry Point	25	35

The model would then consider the assignment of from 45 to 55 PAR's to North Island with the remaining number assigned to Cherry Point. A set of production bounds are specified for each depot maintenance activity being considered for each rework facility. The production bounds allow for consideration of a wider range of assignments than possible under the current planning system. Currently, the planner must specify an exact workload assignment such as 50 to North Island and 30 to Cherry Point. The evaluation of a different workload assignment necessitates a new run of the complete set of computer programs. However, all possible combinations of workload assignments within the stated production bounds would be evaluated with just one run of the model developed here. At the same time, the production bounds allow the planner to specify a range of workload assignments which are realistic. Thus, an upper bound of 55 PAR's at North Island may be due to insufficient facilities, equipment or tools needed for a greater level of production. In addition, these constraints allow for geographical considerations such as assigning requirements to NARFs close to the Navy activities generating the requirements. Again, the production bounds may be made as tight or as loose as the specific circumstances warrant.

Other Constraints

The computer program used to solve the optimization problem can process large problems, in terms of the number of variables and constraints, within reasonable run times. Thus, there are no practical restrictions on the number of other constraints which might be included to further ensure that production plans are realistic.

Although no constraints other than those already discussed are currently in the model, the following illustrate the types of relationships which could be considered in the future. Every engine which is repaired or overhauled undergoes final testing in an engine test cell. These cells are block houses containing various testing devices; the complete cost of one installation can range from $10 to $14 million. In addition, each cell can only be used to test specific types of engines. Since these cells have limited capacity and the cost of obtaining additional capacity is high, it is important that the engine workload be assigned so as to conform to the current test cell capacity of the rework system. This may be accomplished simply through the use of additional constraints which model the test cell capacity and the amount of capacity required by each activity in the Engine Program. A closely related topic concerns the engine repair program. The demand for engine repairs is generated from two sources. First, engines which fail in the fleet and are beyond the maintenance capability of the Organizational and Intermediate Maintenance Activities are returned to the depot for repairs. This is the largest source of engine repairs. A second source is derived from work done at the depot on aircraft. For example, during the PAR process, an aircraft's engines are inspected with the result that some of these engines are identified as in need of repair. Thus, a specific PAR program may generate a demand for one engine repair on average for every 20 PAR's performed. This means that when PAR's are shifted from one rework facility to another the PAR generated engine repairs will also shift. This relationship is currently accounted for by the Long Range Planning Group by adjusting the engine repair assignments each time the aircraft program assignments are changed. This same procedure is used in the model developed here. However, it is possible to include these relationships directly in the model, thus, eliminating the need for manual adjustments. Additional examples of other constraints and extensions to the model which might be considered in future research are discussed in chapter IV.

As emphasized above, the inclusion of additional constraints is easily accomplished. However, it is recommended that experience with the current model be gained before these additional complexities are added. Each addition requires the acquisition and maintenance of a data base. Thus, it is best that the benefits, in terms of improvements to plans, be determined first before such extensions to the model are undertaken.

THE TOTAL SYSTEM

The model which has been developed actually consists of the following four computer programs:

- Input Program
- Matrix Generator
- Mathematical Programming System (MPSX360)
- Report Generator

The input program provides the link between this system and the Long Range Planning System currently used by NavAir. It creates a complete data file for use by the model from three data files currently maintained by NavAir.

The purpose of the matrix generator is to structure the cost function and the several hundred constraints which are used to describe the rework system. The heart of the system is a Mathematical Programming Package (MPSX360) which solves the optimization problem which has just been described. Finally, the report generator produces summary data concerning the minimum cost plan. The following are the major reports which are available:

- Workload Assignment Report
- Program Cost Report

- DOP Cost Report
- Workload Variance Report
- Manpower Variance Report
- Reduced Cost Analyses
  - Manpower
  - Multiple Shift Operations
  - Production Bounds
- Shadow Price Analyses
  - Requirements
  - Shop Capacity
  - Manpower

The first five reports provide the details of the minimum cost workload assignment, the costs of the Depot Maintenance Program in varying levels of aggregation, and the multiple shift operations and manpower adjustments implied by the plan. The Reduced Cost and Shadow Price Analyses provide information considering the cost implications of various types of changes to the production plan that might be considered. Thus, the planner can determine what will happen if changes are made to requirements, shop capacities, manpower, or the production bounds. A discussion of these reports is deferred to the next chapter and appendix C where their use is illustrated with a case analysis for FY-1974.

SUMMARY

It has been shown that the development of production plans for the Depot Maintenance Program can be accomplished by solving a cost minimization problem subject to a set of constraints. The total cost equation not only includes those costs directly attributable to each rework activity, but also the costs of multiple shift operations and manpower adjustments which are implied by the aggregate workload. Constraints are used to ensure that requirements are met and that the workload assigned is within the capacity and manpower limits of each facility within the rework system.

CHAPTER III

CASE ANALYSIS

INTRODUCTION

This chapter presents the results of several case studies which were conducted to test the model and illustrate its uses. A production plan and budget for FY-1974 are developed for each case. The same data base is used throughout to ensure meaningful comparisons are possible.

The first case is an actual production plan and budget prepared by NavAir's Long Range Planning Group in January 1972 during a POM exercise. The model was used to cost out NavAir's plan by not allowing it to deviate from this plan. This case was used initially to validate the internal logic of the model and to ensure compatibility with NavAir's coding system and data files. This case is used here as a base case to which the remaining cases are compared. The second and third cases allow the model to deviate from NavAir's plan by successively greater amounts.

BASIC DATA

The data used for all the case studies was the most current data available as of January 1972. The majority of the data was provided by the Long Range Planning Group in the form of three extensive data files:

- Master File
- Distribution File
- Rate File

The Master File contains all the depot maintenance requirements including the quantities desired, the NORM for each, and the specific workload assignments made by the Long Range Planning Group. The Distribution File includes the shop capacities for all the NARFs and the distribution factors used to allocate each rework activity's workload to the shops. Finally, the Rate File contains the rates for direct labor, direct material, production overhead, and general and administrative overhead applicable to each rework activity and each facility. Since these files are quite extensive, they are not reproduced here, but they are retained for future reference at CNA.

The data required to model multiple shift operations and manpower adjustments was developed in cooperation with the Long Range Planning Group, other NavAir offices, and OCMM. The data for each of these is discussed below.

Multiple Shift Incremental Costs

The model has been designed to explicitly take into account the additional or incremental costs which are incurred if work beyond the first shift is required. Table 10 provides the average hourly pay differentials for second shift, third shift, and overtime work at the seven Naval Air Rework Facilities. These differentials are the cost over and above the first shift hourly wage that must be paid. As an example, if the average hourly wage were $4.00 per hour at Alameda, then the hourly wages for second shift, third shift and overtime would be $4.23, $4.28 and $6.13, respectively. The second and third shift differentials are specific to each NARF. The same overtime differential is applied to all NARF's and is based on time and a half and an average hourly wage of $4.26.

TABLE 10

AVERAGE HOURLY PAY DIFFERENTIALS
(Dollars)

NARF	Second shift	Third shift	Overtime
Alameda	0.23	0.28	2.13
North Island	0.21	0.51	2.13
Norfolk	0.17	0.20	2.13
Pensacola	0.13	0.32	2.13
Jacksonville	0.13	0.23	2.13
Cherry Point	0.13	0.20	2.13
Quonset Point	0.14	0.22	2.13

Source: OCMM

Manpower Adjustments

As discussed in chapter II, manpower constraints may be used for each shop within a NARF or for the total NARF. All three cases use total NARF constraints. In addition, the option is used which charges for increases or decreases to manpower beyond an allowable range.

The allowable range within which no manpower adjustment costs are charged was specified as follows. The approach used is basically the same as described in chapter II and is considered to be conservative. Table 11 shows the acquisition and separation rates for each NARF which occurred during the fourth quarter of FY-1972. The all NARF averages of a 5 percent acquisition rate and a 1.4 percent separation rate are applied to all the NARFs. It is assumed that these rates could be accomplished in the future without incurring extra normal costs. Therefore, the net rate of increase is the acquisition rate less the separation rate of 3.6 percent. Similarly, the net rate of decrease is the separation rate of 1.4 percent. Thus, if the current manning level of a NARF is M then the allowable range would be from .986M to 1.036M. Table 12 shows the actual direct labor workforce manning level for each NARF as of February 1972. The first column shows the direct labor workforce in terms of the number of men available. The second column shows the total direct labor hours of work per year which could be supported with the workforce. This presumes that 2000 productive hours per year are supplied per man. This takes into account adjustments for annual leave, holidays and sick leave. Finally, the last two columns are the lower and upper limits of the allowable range. Again, no manpower adjustmant costs are charged as long as the workload assigned to a NARF falls within its allowable range.

TABLE 11

ACQUISITION RATE AND SEPARATION RATES
(Percent)

	Acquisition rate	Separation rate
Alameda	5.0	1.3
North Island	4.8	1.2
Norfolk	3.7	1.6
Pensacola	5.3	1.3
Jacksonville	6.5	2.2
Cherry Point	8.7	2.2
Quonset Point	2.7	0.7
All NARF average	5.0	1.4

Now consider the estimation of the one-time acquisition and separation costs. The Office of Civilian Manpower Management, NavAir-414, and NARF Pensacola provided information on these costs. Separation costs are a function of the length of service, grade level, date of birth, and age for the employees separated. OCMM's Manpower Planning Division supplied the information in table 12 as averages for all personnel at each NARF. Using these averages to compute severance pay entitlement in accordance with current DoD directives for an employee separated during a reduction in force (RIF), the costs in table 13 were generated. These costs seemed very high when compared to a $3, 500 cost per man generated by an OCMM study done several years ago. It was determined that average data for a NARF is not representative of the personnel actually separated during a RIF. Usually, personnel with less seniority and at lower grade levels are separated so that average data for a NARF inflates severance costs.

TABLE 12

DIRECT LABOR WORKFORCE
ACTUAL MANNING LEVELS AND ALLOWABLE RANGE

	N Number	M Total D.L. hours (N x 2000)	Lower bound D.L. hours (.986M)	Upper bound D.L. hours (1.036M)
Alameda	2,795	5,590,000	5,511,740	5,791,240
North Island	3,620	7,240,000	7,138,640	7,500,640
Norfolk	3,032	6,064,000	5,979,104	6,282,304
Pensacola	2,561	5,122,000	5,050,292	5,306,392
Jacksonville	1,724	3,448,000	3,399,728	3,572,128
Cherry Point	1,506	3,012,000	2,969,832	3,120,432
Quonset Point	1,607	3,214,000	3,169,004	3,329,704

TABLE 13

SEVERANCE PAY PER MAN BY NARF

NARF	Total severance pay/man (Dollars)
Alameda	7330
Cherry Point	4116
Jacksonville	9923
Norfolk	8190
Pensacola	9103
Quonset Point	7347
North Island	6949
Average	7330

NARF Pensacola had recently been through a RIF and had cost data available. Using this data, an average cost to separate of $3,100 per man was calculated. This was more consistent with the OCMM average of $3,500. In lieu of better estimates, the OCMM figure of $3,500 is used for all NARFs in the cases which follow.

Generation of data upon which to base an average hiring cost was almost totally nonexistent. Pensacola estimated an average cost of $100 for their Base Industrial Relations Office when hiring a man. This cost included such functions as generating a certificate, interviewing of applicant, medical physical and processing of selectee to be placed on the rolls. Training costs were not included because it was felt that trained personnel are available to hire. The OCMM study previously mentioned generated a hiring cost of 25 percent of the separation costs. NavAir-414 concurred in this estimate so that a hiring cost of $880 was selected for the model.

CASE I: THE BASE CASE

The production plan for Case I is Run No. K004 prepared by NavAir's Long Range Planning Group in January 1972. Immediately after this plan was developed, the computer programs and data base used by this group underwent considerable modification. The planning system is now configured as described in chapter I of this report; the model developed here is compatible with both versions of the system. The changes which took place mainly allow for more detailed classifications of the major work programs, subprograms, customers, fund sources, and shop categories. The planning system in either case covers the entire Depot Maintenance Program; the difference is that with the new system a finer breakdown of the aggregate results is possible. Thus, the old system has 6 major work programs, 2 fund sources and 7 shop categories while the new system has 10, 8, and 9, respectively. Since it was expected that the data base would be in a state of flux during this time, it was concluded that it was best to use the K004 Plan. Thus, the aggregate results which follow are not as detailed as is possible with the model when the new data base is used.

Finally, because of the above changes, it is not possible to compare the K004 plan to plans currently under consideration. In addition, since the planning function is a dynamic process, the level and mix of requirements, workload assignments and the cost and engineering data have all changed since the K004 run was made. What follows are the major highlights of this base case.

Total Program Costs

Table 14 provides a total cost summary for the case I production plan for FY-1974. The entire Depot Maintenance Program is covered which includes all Navy Depot Maintenance whether performed at the NARFs or at other sources and the work done by the Navy for non-Navy customers. The first six lines provide the total cost for each of the six major work programs. In total, these programs account for $780.49 million. Following this are adjustments for multiple shift operations, cost/volume relationships, and manpower changes. The total cost of the program is given on the last line and is $784.6 million. Each of the adjustments will be explained in the following sections.

TABLE 14

TOTAL PROGRAM COST SUMMARY
CASE I
(Dollars)

	Total cost (All fund sources)
Program:	
Aircraft	230,403,164
Missile	12,814,598
Engine	117,665,524
Component	189,006,874
Other	40,389,988
Special	190,216,289
Sub-total	780,496,437
Incremental second shift	238,156
Incremental third shift	27,520
Post third shift	104,769
Sub-total	780,866,882
Cost/volume adjustment	-2,197,605
Sub-total	778,669,277
Increase to manning level	152,258
Decrease to manning level	5,813,342
Grand total	784,634,877

Table 15 provides a total cost summary for that portion of the Depot Maintenance Program which has been assigned to the Navy's NARFs. It should be remembered that this covers all work to be done at the NARFs including work for non-Navy customers. The total cost of this effort is $576.5 million. Table 16 provides a further breakdown showing the total cost of the work assigned to each of the NARFs. The NARFs are listed from left to right in terms of decreasing expenditures.

Finally, the total cost summary for the depot maintenance assigned to non-Navy rework facilities is given in table 17. The cost of this effort is $208.13 million. It should be noted that for this report no multiple shift, cost/volume, or manpower adjustment costs are included. This is because only the Navy's rework facilities are modeled in terms of such detail. Finally, adding the costs of tables 15 and 17 will provide the total costs for the entire program given previously in table 14.

The various cost reports which are produced by the model contain more detail than shown here. Thus, the costs are also available by fund source. For the cases run here, only two fund sources were used conforming to the old planning system. The first fund source is Operations and Maintenance, Navy funds, while the second includes all other Navy and non-Navy fund sources. A complete set of the reports for all three cases are contained in appendix C.

Multiple Shift Operation

As shown in the Total Program Cost Summary, table 14, multiple shift operations are required for Case I. The incremental costs for the second and third shift work are $238, 156 and $27, 520, respectively. It should be noted that more or less multiple shift operations might in fact be required when a plan is actually implemented. Even when a shop has a workload far less than its total capacity, multiple shift operations can be beneficial. There are several good reasons for this. For example, when an aircraft undergoes PAR there are certain jobs which require long processing times for completion. By performing these jobs over several shifts, the total time in process for an aircraft can be reduced. This releases the aircraft to the operating commands sooner and the total benefits may far outweigh the extra costs of the additional shifts.

The purpose of the multiple shift constraints in the model is not to predict exactly the extent to which extra shifts will be used. Their function is to highlight when extensive multiple shift operations are implied and to guide the model in the direction of assignments which utilize the less expensive first shift operations. As discussed previously, more complex loading schemes chould be used, if desired.

There is one final multiple shift cost which is identified as POST Third Shift. The purpose here is to account for the fact that a plan may be so highly constrained when submitted to the model, that the work cannot be performed even when a full three shift operation is allowed. Clearly, it is not suggested that the shop can provide the extra work called for. Rather, this device highlights the extreme overload which the model has been forced to accept. For costing purposes, the overtime rates given in table 10 are used to charge for this additional work. However, when such a situation occurs, it is time for a careful analysis which would consider possible increases to a shop's capacity, utilization of overtime, reallocations of workload fixed in the model by the planner, and/or the possible farming out of work. It should be noted that Case I has this situation. One shop at NARF Pensacola requires more work than was possible within three shifts.

TABLE 15

TOTAL COST SUMMARY
ALL NARFS
CASE I
(Dollars)

Program:	
Aircraft	195, 302, 497
Missile	11, 326, 939
Engine	107, 587, 793
Component	127, 731, 168
Other	35, 404, 020
Special	95, 009, 462
Sub-total	572, 361, 879
Incremental second shift	238, 156
Incremental third shift	27, 520
Post third shift	104, 769
Sub-total	572, 732, 324
Cost/volume adjustment	-2, 197, 605
Sub-total	570, 534, 719
Increase to manning level	152, 258
Decrease to manning level	5, 813, 342
Grand total	576, 500, 319

TABLE 16

CASE I
TOTAL COST SUMMARY
BY NARF
(Dollars)

Program	North Island	Alameda	Norfolk	Pensacola	Jacksonville	Cherry Point	Quonset Point
Aircraft	48,898,265	33,294,909	34,122,179	35,110,941	15,699,400	14,719,445	13,457,358
Missile	0	5,620,332	5,706,607	0	0	0	0
Engine	17,516,494	19,619,065	14,515,523	9,659,559	28,322,499	10,618,497	7,336,156
F/J	31,290,893	33,188,546	16,314,706	17,824,089	11,137,116	10,808,081	7,167,737
Other	9,259,941	7,636,282	4,734,157	4,451,550	3,022,851	4,196,602	2,102,637
Special	24,960,844	17,561,517	14,075,517	12,414,803	10,510,081	8,383,264	7,103,436
Sub-total	131,926,437	116,920,651	89,468,689	79,460,942	68,691,947	48,725,889	37,167,324
Incremental second shift	125,807	16,257	0	35,816	0	28,990	31,286
Incremental third shift	0	0	0	27,520	0	0	0
Post third shift	0	0	0	104,769	0	0	0
Sub-total	132,052,244	116,936,908	89,468,689	79,629,047	68,691,947	48,754,879	37,198,610
Cost/volume adjustment	–467,666	–102,630	–666,280	–428,526	–246,421	–110,517	–175,565
Sub-total	131,584,578	116,834,278	88,802,409	79,200,521	68,445,526	48,644,362	37,023,045
Increase to manning level	0	152,258	0	0	0	0	0
Decrease to manning level	0	0	1,052,700	1,177,260	1,483,755	320,215	1,779,412
Grand total	131,584,578	116,986,536	89,855,109	80,377,781	69,929,281	48,964,577	38,802,457

TABLE 17

TOTAL COST SUMMARY
NON-NAVY REWORK FACILITIES
CASE I
(Dollars)

Program:	
Aircraft	35,100,667
Missile	1,487,659
Engine	10,077,731
Component	61,275,706
Other	4,985,968
Special	95,206,827
Sub-total	208,134,558
Incremental second shift	0
Incremental third shift	0
Post third shift	0
Sub-total	208,134,558
Cost/volume adjustment	0
Sub-total	208,134,558
Increase to manning level	0
Decrease to manning level	0
Grand total	208,134,558

Manpower Adjustment Costs

The workload plan of Case I requires one time manpower adjustment costs of $5.97 million as given in table 14. Table 16 which summarizes the results for each NARF, shows that NARF Alameda required an increase in manning while five other NARFs required a decrease to their manning levels. The total hiring was approximately 173 men at a one time cost of $152,258. The total layoff for the remaining NARFs was 1,660 men at a one time cost of $5.81 million.

It should be noted that the manpower adjustments needed are actually greater than given above. The reason for this is simply that the model presumes that adjustments within the allowable range will occur through normal personnel adjustments at no extra cost. If the planner wishes to include these adjustments it is accomplished simply by making the allowable range zero. Then costs are incurred immediately for any deviation from the exact manning level of a facility.

Cost/Volume Adjustments

The last cost on table 14 that requires further explanation is for cost/volume adjustments. The rates for direct labor, production overhead, and general and administrative overhead are all based on a specific aggregate workload in terms of direct labor hours for each facility. As the aggregate workload varies, these rates can also vary. The current method used by NavAir and also used here to account for this is as follows. The rates pertaining to the expected aggregate workload for a NARF are used initially. Once the plan is evaluated, a comparison is made between the expected aggregate workload and the aggregate workload called for in the plan. Costs are then adjusted to reflect the fact that the rates may differ for the actual plan. Also, if desired, the model may be rerun with the new rates to further ensure that in total a different plan might not be more beneficial when these rates are explicitly considered. The cost/volume adjustment for Case I implied a reduction to total cost of $2.20 million.

In summary, the major highlights of Case I are as follows. The total cost of the plan was $784.6 million. This plan required 1.53 million hours of multiple shift operations at an incremental cost of $370,445. Finally, manpower adjustments required the hiring of 173 men at NARF Alameda at a one time cost of $152,258. All other NARFs but one had force reductions which totaled 1,660 men at a one time cost of $5.81 million. Case I is compared in the next section to Cases II and III which allowed the model to vary from NavAir's plan.

CASES II AND III

Cases II and III represent two runs of the model in which it was allowed to deviate from NavAir's plan, Case I. The purpose is to illustrate the uses of the model, and comparisons are made to Case I. However, these runs are quite conservative uses of the model since several significant restrictions were placed on the deviations allowed. Thus, the cost savings are not great, but significant improvements in the distribution of the workload do occur. The restrictions placed on the model are discussed first.

The first restriction is that a large number of the workload assignments are not allowed to vary at all from the Case I plan. In terms of cost, only $219 million of work, 28 percent of a total of $780.5 million, was entered into the optimization (Linear Programming) portion of the model. Of course, all depot maintenance requirements are the same as in Case I, so total costs can be compared meaningfully. The above restriction just means that the model could not vary the workload assignments for 72 percent of the total Depot Maintenance Program. The portion of the total program which is fixed is called the Base Workload, while the portion addressed by the model is called the L.P. Workload.

The work included in the L.P. Workload entailed 16 rework activities in the Aircraft Program, 50 in the Engine Program, 122 in the Component Program, 1 missile rework, and no activities in the Special and Other Programs. All activities in the Aircraft Program were PAR's except for one PAR conversion. The activities in the Engine Program were split about evenly between overhauls and fleet generated repairs.

The second restriction on the model was the extent to which workload assignments in the L.P. Workload were allowed to vary from the Case I Plan. Cases II and III allow a 5 percent and 10 percent variation, respectively. For example, suppose 100 PAR's are called for with 50 each assigned to two NARFs in Case I. The percentage variation is based on the total requirement. Thus, for the 10 percent run, Case III, the workload assignments for each NARF could vary from 40 to 60 PAR's. Similarly, the 5 percent variation of CASE II would allow assignments ranging between 45 and 55 PAR's for each NARF.

Finally, the workload assignments for work done at non-Navy rework facilities were also excluded from the L.P. Workload. Thus, the model could only consider reallocation of work between the seven NARFs. Therefore, the total cost of the work assigned to non-Navy facilities, given in table 17, is fixed for all cases.

Program Cost Comparisons

The total program costs for Cases I, II and III are given in table 18. These costs include all depot maintenance for the Navy done at the NARFs and other rework facilities, and the work performed by the Navy for other customers. Again, the depot maintenance requirements are the same for all three cases. The total program costs for Cases II and III are $782.41 million and $780.42 million, respectively. When compared to the total cost for Case I, $784.63 million, the savings in cost are $2.22 million for Case II and $4.21 million for Case III.

The savings result from several sources. This is a breakdown of the total savings by source:

	Savings (Dollars)	
	Case II	Case III
Based on 1st shift rates	1,779,045	3,462,352
Multiple shift operation	8,517	-6,458
Manpower adjustments	639,129	956,638
Cost/volume adjustments	-206,571	-198,641
Total savings over Case I	2,220,120	4,213,891

TABLE 18

TOTAL PROGRAM COST SUMMARY
CASES I, II AND III
(Dollars)

Program:	Case I	Case II	Case III
Aircraft	230,403,164	230,280,457	230,158,148
Missile	12,814,598	12,800,622	12,787,722
Engine	117,665,524	116,652,302	115,673,082
F/J	189,006,874	188,377,736	187,808,858
Other	40,389,988	40,389,988	40,389,988
Special	190,216,289	190,216,287	190,216,287
Sub-total	780,496,437	778,717,392	777,034,085
Incremental second shift	238,156	230,148	245,798
Incremental third shift	27,520	27,520	27,520
Post third shift	104,769	104,260	103,585
Sub-total	780,866,882	779,079,320	777,410,988
Cost/volume adjustment	-2,197,605	-1,991,034	-1,998,964
Sub-total	778,669,277	777,088,286	775,412,024
Increase to manning level	152,258	57,441	0
Decrease to manning level	5,813,342	5,269,030	5,008,962
Grand total	784,634,877	782,414,757	780,420,986

Consider the savings which result for Case II. The savings based on first shift rates, $1.78 million, are due to a more cost effective allocation of the work between the NARF's. This savings may be derived from line 7 of table 18 which represents the total costs of the six major work programs. The total cost on line 7 for Case II is $778.71 million while it is $780.49 million for Case I. The difference is $1.78 million. These savings occurred because the model takes into account differences in the NORM and the rates for direct labor, direct material and overhead, and it assigns work so as to minimize cost. The second source of savings is due to a reduction in multiple shift costs of $8.517. Here the model not only attempts to reduce the reliance on multiple shifts, but also it takes into account differences in shift differentials between facilities. A third savings of $639,129 was due to less expensive changes in manpower. Finally, an increase in cost of $0.207 million occurs in the cost/volume adjustment. This change in the cost/volume adjustment is due to changes in the aggregate workload of each NARF.

Although the cost savings are not large, this is principally due to the limited extent to which the model was allowed to vary from Case I. As more alternatives are included in the L.P. Workload, additional savings and an even more balanced workload should result. It should be clear, however, that there is a limit to the savings accruing from reassignment of work; if additional reductions are necessary, eventually these can only be achieved through cuts in depot maintenance requirements.

Table 19 provides the costs of depot maintenance assigned to the seven NARFs for all three cases. The differences between these total costs are identical to the savings just discussed. This is because no work assigned to non-Navy facilities was allowed to vary. Finally, tables 20 and 21 show the cost of the work assigned to each NARF for Cases II and III, respectively. Again, the NARFs are listed from left to right in terms of decreasing expenditures. It should be noted that the ranking of the seven NARFs remains the same as for Case I.

Multiple Shift Comparisons

The model produces a Workload Variance Report for each NARF which shows the direct labor manhours required for the first, second and third shifts for each shop in a NARF. The following summary statistics are extracted from these reports which are contained in appendix C.

The total direct labor manhours assigned to the second, third, and post third shifts for the three cases are as follows:

		Direct labor manhours	
	Case I	Case II	Case III
Second shift	1,391,749	1,403,994	1,524,490
Third shift	86,000	86,000	86,000
Post third shift	49,187	48,948	48,631
Total	1,526,936	1,538,942	1,659,121

TABLE 19

TOTAL COST SUMMARY
ALL NARFS
(Dollars)

	Total cost - all fund sources		
	Case I	Case II	Case III
Program:			
Aircraft	195,302,497	195,179,790	195,057,481
Missile	11,326,939	11,312,963	11,300,063
Engine	107,587,793	106,574,571	105,595,351
Component	127,731,168	127,102,030	126,533,152
Other	35,404,020	35,404,020	35,404,020
Special	95,009,462	95,009,460	95,009,461
Sub-total	572,361,879	570,582,834	568,899,528
Incremental second shift	238,156	230,148	245,798
Incremental third shift	27,520	27,520	27,520
Post third shift	104,769	104,260	103,585
Sub-total	572,732,324	570,944,762	569,276,431
Cost/volume adjustment	-2,197,605	-1,991,034	-1,998,964
Sub-total	570,534,719	568,953,728	567,277,467
Increase to manning level	152,258	57,441	0
Decrease to manning level	5,813,342	5,269,030	5,008,962
Grand total	576,500,319	574,280,199	572,286,429

TABLE 20

CASE II
TOTAL COST SUMMARY
BY NARF
(Dollars)

Program	North Island	Alameda	Norfolk	Pensacola	Jacksonville	Cherry Point	Quonset Point
Aircraft	48,413,431	33,294,909	34,122,179	35,110,941	15,699,401	15,224,855	13,314,074
Missile	0	5,332,563	5,980,400	0	0	0	0
Engine	17,760,199	18,576,643	14,391,230	9,755,781	28,566,565	10,953,236	6,570,917
F/J	28,896,422	29,676,894	19,891,222	17,570,669	9,654,956	12,281,456	9,130,411
Other	9,259,941	7,636,282	4,734,157	4,451,550	3,022,851	4,196,602	2,102,637
Special	24,960,844	17,561,517	14,075,517	12,414,801	10,510,081	8,383,264	7,103,436
Sub-total	129,290,837	112,078,808	93,194,705	79,303,742	67,453,854	51,039,413	38,221,475
Incremental second shift	118,876	0	0	35,959	0	42,508	32,805
Incremental third shift	0	0	0	27,520	0	0	0
Post third shift	0	0	0	104,260	0	0	0
Sub-total	129,409,713	112,078,808	93,194,705	79,471,481	67,463,854	51,081,921	38,254,280
Cost/volume adjustment	32,343	254,527	−1,358,394	−231,001	−92,866	−336,466	−260,167
Sub-total	129,442,056	112,333,335	91,836,311	79,240,470	67,361,988	50,745,455	37,994,113
Increase to manning level	0	57,441	0	0	0	0	0
Decrease to manning level	0	0	728,833	1,191,493	1,568,627	92,013	1,688,064
Grand total	129,442,056	112,390,776	92,565,144	80,431,963	68,930,615	50,837,468	39,682,177

TABLE 21

CASE III
TOTAL COST SUMMARY
BY NARF
(Dollars)

Program	North Island	Alameda	Norfolk	Pensacola	Jacksonville	Cherry Point	Quonset Point
Aircraft	47,942,052	33,294,909	34,122,179	35,110,941	15,699,401	15,730,265	13,157,734
Missile	0	5,066,931	6,233,132	0	0	0	0
Engine	17,981,931	17,504,325	14,265,742	9,847,961	28,802,279	11,274,568	5,918,545
F/J	26,147,812	27,034,145	23,557,731	17,234,294	8,413,080	12,989,221	11,156,869
Other	9,259,941	7,636,282	4,734,157	4,451,550	3,022,851	4,196,602	2,102,637
Special	24,960,844	17,561,517	14,075,517	12,414,803	10,510,081	8,383,264	7,103,435
Sub-total	126,292,580	108,098,109	96,988,458	79,059,549	66,447,692	52,573,920	39,439,220
Incremental second shift	111,888	0	10,795	35,976	0	52,832	34,307
Incremental third shift	0	0	0	27,520	0	0	0
Post third shift	0	0	0	103,585	0	0	0
Sub-total	126,404,468	108,098,109	96,999,253	79,226,630	66,447,692	52,626,752	39,473,527
Cost/volume adjustment	575,093	547,008	–2,107,712	–189,614	28,950	–509,454	–343,235
Sub-total	126,979,561	108,645,117	94,891,541	79,037,016	66,476,642	52,117,298	39,130,292
Increase to manning level	0	0	0	0	0	0	0
Decrease to manning level	174,234	0	399,322	1,212,848	1,637,305	0	1,585,253
Grand total	127,153,795	108,645,117	95,290,863	80,249,864	68,113,947	52,117,298	40,715,545

The total manhours for multiple shift operations increased for Cases II and III. The increase for Case II is small, 12,007 hours, while the increase for Case III is larger, 132,184 hours. These increases were all due to increased usage of second shift work. The same amount of third shift work is required for all three cases; this occurs in one shop at NARF Pensacola. No third shift work is called for at any other NARF. Similarly, this same shop is heavily overloaded in Case I so that an overflow of work, post third shift, is required. The model does reduce the post third shift requirement in Cases II and III, but the change is small due to the limitations placed on the amount of work it was allowed to reallocate.

The following are the incremental costs of the multiple shift operations for the three cases:

TOTAL INCREMENTAL COST
(Dollars)

	Case I	Case II	Case III
Second shift	$238,156	$230,148	$245,798
Third shift	27,520	27,520	27,520
Post third shift	104,769	104,260	103,585
	$370,445	$361,928	$376,903

The total costs decreased slightly for Case II and increased slightly for Case III. The changes in total cost are predominantly due to changes in the second shift workload. The cost of third shift remains constant since no change in the workload occurred, while the cost of post third shift is reduced slightly due to a reduction in its workload.

The increased utilization of the second shift for Case III is principally due to the following. For this case, the model was given more flexibility in the reallocation of work between the NARF's. Thus, work was reassigned to those facilities having more favorable NORMS and rates. Even though this required an increase in second shift work at the acquiring facilities, the net effect was a decrease in the total cost of the program.

Table 22 shows how the second shift workload was distributed between the NARFs for Cases I and III. The total second shift workload and its allocation to each shop within a NARF is given. A comparison of the total second shift workload indicates that Case III reallocated work from NARF's Alameda and North Island to NARF's Norfolk, Cherry Point and Quonset Point. NARF's Jacksonville and Pensacola had little change in their second shift work. The above reassignments of work are not only due to more favorable NORMS and rates at the acquiring facilities, but they also reflect savings in manpower adjustments since the model optimizes all costs. As an example, Case I called for hiring at NARF Alameda while Case III did not. It appears that the reduction in second shift work at NARF Alameda avoided the cost of hiring additional personnel. In addition, the increased workload for the acquiring facilities reduced the extent to which these facilities had to RIF personnel. The above results also hold in general for Case II. Table 23 shows the second shift workload for each NARF for Cases I and II.

TABLE 22

SECOND SHIFT WORKLOAD
CASES I AND III
(Manhours)

Shop \ Case NARF	Alameda		Norfolk		North Island		Quonset Point		Jacksonville		Cherry Point		Pensacola	
	I	III	I	III	I	III	I	III	I	III	I	III	I	III
Airframe	0	0	0	0	474,448	417,597	196,374	194,501	0	0	28,830	95,126	170,817	170,261
Engine	0	0	0	0	0	0	0	0	0	0	0	29,711	6,954	12,079
Accessories/component	0	0	0	0	0	0	0	0	0	0	154,000	230,905	0	0
Electronics/armament	70,683	0	0	63,499	0	0	0	0	0	0	0	0	0	0
Support	0	0	0	0	124,634	115,202	0	0	0	0	40,174	50,661	86,000	86,000
Manufacturing	0	0	0	0	0	0	27,098	50,547	0	0	0	0	11,737	8,401
Total	70,683	0	0	63,499	599,082	532,799	223,472	245,048	0	0	223,004	406,403	275,508	276,741

TABLE 23

SECOND SHIFT WORKLOAD
CASES I AND II
(Manhours)

Shop \ Case NARF	Alameda I	Alameda II	Norfolk I	Norfolk II	North Island I	North Island II	Quonset Point I	Quonset Point II	Jacksonville I	Jacksonville II	Cherry Point I	Cherry Point II	Pensacola I	Pensacola II
Airframe	0	0	0	0	474,448	445,834	196,374	195,643	0	0	28,830	61,978	170,817	170,578
Engine	0	0	0	0	0	0	0	0	0	0	0	14,226	6,954	9,728
Accessories/components	0	0	0	0	0	0	0	0	0	0	154,000	203,525	0	0
Electronics/armament	70,683	0	0	0	0	0	0	0	0	0	0	0	0	0
Support	0	0	0	0	124,634	120,243	0	0	0	0	40,174	47,258	86,000	86,000
Manufacturing	0	0	0	0	0	0	27,098	38,678	0	0	0	0	11,737	10,303
Total	70,683	0	0	0	599,082	566,077	223,472	234,321	0	0	223,004	326,987	275,508	276,609

Table 24 shows the percent utilization of the shops for each NARF for all three cases. The percent utilization is calculated by dividing the total workload of a shop by its first shift capacity. Thus, a percent utilization of less than 100 percent means that less than a full first shift is required. Similarly, a percent utilization greater than 100 percent means that multiple shift operations are required. A comparison of the percent utilization shows the same general results as discussed above. The utilizations for NARF's Alameda and North Island are reduced due to a transfer of work from these facilities. Since this work was principally reallocated to NARF's Norfolk, Cherry Point and Quonset Point, their utilizations increase. Finally, the utilizations at NARF's Jacksonville and Pensacola remain about the same for all three cases.

Manpower Adjustments

The following are the manpower adjustments called for in all three cases:

	Case I		Case II		Case III	
	Men	Cost	Men	Cost	Men	Cost
Increase	173	$152,258	65	$57,441	0	0
Decrease	1,660	5,813,342	1,505	5,269,030	1,432	5,008,962

Case I called for a hiring of 173 men at a one time cost of $152,258 and the laying off of 1,660 men at a one time cost of $5.81 million. Even though the model was not given much flexibility in reassigning work for Cases II and III, it was able to reduce manpower adjustments significantly. Case II reduced by 108 the need to hire and eliminated the need to hire in Case III. The number of personnel to be separated in Cases II and III was reduced by 155 and 228 men, respectively. This represented a savings in manpower adjustment costs of $639,129 for Case II and $956,638 for Case III.

Table 25 shows the manpower adjustments and costs by NARF for all three cases. Case I required hiring at NARF Alameda and reductions in manpower at five of the remaining NARFs. Cases II and III reduced the need for hiring manpower at NARF Alameda and changed the manpower reductions called for at the remaining NARFs. Again, the next effect was a reduction in the total number of people to be separated.

Parametric Analysis

As emphasized in chapter II, the model provides an extensive amount of information on the aggregate effects of changes in either the variables or constraints used in a particular run. The parametric feature allows the evaluation of changes in:

- Requirements
- Shop capacities
- Manning levels
- Production bounds
- Cost and engineering data

TABLE 24

SHOP UTILIZATION CASES I, II, AND III (Percent)

Shop \ Case NARF	Alameda			Norfolk			North Island			Quonset Point			Jacksonville			Cherry Point			Pensacola		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Airframe	74	74	74	81	81	82	133	131	129	140	140	140	93	93	93	104	109	114	114	114	114
Engine	67	64	61	74	75	76	92	91	90	81	77	73	73	74	75	99	103	107	102	102	103
Accessories/component	65	61	58	72	76	81	74	72	70	61	65	69	55	53	51	124	132	137	66	65	65
Electronics/armament	107	100	94	89	97	105	84	80	76	61	71	82	44	40	36	82	88	91	77	76	75
Support	89	89	88	83	84	86	124	123	122	64	64	64	98	97	97	119	122	124	357	357	357
Manufacturing	92	90	88	62	64	66	79	79	78	108	111	114	38	37	37	91	93	94	102	102	102

TABLE 25

MANPOWER ADJUSTMENTS
CASES I, II, AND III

NARFS \ (Men) Costs	Manpower increases			Manpower decreases		
	Case I	Case II	Case III	Case I	Case II	Case III
Alameda	(173) 152,258	(65) 57,441	(0) 0	(0) 0	(0) 0	(0) 0
Norfolk	(0) 0	(0) 0	(0) 0	(301) 1,052,700	(208) 728,833	(114) 399,322
North Island	(0) 0	(0) 0	(0) 0	(0) 0	(0) 0	(50) 174,234
Quonset Point	(0) 0	(0) 0	(0) 0	(508) 1,779,412	(482) 1,688,064	(453) 1,585,253
Jacksonville	(0) 0	(0) 0	(0) 0	(424) 1,483,755	(448) 1,568,627	(468) 1,637,305
Cherry Point	(0) 0	(0) 0	(0) 0	(91) 320,215	(26) 92,013	(0) 0
Pensacola	(0) 0	(0) 0	(0) 0	(336) 1,177,260	(341) 1,191,493	(347) 1,212,848
Total	(173) 152,258	(65) 57,441	(0) 0	(1,660) 5,813,342	(1,505) 5,269,030	(1,432) 5,008,962

To facilitate the selection of items for parameterization, each run of the model produces two sets of reports: Shadow Price Reports and Reduced Cost Reports. The Shadow Price Reports provide estimates of the change to total costs which would result from a unit change in each constraint used in the model. Similarly, the Reduced Cost Reports provide estimates of changes in total cost which would result from a unit change in the value of any variable as assigned in the model. These reports can thus be used to locate either variables or constraints for which a change in their specification may be promising.

The following is a simple example of how changes in requirements can be analyzed. The shadow price statistics for three depot maintenance requirements are:

	Current requirement	Change in cost per unit increase
Requirement 1	97	$69,126
Requirement 2	11	70,273
Requirement 3	44	54,326

The first requirement is a helicopter PAR while the second and third are for aircraft PAR's. The first column gives the total number required in the basic run. The second column is an estimate of the change in total cost for a one unit increase in each requirement. Thus, for requirement 1, $69,126 is estimated as the increase in total costs if the number required is changed from 97 to 98.

The following are the changes which were analyzed with the parametric feature of the model:

	Run 1 no. required	Run 2 no. required	Run 3 no. required	Run 4 no. required
Requirement 1	97	101	105	109
Requirement 2	11	10	9	8
Requirement 3	44	42	40	38
Total program cost (millions)	$782.65	$782.74	$782.84	$782.94

The first requirement was increased by increments of 4 units, while the second and third were reduced by increments of 1 and 2, respectively. Thus, one requirement was forced to increase while the other two were forced to decrease. As shown by the total program costs, the net effect was a gradual increase in cost. The parametric feature represents a quick way of evaluating a variety of options which may be under consideration.

SUMMARY

The model was used to produce production plans and budgets for FY-1974 for three cases. The first case was a plan developed in January 1972 by NavAir's Long Range Planning Group. Cases II and III allowed a 5 and 10 percent variation, respectively, from NavAir's basic plan. The production plans for Cases II and III resulted in total savings of $2.22 million and $4.21 million, respectively. These savings arose from the assignment of work to lower cost facilities, changes in the amount and distribution of multiple shift operations and reductions in the manpower adjustments required.

The model used to perform these cases has been programmed for use on an IBM 360/65 computer. The matrix generator simultaneously set up the problems for all three cases with a wall-clock time of 7.7 minutes; The average wall-clock time for the linear programming package to solve each case was 9.24 minutes, 29 percent of this time was for the control processing unit. Given the small run times required and the extensive amount of information provided, it is recommended that the Navy use the model in conjunction with its current long range planning system.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

It was concluded early in the study that it was not necessary to develop a completely new system for long range planning of the Depot Maintenance Program. The steps taken by NavAir over the past five years to improve its long range planning capability have been most successful. NavAir's system now includes a comprehensive data base, an information system to maintain that base, and an extensive reporting capability. It was determined that the greatest benefits would result from the development of an analytical tool which builds upon the current system and extends the range and depth of questions that can be addressed.

The generation and evaluation of alternative production plans is now a time-consuming process. It requires a complete specification of the workload assignments for all requirements in the Depot Maintenance Program. This must be completed before summary reports can be produced to evaluate the costs and feasibility of the plan. This study has shown that this process is greatly simplified by imbedding the workload assignment function within a cost minimization problem. There are three basic advantages to this approach over the current system. First, a much larger number of workload assignments are generated within the model; all possible workload assignments within the production bounds specified by the planner are considered. In addition, the plans are consistent with the inherent constraints of the rework system such as shop and manpower capacities. Second, each plan which is feasible is evaluated on the basis of cost and the least-cost plan is identified. It is true that decisions cannot be made solely on the basis of quantifiable costs. A plan which calls for a significant workforce reduction may be cost effective, but it may not be best in terms of other long run goals of the government. Thus, a more gradual transition may be preferred to avoid potential impacts on a local economy. However, these types of restrictions can be taken into account by varying the constraints used to model the rework system, and most important, the cost of conforming to these restrictions is identified. Finally, many of the assumptions and constraints included in the model are controllable, at least in the long run, by the decision maker. The parametric capability of the model allows the planner to evaluate many "what if" questions such as the cost and production implications of changes in requirements, shop capacities, manpower, and the production bounds.

RECOMMENDATIONS

It is recommended that NavAir adopt the proposed model for use in conjunction with its current long range planning system. It is expected that implementation and use of the model would be accomplished in the Depot Level Long Range Planning and Programming Group (AIR-414A2). This group currently performs the long range planning functions for which the model has been designed. In addition, the model has been programmed to be compatible with this group's data base, coding system, and reporting needs. Two additional documents have been prepared, a User's Manual (reference (b)), and a Programmer's Guide (reference (c)) to facilitate the implementation of the system.

Several suggestions for future research are discussed in the next section. It is recommended, however, that experience with the model, as it is currently configured, be gained first before further extensions are considered. Since these extensions could require new data and programming it is best that they be considered on an individual basis, taking into account the benefits to be derived in terms of improved plans and better decisions. The most profitable extensions to make will become apparent only after using the model.

Finally, a larger proportion of the Depot Maintenance Program should be included in the optimization (Linear Programming) portion of the model rather than in the base workload. It is obvious that the model will not be able to find cheaper methods of performing the work or a more balanced workload unless it is given alternatives to test. The inclusion of more alternatives is not a simple problem; time and effort must be expended to develop these alternatives. This requires a detailed understanding of what each rework activity entails and what alternative facilities have the necessary expertise and resources to accomplish the work. This is, however, an important objective which only the planners in depot maintenance can perform. Thus, a major recommendation is that when implemented, initial efforts should focus on the inclusion of more rework activities into the optimization portion of the model. There is a practical limit as to how far this process should go, but, it is felt this limit has not yet been reached. These additions should produce even greater savings and more promising workloads than shown in the case analysis of chapter III.

FUTURE RESEARCH

As discussed in chapter II, the linear programming package used in the model has the computational capability to accept many more variables and constraints than are currently included. Thus, one emphasis of future research could be an evaluation of specific types of facilities, equipment, or skills which if modeled would improve the realism of the resulting production plans. Two examples have already been discussed, namely engine test cell capacities, and the relationship between engine repairs and the work done under the Aircraft Program. NavAir is currently obtaining data on these relationships which should facilitate their incorporation in the model.

The following is another example worth considering. When making workload assignments, planners take into account the geographical distribution of the demands for each rework activity. Thus, 40 percent of the PAR's for a specific type/model/series aircraft may arise on the East Coast while the remaining 60 percent occur on the West Coast. By making workload assignments conform closely to these percentage splits, planners are assured that transportation costs and out-of-service transit times are minimized. This can be accomplished in the model now through the use of the production bounds. However, it may be potentially useful to estimate the transport costs for the major rework activities in the program and include these directly in the model. This would allow an overall optimization of production costs, transport costs and out-of-service costs.

A final area for future research is concerned with the cost/volume relationships used to account for changes in overhead costs. Clearly, some overhead costs are fixed for wide variations in total output, while others vary with output. A capability to adjust for cost/volume relationships is included in the model, and it conforms to the basic approach now used. The accuracy of such an approach of course depends upon the accuracy of the specific cost/volume relationships which are supplied to the model. A useful contribution would result from an intensified empirical investigation of how costs vary with output. Sound estimation of these relationships should facilitate decisions concerned with the appropriate number and size of the rework facilities.

REFERENCES

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(d) Hillier, Frederick S., and Lieberman, Gerald J., Introduction to Operations Research, Holden-Day, Inc., San Francisco, 1967

(e) Stanford Research Institute Project No. IU-1375 for Department of the Navy, Bureau of Aeronautics, 31 May 1956

(f) SecDef Memo dated 21 Nov 1964; "Aeronautical Depot Maintenance Cost Comparison Study - Beardsley Study," Unclassified 1965

APPENDIX A

STUDY DIRECTIVE

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

IN REPLY REFER TO
OP96/Lb
Ser 295P96

13 MAY 1972

From: Chief of Naval Operations
To: Distribution List

Subj: Study Directive for Naval Aircraft Rework Facility Study

Ref: (a) CNO ltr ser 00502P96 of 29 Nov 1971; CNO FY-72 Study Program
(b) DON PIC ltr ser 00274PIC of 8 Dec 1971; Selected Analyses for 71-72

1. Title. Naval Aircraft Rework Facility Study (NARFS).

2. Type. CNO Study conducted by CNA.

3. Background. Changes in the level, mix, and activity of naval aircraft forces affect rework requirements for the Navy's Aircraft Rework Facilities. Navy managers must have the capability to analyze the impact of these changes in forces on the rework system to insure that rework requirements are met in a timely and efficient manner. This study is included in the CNO FY-72 Study Program, reference (a) and conforms with the selected analyses directed in reference (b).

4. Objective.

a. The study objective is to develop a model suitable for incorporation into the existing Aeronautical Depot Long Range Planning and Programming System. Given alternative force levels, mixes, and flying hour programs, the model is to generate and provide measures to evaluate alternative rework production plans, giving due consideration to their feasibility, efficiency, and cost.

b. The model will include, to the greatest extent possible, all the aeronautical depot maintenance programs, such as aircraft, engine and component reworks and fleet and general support functions, which are required to support naval aircraft forces. The model is to accurately reflect the production capability of all Naval Aircraft Rework Facilities (NARF's), including explicit recognition of all major constraints such as capacity, manpower, and budget, as well as the organic/commercial mix. In addition, it will have the capability, through sensitivity analyses, to evaluate the impact of altering those constraints which are realistically controllable in the short or long run.

c. It is expected that such a model will not only determine the impact of alternative force levels on the rework program, but that it will also be useful in seeking more efficient production plans.

5. Specific Guidance.

a. The planning of a rework program is a sequential decision process: (1) the level and mix of forces are chosen; (2) maintenance procedures, frequency of PAR's, etc., are specified; and finally, the first two are used to (3) develop an aggregate production plan. The model is to emphasize the third stage in this decision process. It should have the flexibility to accept differing force levels, mixes, and maintenance philosophies, including wartime consideration, and to evaluate their impact. All of the present NARF's will be considered.

b. In order to provide the decision makers with quantitative measures of the major differences among alternatives developed to support the most effective and efficient options, it is imperative that:

(1) Assumptions necessary to structure the analysis be clearly identified (Study Project Officers' Handbook stipulates that assumptions should be clearly stated in a separate paragraph at the beginning of the report. Further, those assumptions which are applicable should be restated at the beginning of each chapter, annex or appendix to the report).

(2) Sensitivity checks and uncertainty analyses will be conducted for assumptions. Whenever possible the effect of relaxing the assumptions should be identified. Uncertainties as far as threat, technical, cost, and operational parameters should be explored in reasonable ranges to identify the sensitivity of the study results to such uncertainties. While a certain amount of judgment is required to identify key parameters, the range of uncertainty needs to be explored and addressed in the report. It is generally useful to begin the analysis with the best estimates available and to introduce variations, pessimistic on lower limits and optimistic on upper limits to identify the effects of uncertainty on various parameters. Special emphasis will be placed on the realistic factors identified in the Project Officers' Handbook.

(3) Detailed design specifications for each model will be collected by the study project officer and will be included in the permanent files of the study except that if the project officer determines that the design specifications for a given model are already included in a permanent OPNAV file, the project officer may elect to include reference to that file instead of duplicating the model design specifications in the permanent files for this study.

6. Purpose. The primary purpose of this study is to provide Navy managers with the capability of relating support requirements to aircraft forces.

7. Coordination.

a. The study sponsor is the Director, Navy Program Planning (OP-090).

b. The Cog OP and Deputy Study Sponsor is the Deputy Chief of Naval Operations (Air Warfare) (OP-05).

c. The Study Director is Dr. Richmond M. Lloyd, CNA.

d. CDR Carl O. Hausler, OP-96-OSG, is designated the CNO Project Officer and is responsible for compliance with current instructions on the CNO Studies and Analyses program and guidance.

e. An advisory committee will be established with the Director, Aviation Program Division (OP-51), Chairman, and the following members or their designated representatives: OP's 90, 96, and CNA. OPA, OP-04, NAVMAT, and NAVAIRSYSCOM are invited to participate in advisory committee proceedings.

f. The Advisory Committee Chairman shall arrange such meetings with the 1971-1972 Selected Analyses Advisory Board as may be required by the Chairman of that Board.

8. Reporting.

a. Submit Study Plan to Advisory Committee by 17 May 1972. Do not delay study progress pending approval of the Study Plan.

b. Submit Monthly Progress Reports to OP-96 in accordance with current instructions.

c. Schedule of briefings:

Briefings and reports as specified in the study plan.
June - Presentation of Report.

d. Draft report delivered by 1 June 1972. Final report delivered 30 days after completion of review of the draft report.

W. H. Bagley

W. H. BAGLEY
Director, Navy
Program Planning

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APPENDIX B

DEFINITIONS

SECTION 1: SUB-PROGRAMS

SECTION 2: PRODUCTION SHOP CATEGORIES

SECTION 3: INPUT DATA AND SOURCE

SECTION 1

SUB-PROGRAMS

The sub-programs listed below depict the type of rework activities performed in the depot maintenance program.

overhaul
overhaul/conversion
crash damage overhaul
progressive aircraft rework (PAR)
PAR/modification
PAR/conversion
PAR/repair
F/S (AIR 414 custody) PAR
Federal Aviation Agency (FAA) inspections
progressive maintenance (PM)
modernization
modification (MOD)
conversion
modernization/conversion
Naval engineering support programs
manufacturing for stores
manufacturing for modernization
repair
field team, South East Asia (SEA)
aircraft & engine accessories and components rework
electronic & communications equipment rework
force support
general support
inspect and repair as necessary (IRAN)
indirect NARF support
reclamation in lieu of procurement (RILOP)
special reimbursement
special systems support
auxiliary support
other maintenance support
ground support equipment
test equipment calibration
equipment modification
assigned technical assistance
missile component repair
missile component repair/modification
missile motors
ordnance
targets
IRAN/REPAIR
stricken aircraft reclamation and disposal program (SARDIP)
activation
inactivation
storage

SECTION 2

PRODUCTION SHOP CATEGORIES

The following are abbreviated descriptions of the major activities performed in the nine shop categories used to model each NARF. NavAir has developed more detailed shop capacities, shop manning levels and workload distribution factors. These definitions and guidelines resulted from DoD Instruction 4151.15 and were used to insure consistent reporting by each NARF.

Airframes - Production Ship Category No. 1

Covered areas associated with processing the airframe under those programs commonly identified as PDLM (Periodic Depot Level Maintenance), IRAN (Inspect and Repair as Necessary) maintenance, crash damage repair and/or overhaul, modernization, modification, etc. The work functions include stripping, disassembly, airframe repair, reassembly, refinishing and systems check.

Engines - Production Shop Category No. 2

Covered areas associated with processing jet, turbo-jet, and reciprocating type aviation engines (including gas turbine compressors and auxiliary power plant turbines) in terms of overhaul, low time, complete repair, and major inspection. The work functions include uncanning, disassembly, cleaning, metals examination, examination and evaluation, parts reconditioning, sub-assembly, final assembly, preservation and tests.

Accessories and Components - Production Shop Category No. 3

Covered areas associated with processing airframe and engine accessories such as surfaces, hydraulic components, electrical equipment, pneumatics equipment, landing gear, fuel accessories, propellers, airborne photographic equipment, instruments, etc.

Electronics, Communications and Armament - Production Shop Category No. 4

Covered areas associated with processing airborne communication, navigation, airborne data computers, fire control, and bombing system equipment, etc., used by the aircraft in carrying out its assigned mission.

Armament - Production Shop Category No. 5

Covered areas associated with processing weapons, guns and missiles used by the aircraft in carrying out its assigned mission.

Support Equipment - Production Shop Category No. 6

Covered areas associated with processing aviation general and special support equipment and aerospace ground equipment including calibration and repair functions.

Manufacture and Repair - Production Shop Category No. 7

Covered areas which are not an integral part of other categories previously prescribed, and which contribute to aircraft repair operations by such work functions as parts, cleaning; painting and plating; parachute, ordnance, photographic, leather, and fabric repair; machine and metal repair and fabrication, etc.

Test and Calibration - Production Shop Category No. 8

That space, either covered or uncovered, which is used to test, trim or calibrate engines, electronics communications or armament systems. The equipment can be either installed on the aircraft or on special test stands. General ramp area is not included in the area.

Other - Production Shop Category No. 9

That space used to perform productive work other than covered or uncovered areas included in Production Shop Categories No. 1 through No. 8 above. Includes ramp, apron, aircraft storage sites, work performed away from facility by field teams, etc.

SECTION 3

INPUT DATA AND SOURCE

Listed below are the major inputs to the long-range planning model and a brief description of the data. The source for each of these inputs is also included.

1. U.S. Navy Aircraft Program-Resources (Exhibit A-II of Congressional budget submission): Projects distribution of approved force levels which define the number of operating aircraft by inventory status including gains and losses such as new production, conversion, damage and retirement by type, model and series. Source: NOP-512

2. U.S. Navy Aircraft-Estimated Reworks (Exhibit A-VII of Congressional budget submission): projects active and operational aircraft inventories and rework quantities by type, model and series including the type of rework to be performed. Source: NOP-512

3. Aircraft Program Data File (APDF): projects the distribution of approved force level aircraft among using activities by geographical location along with their associated flying hour program. Source: NOP-512.

4. Operational Safety and Improvement Program Listing: represents a list of product improvements for aircraft, air launch weapons, engines, and accessories and components. Source: NOP-506

5. Mission Essentiality Listing: designates by a percentage factor those aircraft determined to be mission essential within a type, model, and series. Source: NOP-512

6. Aircraft Engine Rework Requirements: reflects engine rework quantities by type, model, and series necessary to support the projected Naval Aviation Flying Hour Program. Source: NAIR-412 & 414, in consonance with Flying Hour Program NOP-51

7. Weapons System Planning Directive: provides overall program guidance for a given weapons system. Source: NAIR-101

8. Depot Maintenance Interservice Support Agreements: determines cross service support requirements. Source: NAIR-414 and interested service.

9. Production Performance Reports and Summaries: provides past and current employment, fiscal, and production data. Source: NARF's and NAIR-414

10. NORM and Manhour Allocation Data: provided by program, sub-program, customer, fund source and activity. Source: NAIR-414, workload conferences, NavAirREPS Pac & Lant

11. Navy Industrial Fund (NIF) A-11 Budget Data: projection of NIF operating budget for each NARF based on prior, current and budget year data. Source: NARF's and NAIR-414

12. Cost Volume Analysis Data: specifies general and administrative rates for each activity under varying workloads. Source: NARFs and NAIR-414

13. Facility Capacities: direct manhours related to production shop category. Source: NARFs and NAIR-414

14. NORM Distribution: specifies percent of direct manhours allocated to each production shop category; measures facility utilization. Source: NARFs, NAIR-414, NORS Pac and Lant

APPENDIX C

REPORTS FOR THE CASE ANALYSIS

SECTION 1: DESCRIPTION OF REPORT FORMATS

SECTION 2: CASE I, LRPG ASSIGNMENTS

SECTION 3: CASE II, ±5% VARIATION OF ASSIGNMENTS

SECTION 4: CASE III, ±10% VARIATION OF ASSIGNMENTS

SECTION 1

DESCRIPTION OF REPORT FORMATS

This appendix contains the reports produced for each of the three (3) case studies. The first case maintains the assignments of the Long Range Planning Group with no variation allowed. The second and third cases allow the assignments to vary 5 and 10 percent, respectively, from the assignments made in the first case.

A sample of each of the five types of reports contained in sections 2, 3, and 4 is included in this section with a detailed explanation of each caption annotated on the sample report.

- Workload Assignment - The assignment of workload to each NARF or non-Navy facility is shown plus a total which is the total quantity of units required to be reworked within a program for each TEC, sub-program, and customer.

- Workload Variance Report - The workload assigned by the LRPG, the L.P. assigned workload, and a total in manhours is shown along with shift workload and capacity. A percent utilization for each shop and a variance for all shops with a defined capacity is calculated.

- Program Cost Report - The total cost for each program and fund code within a NARF is shown. Total costs are also shown for the incremental second, third, and post third shift workload, the cost/volume adjustment, and increases and decreases to the manning level.

- DOP Cost Report - This report is the same as the Program Cost Report except it is broken out by NARF.

- DOP Workload - Cost Summary Report - The total manhours and costs for each NARF is summed and listed.

An index to the DOP, PROGRAM, SUB-PROGRAM, and CUSTOMER codes used in the three case studies is provided on page C-81.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE I　　DATE 1 JUNE 1972

PROGRAM A　　YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0022	D	A	0.	0.	0.	0.	11.	0.	0.	0.	0.	0.	0.	0.	11.
0023	D	A	0.	0.	0.	0.	44.	0.	0.	0.	0.	0.	0.	0.	44.
0056	D	A	0.	0.	18.	0.	0.	23.	0.	0.	0.	0.	0.	0.	41.
0059	D	A	0.	0.	68.	0.	0.	56.	0.	0.	0.	0.	0.	0.	124.
0062	D	A	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0063	D	A	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0064	D	A	0.	11.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0065	D	A	0.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0084	D	A	0.	0.	0.	13.	0.	0.	0.	0.	0.	0.	0.	0.	13.
0086	D	L	0.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0087	D	A	0.	0.	0.	22.	0.	0.	0.	0.	0.	0.	0.	0.	22.
0088	D	A	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0089	D	A	0.	0.	0.	14.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0089	F	A	0.	0.	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0094	D	A	0.	0.	70.	0.	0.	27.	0.	0.	0.	0.	0.	0.	97.
0094	D	B	0.	0.	10.	0.	0.	9.	0.	0.	0.	0.	0.	0.	19.

Total workload assigned to a NARF for a TEC, S/P, and customer.

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE I
DOP A

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1554657.	0.	0.	1554657.	1554657.	2094000.	0.	2093999.	0.	2093999.	0.	74.
ENGINE	340608.	0.	601190.	941798.	941798.	1400000.	0.	1399999.	0.	1399999.	0.	67.
ACC/COMP	502579.	0.	728113.	1230692.	1230692.	1908000.	0.	1907999.	0.	1907999.	0.	65.
ELEC/ARM	296490.	0.	732193.	1028683.	958000	958000.	70683.	958000.	0.	958000.	0.	107.
SUPPORT	438694.	0.	15239.	453932.	453932.	510000.	0.	510000.	0.	510000.	0.	89.
MFG'NG	592613.	0.	154365.	746979.	746979.	812000.	0.	812000.	0.	812000.	0.	92.
SUB TOTL	3725641.	0.	2231101.	5956742.	5886059.	7682000.	70683.	7681997.	0.			
VARIANCE					5886059.	7682000.	70683.					78.
OTHER	165301.	0.	15239.	180540.								
TOTAL	3890943.	0.	2246339.	6137282.								

BASE WORKLOAD: Fixed portion of the total workload assigned by LRPG and not assigned by the L.P. model which is accomplished on the first shift.

INCREMENT BASE WORKLOAD SHIFT 2 & 3: Fixed portion of the total workload assigned by LRPG and not assigned by the L.P. model which is accomplished on the second and third shifts.

L.P. ASSIGNED WORKLOAD: That portion of the total workload which is assigned by the L.P. model to all shifts.

TOTAL WORKLOAD: The sum of the LRPG workload (base workload and increment base workload shift 2 & 3) and the L.P. assigned workload. It is also the sum of the first, second, and third shift workload.

SHIFT 1, 2, & 3 WORKLOAD: The total amount of workload (TOTAL WORKLOAD) performed on each of the three shifts which includes both LRPG base workload and L.P. assigned workload.

SHIFT 1, 2, & 3 CAPACITY: The amount of workload which can be performed on each shift.

POST SHIFT 3 WORKLOAD: The amount of workload, which could not be performed within the total capacity of shifts 1, 2, & 3, needed to meet the given total requirement.

PERCENT UTILIZED: TOTAL WORKLOAD for each SHOP CATEGORY divided by SHIFT 1 CAPACITY.

VARIANCE/PERCENT UTILIZED: SUM of subtotal of SHIFT 1, 2, & 3 WORKLOAD divided by subtotal of SHIFT 1 CAPACITY.

OTHER (SHOP CATEGORY): Does not have a defined capacity and is therefore shown below VARIANCE calculation.

PROGRAM COST REPORT

RUN NO./NAME ALL NARFS CASE I

DATE 1 JUNE 1972
YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	173998103.	42639283.	216637387.	13493165.	272612.	13765777.	230403164.
MISSILE	6474424.	0.	6474424.	848338.	5491836.	6340174.	12814598.
ENGINE	41911306.	48528518.	90439824.	26516385.	709315.	27225700.	117665524.
F/J	67642378.	121364496.	189006874.	0.	0.	0.	189006874.
OTHER	40389988.	0.	40389988.	0.	0.	0.	40389988.
SPECIAL	23976860.	0.	23976860.	166239429.	0.	166239429.	190216289.
INCREMENTAL 2ND SHIFT							238157.
INCREMENTAL 3RD SHIFT							27520.
INCREMENTAL POST THIRD SHIFT							104769.
SUB TOTAL	354393060.	212532298.	566925357.	207097317.	6473763.	213571080.	780866883.
COST/VOLUME ADJ.							-2197604.
SUB TOTAL							778669279.
INCREASE TO MANNING LEVEL							79527.
DECREASE TO MANNING LEVEL							7854957.
GRAND TOTAL							786603763.

BASE WKLD FUND ONE/TWO: Fixed portion of the total workload assigned by the LRPG and not assigned by the L.P. model for fund codes one and two.

L.P. WKLD FUND ONE/TWO: That portion of the total workload which is assigned by the L.P. model for fund codes one and two.

INCREMENTAL 2ND, 3RD, & POST THIRD SHIFT: Cost of applying the incremental or differential shift charge to the total hours assigned to a shift.

COST/VOLUME ADJ: Adjustment made to total cost because of a change in volume (total manhours) required at a NARF requiring new cost rates.

INCREASE/DECREASE TO MANNING LEVEL: Increases to costs due to the hiring or firing of personnel.

DOP COST REPORT

RUN NO./NAME CASE I
DOP A

DATE 1 JUNE 1972
YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	31592841.	0.	31592832.	1702068.	0.	1702068.	33294896.
MISSILE	2018451.	0.	2018450.	237203.	3364678.	3601880.	5620330.
ENGINE	5430715.	14188350.	19619056.	0.	0.	0.	19619056.
F/J	42535.	33146011.	33188544.	0.	0.	0.	33188544.
OTHER	7636282.	0.	7636281.	0.	0.	0.	7636281.
SPECIAL	3415555.	0.	3415555.	14145962.	0.	14145962.	17561504.
INCREMENTAL 2ND SHIFT							16257.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	50136378.	47334361.	97470739.	16085234.	3364678.	19449911.	116936848.
COST/VOLUME ADJ							-102630.
SUB TOTAL							116834208.
INCREASE TO MANNING LEVEL							79527.
DECREASE TO MANNING LEVEL							0.
GRAND TOTAL							116913728.

Same as PROGRAM REPORT except this is by NARF.

DOP WORKLOAD - COST SUMMARY REPORT

RUN NO./NAME CASE I

DATE 1 JUNE 1972

DOP	MANHOURS	COSTS
ALA	6137282.	116913728.
NOR	5377561.	90416786.
N.I.	7318723.	132098463.
Q.P.	2152197.	38991888.
JAX	2551868.	70135936.
C.P.	2786852.	49054960.
PNS	4377572.	80857006.
TOTAL	30751200.	578683136.

MANHOURS: Total manhours expended by NARF.

COSTS: Total costs by NARF.

SECTION 2

CASE I, LRPG ASSIGNMENTS

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE I DATE 1 JUNE 1972

PROGRAM A YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0022	D	A	0.	0.	0.	0.	11.	0.	0.	0.	0.	0.	0.	0.	11.
0023	D	A	0.	0.	0.	0.	44.	0.	0.	0.	0.	0.	0.	0.	44.
0056	D	A	0.	0.	18.	0.	0.	23.	0.	0.	0.	0.	0.	0.	41.
0059	D	A	0.	0.	68.	0.	0.	56.	0.	0.	0.	0.	0.	0.	124.
0062	D	A	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0063	D	A	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0064	D	A	0.	11.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0065	D	A	0.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0084	D	A	0.	0.	0.	13.	0.	0.	0.	0.	0.	0.	0.	0.	13.
0086	D	L	0.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0087	D	A	0.	0.	0.	22.	0.	0.	0.	0.	0.	0.	0.	0.	22.
0088	D	A	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0089	D	A	0.	0.	0.	14.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0089	F	A	0.	0.	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0094	D	A	0.	0.	70.	0.	0.	27.	0.	0.	0.	0.	0.	0.	97.
0094	D	B	0.	0.	10.	0.	0.	9.	0.	0.	0.	0.	0.	0.	19.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE I

PROGRAM B

DATE 1 JUNE 1972

YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0182	S	L	152.	101.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	253.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE I — DATE 1 JUNE 1972

PROGRAM E — YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0146	A	A	36.	0.	0.	0.	0.	44.	0.	0.	0.	0.	0.	0.	80.
0147	A	A	86.	0.	0.	0.	0.	18.	0.	0.	0.	0.	0.	0.	104.
0148	A	A	24.	0.	0.	0.	0.	36.	0.	0.	0.	0.	0.	0.	60.
0149	A	A	160.	0.	0.	0.	0.	86.	0.	0.	0.	0.	0.	0.	246.
0151	A	A	160.	0.	0.	0.	0.	278.	0.	0.	0.	0.	0.	0.	438.
0154	A	A	40.	0.	0.	0.	0.	51.	0.	0.	0.	0.	0.	0.	91.
0160	P	A	0.	0.	0.	0.	0.	19.	95.	0.	0.	0.	0.	0.	114.
0161	A	A	73.	0.	0.	0.	110.	0.	0.	0.	0.	0.	0.	0.	183.
0161	P	A	34.	22.	0.	0.	63.	0.	77.	0.	0.	0.	0.	0.	196.
0162	A	A	17.	0.	0.	0.	19.	0.	0.	0.	0.	0.	0.	0.	36.
0162	P	A	27.	0.	0.	0.	27.	0.	0.	0.	0.	0.	0.	0.	54.
0163	A	A	87.	0.	0.	0.	46.	0.	0.	0.	0.	0.	0.	0.	133.
0163	A	B	5.	0.	0.	0.	4.	0.	0.	0.	0.	0.	0.	0.	9.
0163	P	A	54.	21.	0.	0.	74.	0.	29.	0.	0.	0.	0.	0.	178.
0163	P	B	8.	0.	0.	0.	7.	0.	0.	0.	0.	0.	0.	0.	15.
0166	P	A	10.	37.	31.	0.	0.	0.	0.	0.	0.	0.	0.	0.	78.
0168	P	A	0.	12.	32.	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.
0168	P	B	0.	21.	11.	0.	0.	0.	0.	0.	0.	0.	0.	0.	32.
0169	P	A	0.	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0172	A	Q	0.	0.	0.	12.	0.	0.	0.	0.	0.	0.	0.	0.	12.
0173	A	A	27.	0.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	30.
0173	A	B	12.	0.	0.	31.	0.	0.	0.	0.	0.	0.	0.	0.	43.
0173	P	A	0.	0.	0.	10.	11.	0.	0.	0.	0.	0.	0.	0.	21.
0173	P	B	21.	0.	0.	7.	0.	0.	0.	0.	0.	0.	0.	0.	28.
0175	A	A	0.	0.	89.	46.	0.	0.	0.	0.	0.	0.	0.	0.	135.

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PROGRAM E (Continued) — YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0175	A	B	0.	0.	5.	6.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0175	P	A	0.	0.	122.	57.	40.	26.	0.	0.	0.	0.	0.	0.	245.
0175	P	B	0.	0.	11.	10.	0.	0.	0.	0.	0.	0.	0.	0.	21.
0176	A	A	0.	0.	63.	60.	0.	0.	0.	0.	0.	0.	0.	0.	123.
0176	P	A	0.	0.	159.	65.	0.	70.	0.	0.	0.	0.	0.	0.	294.
0202	P	A	24.	80.	0.	0.	5.	0.	0.	0.	0.	0.	0.	0.	109.
0204	P	A	12.	22.	0.	0.	19.	0.	0.	0.	0.	0.	0.	0.	53.
0204	P	B	10.	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	20.
0205	P	A	72.	0.	0.	0.	38.	0.	0.	0.	0.	0.	0.	0.	110.
0209	P	A	16.	3.	12.	0.	0.	0.	0.	0.	0.	0.	0.	0.	31.
0211	P	A	39.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.
0211	P	B	12.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	17.
0212	P	A	86.	18.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	104.
0213	P	A	6.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.
0218	A	N	0.	0.	16.	0.	0.	16.	0.	0.	0.	0.	0.	0.	32.
0218	P	N	0.	0.	12.	0.	0.	12.	0.	0.	0.	0.	0.	0.	24.
0219	A	A	0.	0.	0.	0.	0.	8.	0.	0.	0.	0.	0.	0.	8.
0220	A	A	0.	0.	14.	0.	0.	20.	0.	0.	0.	0.	0.	0.	34.
0220	P	A	0.	0.	72.	41.	0.	25.	0.	0.	0.	0.	0.	0.	138.
0221	A	A	0.	0.	21.	0.	0.	15.	0.	0.	0.	0.	0.	0.	36.
0221	A	B	0.	0.	6.	0.	0.	6.	0.	0.	0.	0.	0.	0.	12.
0221	B	A	0.	0.	36.	0.	0.	27.	0.	0.	0.	0.	0.	0.	63.
0221	B	B	0.	0.	10.	0.	0.	11.	0.	0.	0.	0.	0.	0.	21.
0221	P	A	0.	0.	74.	152.	0.	2.	0.	0.	0.	0.	0.	0.	228.
0221	P	B	0.	0.	38.	0.	0.	38.	0.	0.	0.	0.	0.	0.	76.

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PROGRAM F — YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0001	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0002	T	A	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.
0003	T	A	13.	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	16.
0004	T	A	12.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0005	T	A	9.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0006	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0007	T	A	18.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	19.
0007	T	B	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0008	T	A	8.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.
0009	T	A	2.	0.	0.	1.	1.	1.	52.	0.	0.	0.	0.	0.	57.
0009	T	B	8.	0.	0.	0.	0.	0.	9.	0.	0.	0.	0.	0.	17.
0010	T	A	31.	0.	0.	0.	0.	1.	12.	0.	0.	0.	0.	0.	44.
0010	T	B	26.	0.	0.	0.	9.	0.	47.	0.	0.	0.	0.	0.	82.
0011	T	A	5.	1.	0.	0.	4.	0.	25.	0.	0.	0.	0.	0.	35.
0012	T	A	70.	0.	0.	0.	0.	0.	10.	0.	0.	0.	0.	0.	80.
0013	T	A	0.	0.	0.	0.	7.	3.	54.	0.	0.	0.	0.	0.	64.
0014	T	A	0.	0.	0.	0.	0.	11.	254.	0.	0.	0.	0.	0.	265.
0015	T	B	17.	0.	0.	0.	3.	2.	50.	0.	0.	0.	0.	0.	72.
0016	T	A	2.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0017	T	A	3.	0.	1.	2.	26.	0.	0.	0.	0.	0.	0.	0.	32.
0018	T	A	130.	121.	0.	0.	0.	6.	0.	0.	0.	0.	0.	0.	257.
0019	T	A	10.	11.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	22.
0020	T	A	15.	17.	0.	0.	1.	1.	0.	0.	0.	0.	0.	0.	34.
0021	T	A	25.	20.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	45.
0022	T	A	39.	1.	0.	0.	26.	1.	0.	0.	0.	0.	0.	0.	67.
0022	T	B	24.	1.	0.	0.	9.	1.	0.	0.	0.	0.	0.	0.	35.
0023	T	A	64.	2.	0.	0.	43.	1.	0.	0.	0.	0.	0.	0.	110.
0024	T	A	11.	1.	0.	0.	18.	0.	0.	0.	0.	0.	0.	0.	30.
0025	T	A	59.	8.	0.	0.	102.	0.	0.	0.	0.	0.	0.	0.	169.
0027	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.

WORKLOAD ASSIGNMENT

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PROGRAM F (Continued) | YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0029	T	A	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0032	T	A	1.	1.	2.	1.	5.	1.	2.	0.	0.	0.	0.	0.	13.
0033	T	A	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
0034	T	A	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
0035	T	A	3.	3.	0.	0.	1.	0.	2.	0.	0.	0.	0.	0.	9.
0035	T	B	6.	6.	0.	0.	2.	2.	0.	0.	0.	0.	0.	0.	16.
0036	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0037	T	B	2.	0.	0.	2.	0.	1.	0.	0.	0.	0.	0.	0.	5.
0038	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0039	T	A	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0041	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0042	T	A	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.
0043	T	A	15.	3.	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.	20.
0043	T	B	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0044	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0045	T	A	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.
0046	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0047	T	A	5.	3.	3.	0.	2.	2.	1.	0.	0.	0.	0.	0.	16.
0049	T	A	7.	7.	22.	13.	0.	0.	0.	0.	0.	0.	0.	0.	49.
0050	T	A	1.	2.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0053	T	A	0.	2.	4.	13.	0.	0.	0.	0.	0.	0.	0.	0.	19.
0053	T	B	0.	2.	4.	8.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0054	T	A	3.	12.	24.	0.	0.	1.	0.	0.	0.	0.	0.	0.	40.
0056	T	A	9.	9.	82.	5.	0.	47.	0.	0.	0.	0.	0.	0.	152.
0056	T	B	0.	0.	7.	0.	0.	2.	0.	0.	0.	0.	0.	0.	9.
0057	T	A	0.	0.	11.	0.	0.	5.	0.	0.	0.	0.	0.	0.	16.
0057	T	B	0.	0.	4.	0.	0.	2.	0.	0.	0.	0.	0.	0.	6.
0059	T	A	8.	8.	180.	8.	0.	46.	0.	0.	0.	0.	0.	0.	250.

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PROGRAM F (Continued) YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0062	T	A	0.	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0063	T	A	0.	11.	9.	0.	0.	0.	0.	0.	0.	0.	0.	0.	20.
0063	T	B	0.	7.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0064	T	A	0.	18.	4.	0.	0.	0.	0.	0.	0.	0.	0.	0.	22.
0064	T	B	0.	0.	17.	4.	0.	0.	0.	0.	0.	0.	0.	0.	21.
0065	T	A	0.	10.	31.	0.	0.	0.	0.	0.	0.	0.	0.	0.	41.
0065	T	B	0.	10.	19.	0.	0.	0.	0.	0.	0.	0.	0.	0.	29.
0066	T	B	0.	5.	0.	0.	1.	0.	3.	0.	0.	0.	0.	0.	9.
0067	T	A	0.	3.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	4.
0067	T	B	0.	10.	0.	0.	0.	0.	3.	0.	0.	0.	0.	0.	13.
0068	T	A	0.	0.	0.	0.	0.	2.	42.	0.	0.	0.	0.	0.	44.
0069	T	A	0.	27.	19.	0.	0.	0.	0.	0.	0.	0.	0.	0.	46.
0071	T	A	0.	0.	5.	0.	0.	6.	3.	0.	0.	0.	0.	0.	14.
0071	T	B	0.	0.	2.	0.	0.	1.	1.	0.	0.	0.	0.	0.	4.
0072	T	A	0.	0.	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0074	T	A	0.	0.	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0074	T	B	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0075	T	A	0.	0.	0.	0.	0.	5.	2.	0.	0.	0.	0.	0.	7.
0076	T	A	0.	0.	2.	0.	0.	0.	2.	0.	0.	0.	0.	0.	4.
0080	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0082	T	A	0.	0.	24.	19.	0.	2.	0.	0.	0.	0.	0.	0.	45.
0083	T	A	0.	0.	29.	15.	0.	2.	0.	0.	0.	0.	0.	0.	46.
0084	T	A	0.	0.	10.	11.	0.	2.	0.	0.	0.	0.	0.	0.	23.
0085	T	A	0.	0.	0.	1.	0.	1.	0.	0.	0.	0.	0.	0.	2.
0087	T	A	0.	0.	15.	24.	1.	2.	0.	0.	0.	0.	0.	0.	42.
0088	T	A	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0089	T	A	0.	0.	49.	33.	0.	4.	0.	0.	0.	0.	0.	0.	86.
0089	T	B	0.	0.	17.	12.	0.	1.	0.	0.	0.	0.	0.	0.	30.
0090	T	A	0.	0.	5.	4.	0.	0.	0.	0.	0.	0.	0.	0.	9.

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PROGRAM F (Continued) — YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0095	T	A	0.	0.	131.	0.	0.	92.	0.	0.	0.	0.	0.	0.	223.
0095	T	B	0.	0.	18.	0.	0.	18.	0.	0.	0.	0.	0.	0.	36.
0096	T	A	0.	0.	84.	6.	0.	27.	0.	0.	0.	0.	0.	0.	117.
0096	T	B	0.	0.	15.	0.	0.	6.	0.	0.	0.	0.	0.	0.	21.
0097	T	A	0.	0.	10.	0.	0.	6.	0.	0.	0.	0.	0.	0.	16.
0098	T	A	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0101	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0104	T	B	47.	26.	0.	0.	1.	1.	2.	0.	0.	0.	0.	0.	77.
0105	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0106	T	A	37.	23.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	61.
0106	T	B	20.	15.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	35.
0107	T	A	64.	29.	0.	2.	0.	1.	0.	0.	0.	0.	0.	0.	96.
0108	T	A	65.	29.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	95.
0111	T	A	6.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0112	T	A	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0113	T	A	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0114	T	A	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0115	T	A	0.	0.	13.	7.	0.	0.	92.	0.	0.	0.	0.	0.	112.
0116	T	A	4.	4.	16.	13.	2.	1.	16.	0.	0.	0.	0.	0.	56.
0116	T	B	0.	0.	6.	6.	0.	0.	5.	0.	0.	0.	0.	0.	17.
0117	T	A	0.	1.	6.	7.	1.	0.	7.	0.	0.	0.	0.	0.	22.
0118	T	A	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0119	T	A	2.	0.	13.	15.	1.	0.	0.	0.	0.	0.	0.	0.	31.
0119	T	B	0.	0.	15.	13.	0.	0.	15.	0.	0.	0.	0.	0.	43.
0120	T	A	5.	3.	24.	16.	1.	0.	0.	0.	0.	0.	0.	0.	49.
0121	T	A	4.	0.	22.	21.	1.	0.	0.	0.	0.	0.	0.	0.	48.
0122	T	A	0.	1.	5.	2.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0123	T	A	0.	0.	2.	5.	0.	0.	0.	0.	0.	0.	0.	0.	7.

WORKLOAD ASSIGNMENT

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PROGRAM F (Continued) YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.F.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0129	T	A	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	1.
0131	T	A	0.	0.	0.	0.	0.	1.	5.	0.	0.	0.	0.	0.	6.
0133	T	A	2.	4.	1.	0.	1.	0.	7.	0.	0.	0.	0.	0.	15.
0133	T	B	0.	0.	3.	0.	0.	0.	13.	0.	0.	0.	0.	0.	16.
0141	T	A	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0142	T	A	1.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	2.
0144	T	A	1.	0.	21.	1.	1.	24.	0.	0.	0.	0.	0.	0.	48.

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE I
DOP A

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1554657.	0.	0.	1554657.	1554657.	2094000.	0.	2093999.	0.	2093999.	0.	74.
ENGINE	340608.	0.	601190.	941798.	941798.	1400000.	0.	1399999.	0.	1399999.	0.	67.
ACC/COMP	502579.	0.	728113.	1230692.	1230692.	1908000.	0.	1907999.	0.	1907999.	0.	65.
ELEC/ARM	296490.	0.	732193.	1028683.	958000	958000.	70683.	958000.	0.	958000.	0.	107.
SUPPORT	438694.	0.	15239.	453933.	453933.	510000.	0.	510000.	0.	510000.	0.	89.
MFG'NG	592613.	0.	154365.	746978.	746978.	812000.	0.	812000.	0.	812000.	0.	92.
SUB TOTL	3725641.	0.	2231100.	5956741.	5886058.	7682000.	70683.	7681997.	0.	7681997.	0.	
VARIANCE					5886058.	7682000.	70683.					78.
OTHER	165301.	0.	15239.	180540.								
TOTAL	3890942.	0.	2246339.	6137281.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE I
DOP B

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1343934.	0.	136082.	1480016.	1480016.	1820000.	0.	1819999.	0.	1819999.	0.	81.
ENGINE	401398.	0.	217719.	619117.	619117.	836000.	0.	836000.	0.	836000.	0.	74.
ACC/COMP	574531.	0.	355294.	929825.	929824.	1300000.	0.	1299999.	0.	1299999.	0.	72.
ELEC/ARM	568439.	0.	499051.	1067490.	1067490.	1198000.	0.	1197999.	0.	1197999.	0.	89.
SUPPORT	485892.	0.	31955.	517847.	517847.	622000.	0.	622000.	0.	622000.	0.	83.
MFG'NG	354211.	0.	65994.	420205.	420205.	674000.	0.	674000.	0.	674000.	0.	62.
SUB TOTL	3728405.	0.	1306095.	5034500.	5034498.	6450000.	0.	6449997.	0.	6449997.	0.	
VARIANCE					5034498.	6450000.	0.					78.
OTHER	320986.	0.	22077.	343063.								
TOTAL	4049391.	0.	1328172.	5377563.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE I
DOP C

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD +	INCREMENT BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD =	TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1286675.	0.	643773.	1930448.	1456000.	1456000.	474448.	1455999.	0.	1455939.	0.	133.
ENGINE	204425.	0.	530458.	734883.	734883.	800000.	0.	800000.	0.	800000.	0.	92.
ACC/COMP	685852.	0.	812943.	1498795.	1498795.	2028000.	0.	2027999.	0.	2027999.	0.	74.
ELEC/ARM	397565.	0.	625851.	1023416.	1023416.	1220000.	0.	1219999.	0.	1219999.	0.	84.
SUPPORT	591598.	0.	57036.	648634.	524000.	524000.	124634.	524000.	0.	524000.	0.	124.
MFG'NG	653034.	0.	235724.	888758.	888758.	1118000.	0.	1117999.	0.	1117999.	0.	79.
SUB TOTL	3819149.	0.	2905785.	6724934.	6125852.	7146000.	599082.	7145996.	0.	7145996.		
VARIANCE					6125852.	7146000.	599082.				0.	94.
OTHER	473788.	0.	120000.	593788.								
TOTAL	4292937.	0.	3025785.	7318722.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME
DOP D

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE + WORKLOAD	INCREMENT BASEWKLD + SHIFT 2&3	L.P. ASSIGNED = WORKLOAD	TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	524283.	0.	160091.	684374.	488000.	488000.	196374.	488000.	0.	488000.	0.	140.
ENGINE	40476.	0.	292199.	332675.	332674.	412000.	0.	412000.	0.	412000.	0.	81.
ACC/COMP	146534.	0.	216382.	362916.	362916.	592000.	0.	592000.	0.	592000.	0.	61.
ELEC/ARM	68102.	0.	151613.	219715.	219714.	360000.	0.	360000.	0.	360000.	0.	61.
SUPPORT	59138.	0.	0.	59138.	59138.	92000.	0.	92000.	0.	92000.	0.	64.
MFG'NG	287359.	0.	97739.	385098.	358000.	358000.	27098.	358000.	0.	358000.	0.	108.
SUB TOTL	1125892.	0.	918024.	2043916.	1820443.	2302000.	223472.	2302000.	0.	2302000.	0.	
VARIANCE					1820443.	2302000.	223472.					89.
OTHER	108281.	0.	1.	108282.								
TOTAL	1234173.	0.	918025.	2152198.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE I

DOP E

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	578122.	0.	135388.	713510.	713510.	768000.	0.	768000.	0.	768000.	0.	93.
ENGINE	278831.	0.	205349.	484180.	484180.	660000.	0.	660000.	0.	660000.	0.	73.
ACC/COMP	236290.	0.	271446.	507736.	507736.	924000.	0.	924000.	0.	924000.	0.	55.
ELEC/ARM	81376.	0.	202396.	283772.	283772.	652000.	0.	652000.	0.	652000.	0.	44.
SUPPORT	227958.	0.	13145.	241103.	241103.	246000.	0.	246000.	0.	246000.	0.	98.
MFG'NG	142519.	0.	50579.	193098.	193098.	510000.	0.	510000.	0.	510000.	0.	38.
SUB TOTL	1545096.	0.	878303.	2423397.	2423398.	3760000.	0.	3760000.	0.	3760000.	0.	
VARIANCE					2423399.	3760000.	0.					64.
OTHER	118119.	0.	10350.	128469.								
TOTAL	1663215.	0.	888653.	2551868.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE I
DOP F

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	201334.	0.	529496.	730830.	702000.	702000.	28830.	702000.	0.	702000.	0.	104.
ENGINE	222612.	0.	189287.	411899.	411899.	416000.	0.	416000.	0.	416000.	0.	99.
ACC/COMP	286545.	0.	499455.	786000.	632000.	632000.	154000.	632000.	0.	632000.	0.	124.
ELEC/ARM	62928.	0.	104981	167909.	167909.	206000.	0.	206000.	0.	206000.	0.	82.
SUPPORT	203409.	0.	48765.	252174.	212000.	212000.	40174.	212000.	0.	212000.	0.	119.
MFG'NG	210888.	0.	127796.	338684.	338684.	374000.	0.	374000.	0.	374000.	0.	91.
SUB TOTL	1187716.	0.	1499780.	2687496.	2464492.	2542000.	223004.	2542000.	0.	2542000.	0.	
VARIANCE					2464492.	2542000.	223004.					106.
OTHER	51686.	0.	47669.	99355.								
TOTAL	1239402.	0.	1547449.	2786851.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE I
DOP G

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1351112.	0.	11705.	1362817.	1192000.	1192000.	170817.	1191999.	0.	1191999.	0.	114.
ENGINE	372609.	0.	70345.	442954.	436000.	436000.	6954.	436000.	0.	436000.	0.	102.
ACC/COMP	677686.	0.	259224.	936910.	936910.	1430000.	0.	1429999.	0.	1429999.	0.	66.
ELEC/ARM	298987.	0.	193121.	492108.	492108.	640000.	0.	640000.	0.	640000.	0.	77.
SUPPORT	295482.	0.	11705.	307187.	86000.	86000.	86000.	86000.	86000.	86000.	49187.	414.
MFG'NG	491505.	0.	70232.	561737.	550000.	550000.	11737.	550000.	0.	550000.	0.	102.
SUB TOTL	3487381.	0.	616332.	4103703.	3693018.	4334000.	275508.	4333998.	86000.	4333998.	49187.	
VARIANCE					3693018.	4334000.	275508.		86000.			94.
OTHER	273859.	0.	0.	273859.								
TOTAL	3761240.	0.	616332.	4377572.								

DOP COST REPORT

RUN NO./NAME CASE I
DOP A

DATE 1 JUNE 1972
YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	31592841.	0.	31592841.	1702068.	0.	1702068.	33294909.
MISSILE	2018451.	0.	2018451.	237203.	3364678.	3601881.	5620332.
ENGINE	5430715.	14188350.	19619065.	0.	0.	0.	19619065.
F/J	42535.	33146011.	33188546.	0.	0.	0.	33188546.
OTHER	7636282.	0.	7636282.	0.	0.	0.	7636282.
SPECIAL	3415555.	0.	3415555.	14145962.	0.	14145962.	17561517.
INCREMENTAL 2ND SHIFT							16257.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	50136379.	47334361.	97470740.	16085233.	3364678.	19449911.	116936908.
COST/VOLUME ADJ							-102630.
SUB TOTAL							116834278.
INCREASE TO MANNING LEVEL							152258.
DECREASE TO MANNING LEVEL							0.
GRAND TOTAL							116986536.

DOP COST REPORT

RUN NO./NAME CASE I
DOP B

DATE 1 JUNE 1972
YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	30334890.	3787289.	34122179.	0.	0.	0.	34122179.
MISSILE	3262874.	0.	3262874.	316575.	2127158.	2443733.	5706607.
ENGINE	10785251.	3730272.	14515523.	0.	0.	0.	14515523.
F/J	40380.	16274326.	16314706.	0.	0.	0.	16314706.
OTHER	4734157.	0.	4734157.	0.	0.	0.	4734157.
SPECIAL	2572786.	0.	2572786.	11502731.	0.	11502731.	14075517.
INCREMENTAL 2ND SHIFT							0.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	51729338.	23791887.	75522225.	11819306.	2127158.	13946464.	89468689.
COST/VOLUME ADJ.							-666280.
SUB TOTAL							88802409.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1052700.
GRAND TOTAL							89855109.

DOP COST REPORT

RUN NO./NAME CASE I — DATE 1 JUNE 1972

DOP C — YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	26814366.	17413474.	44227840.	4397813.	272612.	4670425.	48898265.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	2284178.	11469800.	13753978.	3464721.	297795.	3762516.	17516494.
F/J	191874.	31099019.	31290893.	0.	0.	0.	31290893.
OTHER	9259941.	0.	9259941.	0.	0.	0.	9259941.
SPECIAL	3838767.	0.	3838767.	21122077.	0.	21122077.	24960844.
INCREMENTAL 2ND SHIFT							125807.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	42389126.	59982293.	102371419.	28984611.	570407.	29555018.	132052244.
COST/VOL ADJ.							-467666.
SUB TOTAL							131584578.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							0.
GRAND TOTAL							131584578.

DOP COST REPORT

RUN NO./NAME CASE I
DOP D

DATE 1 JUNE 1972
YEAR FS74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	8917558.	4539800.	13457358.	0.	0.	0.	13457358.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	0.	6936718.	6936718.	188270.	211168.	399438.	7336156.
F/J	19470.	7148267.	7167737.	0.	0.	0.	7167737.
OTHER	2102637.	0.	2102637.	0.	0.	0.	2102637.
SPECIAL	1329121.	0.	1329121.	5774315.	0.	5774315.	7103436.
INCREMENTAL 2ND SHIFT							31286.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	12368786.	18624785.	30993571.	5962585.	211168.	6173753.	37198610.
COST/VOLUME ADJ.							-175565.
SUB TOTAL							37023045.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1779412.
GRAND TOTAL							38802457.

DOP COST REPORT

RUN NO./NAME CASE I DATE 1 JUNE 1972
DOP E YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	12187591.	3511809.	15699400.	0.	0.	0.	15699400.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	5097583.	7550422.	12648005.	15674494.	0.	15674494.	28322499.
F/J	0.	11137116.	11137116.	0.	0.	0.	11137116.
OTHER	3022851.	0.	3022851.	0.	0.	0.	3022851.
SPECIAL	2415487.	0.	2415487.	8094594.	0.	8094594.	10510081.
INCREMENTAL 2ND SHIFT							0.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	22723512.	22199347.	44922859.	23769088.	0.	23769088.	68691947.
COST/VOLUME ADJ.							-246421.
SUB TOTAL							68445526.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1483755.
GRAND TOTAL							69929281.

DOP COST REPORT

RUN NO./NAME CASE I — DATE 1 JUNE 1972
DOP F — YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	1143059.	13386912.	14529971.	189474.	0.	189474.	14719445.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	3833721.	3867444.	7701165.	2716980.	200352.	2917332.	10618497.
F/J	665168.	10142913.	10808081.	0.	0.	0.	10808081.
OTHER	4196602.	0.	4196602.	0.	0.	0.	4196602.
SPECIAL	1615670.	0.	1615670.	6767594.	0.	6767594.	8383264.
INCREMENTAL 2ND SHIFT							28990.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	11454220.	27397269.	38851489.	9674048.	200352.	9874400.	48754879.
COST/VOLUME ADJ.							-110517.
SUB TOTAL							48644362.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							320215.
GRAND TOTAL							48964577.

DOP COST REPORT

RUN NO./NAME CASE I — DATE 1 JUNE 1972

DOP G — YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	29337062.	0.	29337062.	5773879.	0.	5773879.	35110941.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	4456126.	785512.	5241638.	4417921.	0.	4417921.	9659559.
F/J	5407246.	12416843.	17824089.	0.	0.	0.	17824089.
OTHER	4451550.	0.	4451550.	0.	0.	0.	4451550.
SPECIAL	1381624.	0.	1381624.	11033179.	0.	11033179.	12414803.
INCREMENTAL 2ND SHIFT							35816.
INCREMENTAL 3RD SHIFT							27520.
ONCREMENTAL POST THIRD SHIFT							104769.
SUB TOTAL	45033608.	13202355.	58235963.	21224979.	0.	221244979.	79629047.
COST/VOLUME ADJ.							-428526.
SUB TOTAL							79200521.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1177260.
GRAND TOTAL							80377781.

PROGRAM COST REPORT

RUN NO./NAME ALL NARFS CASE I

DATE 1 JUNE 1972
YEAR FY74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	173998103.	42639283.	216637386.	13493165.	272612.	13765777.	230403163.
MISSILE	6474424.	0.	6474424.	848338.	5491836.	6340174.	12814598.
ENGINE	41911306.	48528518.	90439824.	26516385.	709315.	27225700.	117665524.
F/J	67642378.	121364496.	189006874.	0.	0.	0.	189006874.
OTHER	40389988.	0.	40389988.	0.	0.	0.	40389988.
SPECIAL	23976860.	0.	23976860.	166239429.	0.	166239429.	190216289.
INCREMENTAL 2ND SHIFT							238157.
INCREMENTAL 3RD SHIFT							27520.
INCREMENTAL POST THIRD SHIFT							104769.
SUB TOTAL	354393059.	212532297.	566925356.	207097317.	6473763.	213571080.	780866882.
COST/VOLUME ADJ.							-2197604.
SUB TOTAL							778669278.
INCREASE TO MANNING LEVEL							152258.
DECREASE TO MANNING LEVEL							5813342.
GRAND TOTAL							784634879.

DOP WORKLOAD - COST SUMMARY REPORT

RUN NO./NAME CASE I DATE 1 JUNE 1972

DOP	MANHOURS	COSTS
ALA	6137281.	116986536.
NOR	5377563.	89855109.
N.I.	7318722.	131584578.
Q.P.	2152198.	38802457.
JAX	2551868.	66929280.
C.P.	2786851.	48964577.
PNS	4377572.	80377781.
TOTAL	30702055.	573500318.

SECTION 3

CASE II, ±5% VARIATION OF ASSIGNMENTS

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE II

PROGRAM A

DATE 1 JUNE 1972

YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0022	D	A	0.	0.	0.	0.	11.	0.	0.	0.	0.	0.	0.	0.	11.
0023	D	A	0.	0.	0.	0.	44.	0.	0.	0.	0.	0.	0.	0.	44.
0056	D	A	0.	0.	16.	0.	0.	25.	0.	0.	0.	0.	0.	0.	41.
0059	D	A	0.	0.	62.	0.	0.	62.	0.	0.	0.	0.	0.	0.	124.
0062	D	A	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0063	D	A	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0064	D	A	0.	11.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0065	D	A	0.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0084	D	A	0.	0.	0.	13.	0.	0.	0.	0.	0.	0.	0.	0.	13.
0086	D	L	0.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0087	D	A	0.	0.	1.	21.	0.	0.	0.	0.	0.	0.	0.	0.	22.
0088	D	A	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0089	D	A	0.	0.	1.	13.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0089	F	A	0.	0.	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0094	D	A	0.	0.	75.	0.	0.	22.	0.	0.	0.	0.	0.	0.	97.
0094	D	B	0.	0.	11.	0.	0.	8.	0.	0.	0.	0.	0.	0.	19.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE II

PROGRAM B

DATE 1 JUNE 1972

YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0182	S	L	139.	114.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	253.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE II DATE 1 JUNE 1972

PROGRAM E YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0146	A	A	40.	0.	0.	0.	0.	40.	0.	0.	0.	0.	0.	0.	80.
0147	A	A	91.	0.	0.	0.	0.	13.	0.	0.	0.	0.	0.	0.	104.
0148	A	A	21.	0.	0.	0.	0.	39.	0.	0.	0.	0.	0.	0.	60.
0149	A	A	148.	0.	0.	0.	0.	98.	0.	0.	0.	0.	0.	0.	246.
0151	A	A	138.	0.	0.	0.	0.	300.	0.	0.	0.	0.	0.	0.	438.
0154	A	A	35.	0.	0.	0.	0.	56.	0.	0.	0.	0.	0.	0.	91.
0160	P	A	0.	0.	0.	0.	0.	13.	101.	0.	0.	0.	0.	0.	114.
0161	A	A	64.	0.	0.	0.	119.	0.	0.	0.	0.	0.	0.	0.	183.
0161	P	A	24.	32.	0.	0.	53.	0.	87.	0.	0.	0.	0.	0.	196.
0162	A	A	19.	0.	0.	0.	17.	0.	0.	0.	0.	0.	0.	0.	36.
0162	P	A	24.	0.	0.	0.	30.	0.	0.	0.	0.	0.	0.	0.	54.
0163	A	A	80.	0.	0.	0.	53.	0.	0.	0.	0.	0.	0.	0.	133.
0163	A	B	5.	0.	0.	0.	4.	0.	0.	0.	0.	0.	0.	0.	9.
0163	P	A	45.	30.	0.	0.	65.	0.	38.	0.	0.	0.	0.	0.	178.
0163	P	B	7.	0.	0.	0.	8.	0.	0.	0.	0.	0.	0.	0.	15.
0166	P	A	14.	37.	27.	0.	0.	0.	0.	0.	0.	0.	0.	0.	78.
0168	P	A	0.	14.	30.	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.
0168	P	B	0.	23.	9.	0.	0.	0.	0.	0.	0.	0.	0.	0.	32.
0169	P	A	0.	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0172	A	Q	0.	0.	0.	12.	0.	0.	0.	0.	0.	0.	0.	0.	12.
0173	A	A	26.	0.	0.	4.	0.	0.	0.	0.	0.	0.	0.	0.	30.
0173	A	B	10.	0.	0.	33.	0.	0.	0.	0.	0.	0.	0.	0.	43.
0173	P	A	0.	0.	0.	9.	12.	0.	0.	0.	0.	0.	0.	0.	21.
0173	P	B	20.	0.	0.	8.	0.	0.	0.	0.	0.	0.	0.	0.	28.
0175	A	A	0.	0.	96.	39.	0.	0.	0.	0.	0.	0.	0.	0.	135.
0175	A	B	0.	0.	6.	5.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0175	P	A	0.	0.	134.	45.	28.	38.	0.	0.	0.	0.	0.	0.	245.
0175	P	B	0.	0.	12.	9.	0.	0.	0.	0.	0.	0.	0.	0.	21.
0176	A	A	0.	0.	69.	54.	0.	0.	0.	0.	0.	0.	0.	0.	123.
0176	P	A	0.	0.	159.	50.	0.	85.	0.	0.	0.	0.	0.	0.	294.

WORKLOAD ASSIGNMENT

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PROGRAM E (Continued) YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0202	P	A	24.	75.	0.	0.	10.	0.	0.	0.	0.	0.	0.	0.	109.
0204	P	A	12.	19.	0.	0.	22.	0.	0.	0.	0.	0.	0.	0.	53.
0204	P	B	11.	9.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	20.
0205	P	A	67.	0.	0.	0.	43.	0.	0.	0.	0.	0.	0.	0.	110.
0209	P	A	14.	3.	14.	0.	0.	0.	0.	0.	0.	0.	0.	0.	31.
0211	P	A	41.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.
0211	P	B	13.	4.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	17.
0212	P	A	91.	13.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	104.
0213	P	A	6.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.
0218	A	N	0.	0.	14.	0.	0.	18.	0.	0.	0.	0.	0.	0.	32.
0218	P	N	0.	0.	11.	0.	0.	13.	0.	0.	0.	0.	0.	0.	24.
0219	A	A	0.	0.	0.	0.	0.	8.	0.	0.	0.	0.	0.	0.	8.
0220	A	A	0.	0.	12.	0.	0.	22.	0.	0.	0.	0.	0.	0.	34.
0220	P	A	0.	0.	65.	48.	0.	25.	0.	0.	0.	0.	0.	0.	138.
0221	A	A	0.	0.	19.	0.	0.	17.	0.	0.	0.	0.	0.	0.	36.
0221	A	B	0.	0.	5.	0.	0.	7.	0.	0.	0.	0.	0.	0.	12.
0221	B	A	0.	0.	33.	0.	0.	30.	0.	0.	0.	0.	0.	0.	63.
0221	B	B	0.	0.	9.	0.	0.	12.	0.	0.	0.	0.	0.	0.	21.
0221	P	A	0.	0.	65.	163.	0.	0.	0.	0.	0.	0.	0.	0.	228.
0221	P	B	0.	0.	42.	0.	0.	34.	0.	0.	0.	0.	0.	0.	76.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE II DATE 1 JUNE 1972

PROGRAM F YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0001	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0002	T	A	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.
0003	T	A	12.	2.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	16.
0004	T	A	11.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0005	T	A	8.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0006	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0007	T	A	17.	0.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	19.
0007	T	B	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0008	T	A	8.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.
0009	T	A	0.	0.	0.	4.	0.	4.	49.	0.	0.	0.	0.	0.	57.
0009	T	B	7.	0.	0.	0.	0.	0.	10.	0.	0.	0.	0.	0.	17.
0010	T	A	29.	0.	0.	0.	0.	3.	12.	0.	0.	0.	0.	0.	44.
0010	T	B	26.	0.	0.	0.	5.	0.	51.	0.	0.	0.	0.	0.	82.
0011	T	A	3.	3.	0.	0.	2.	2.	25.	0.	0.	0.	0.	0.	35.
0012	T	A	66.	0.	0.	0.	0.	0.	14.	0.	0.	0.	0.	0.	80.
0013	T	A	0.	0.	0.	0.	4.	6.	54.	0.	0.	0.	0.	0.	64.
0014	T	A	0.	0.	0.	0.	0.	24.	241.	0.	0.	0.	0.	0.	265.
0015	T	B	13.	0.	0.	0.	0.	6.	53.	0.	0.	0.	0.	0.	72.
0016	T	A	2.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0017	T	A	1.	0.	3.	4.	24.	0.	0.	0.	0.	0.	0.	0.	32.
0018	T	A	117.	134.	0.	0.	0.	6.	0.	0.	0.	0.	0.	0.	257.
0019	T	A	9.	12.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	22.
0020	T	A	13.	19.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	34.
0021	T	A	23.	22.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	45.
0022	T	A	36.	4.	0.	0.	23.	4.	0.	0.	0.	0.	0.	0.	67.
0022	T	B	22.	3.	0.	0.	7.	3.	0.	0.	0.	0.	0.	0.	35.
0023	T	A	59.	7.	0.	0.	38.	6.	0.	0.	0.	0.	0.	0.	110.
0024	T	A	11.	2.	0.	0.	17.	0.	0.	0.	0.	0.	0.	0.	30.
0025	T	A	59.	16.	0.	0.	94.	0.	0.	0.	0.	0.	0.	0.	169.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE II DATE 1 JUNE 1972

PROGRAM F (Continued) YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0027	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0029	T	A	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0032	T	A	0.	2.	1.	2.	4.	2.	2.	0.	0.	0.	0.	0.	13.
0033	T	A	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
0034	T	A	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
0035	T	A	3.	3.	0.	0.	1.	0.	2.	0.	0.	0.	0.	0.	9.
0035	T	B	5.	7.	0.	0.	1.	3.	0.	0.	0.	0.	0.	0.	16.
0036	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0037	T	B	2.	0.	0.	2.	0.	1.	0.	0.	0.	0.	0.	0.	5.
0038	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0039	T	A	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0041	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0042	T	A	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.
0043	T	A	14.	4.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	20.
0043	T	B	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0044	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0045	T	A	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.
0046	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0047	T	A	4.	4.	2.	1.	1.	3.	1.	0.	0.	0.	0.	0.	16.
0049	T	A	5.	9.	20.	15.	0.	0.	0.	0.	0.	0.	0.	0.	49.
0050	T	A	1.	2.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0053	T	A	0.	3.	3.	13.	0.	0.	0.	0.	0.	0.	0.	0.	19.
0053	T	B	0.	3.	3.	8.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0054	T	A	1.	14.	22.	0.	0.	3.	0.	0.	0.	0.	0.	0.	40.
0056	T	A	1.	17.	74.	13.	0.	47.	0.	0.	0.	0.	0.	0.	152.
0056	T	B	0.	0.	7.	0.	0.	2.	0.	0.	0.	0.	0.	0.	9.
0057	T	A	0.	0.	10.	0.	0.	6.	0.	0.	0.	0.	0.	0.	16.
0057	T	B	0.	0.	4.	0.	0.	2.	0.	0.	0.	0.	0.	0.	6.
0059	T	A	0.	20.	168.	20.	0.	42.	0.	0.	0.	0.	0.	0.	250.
0062	T	A	0.	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE II — DATE 1 JUNE 1972

PROGRAM F (Continued) — YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0063	T	A	0.	12.	8.	0.	0.	0.	0.	0.	0.	0.	0.	0.	20.
0063	T	B	0.	7.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0064	T	A	0.	19.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	22.
0064	T	B	0.	0.	16.	5.	0.	0.	0.	0.	0.	0.	0.	0.	21.
0065	T	A	0.	12.	29.	0.	0.	0.	0.	0.	0.	0.	0.	0.	41.
0065	T	B	0.	11.	18.	0.	0.	0.	0.	0.	0.	0.	0.	0.	29.
0066	T	B	0.	5.	0.	0.	1.	0.	3.	0.	0.	0.	0.	0.	9.
0067	T	A	0.	3.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	4.
0067	T	B	0.	11.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.	13.
0068	T	A	0.	0.	0.	0.	0.	4.	40.	0.	0.	0.	0.	0.	44.
0069	T	A	0.	29.	17.	0.	0.	0.	0.	0.	0.	0.	0.	0.	46.
0071	T	A	0.	0.	4.	0.	0.	7.	3.	0.	0.	0.	0.	0.	14.
0071	T	B	0.	0.	2.	0.	0.	1.	1.	0.	0.	0.	0.	0.	4.
0072	T	A	0.	0.	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0074	T	A	0.	0.	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0074	T	B	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0075	T	A	0.	0.	0.	0.	0.	5.	2.	0.	0.	0.	0.	0.	7.
0076	T	A	0.	0.	2.	0.	0.	0.	2.	0.	0.	0.	0.	0.	4.
0080	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0082	T	A	0.	0.	22.	21.	0.	2.	0.	0.	0.	0.	0.	0.	45.
0083	T	A	0.	0.	27.	17.	0.	2.	0.	0.	0.	0.	0.	0.	46.
0084	T	A	0.	0.	9.	12.	0.	2.	0.	0.	0.	0.	0.	0.	23.
0085	T	A	0.	0.	0.	1.	0.	1.	0.	0.	0.	0.	0.	0.	2.
0087	T	A	0.	0.	13.	26.	0.	3.	0.	0.	0.	0.	0.	0.	42.
0088	T	A	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0089	T	A	0.	0.	45.	37.	0.	4.	0.	0.	0.	0.	0.	0.	86.
0089	T	B	0.	0.	16.	13.	0.	1.	0.	0.	0.	0.	0.	0.	30.
0090	T	A	0.	0.	5.	4.	0.	0.	0.	0.	0.	0.	0.	0.	9.
0095	T	A	0.	0.	120.	0.	0.	103.	0.	0.	0.	0.	0.	0.	223.
0095	T	B	0.	0.	16.	0.	0.	20.	0.	0.	0.	0.	0.	0.	36.
0096	T	A	0.	0.	78.	12.	0.	27.	0.	0.	0.	0.	0.	0.	117.
0096	T	B	0.	0.	14.	0.	0.	7.	0.	0.	0.	0.	0.	0.	21.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE II DATE 1 JUNE 1972

PROGRAM F (Continued) YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0097	T	A	0.	0.	9.	0.	0.	7.	0.	0.	0.	0.	0.	0.	16.
0098	T	A	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0101	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0104	T	B	43.	30.	0.	0.	0.	4.	0.	0.	0.	0.	0.	0.	77.
0105	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0106	T	A	34.	26.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	61.
0106	T	B	18.	17.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	35.
0107	T	A	59.	34.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	96.
0108	T	A	60.	34.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	95.
0111	T	A	5.	6.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0112	T	A	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0113	T	A	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0114	T	A	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0115	T	A	0.	0.	7.	13.	0.	0.	92.	0.	0.	0.	0.	0.	112.
0116	T	A	1.	7.	13.	16.	0.	4.	15.	0.	0.	0.	0.	0.	56.
0116	T	B	0.	0.	5.	7.	0.	0.	5.	0.	0.	0.	0.	0.	17.
0117	T	A	0.	2.	5.	8.	0.	0.	7.	0.	0.	0.	0.	0.	22.
0118	T	A	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0119	T	A	0.	0.	14.	17.	0.	0.	0.	0.	0.	0.	0.	0.	31.
0119	T	B	0.	0.	13.	15.	0.	0.	15.	0.	0.	0.	0.	0.	43.
0120	T	A	3.	5.	23.	18.	0.	0.	0.	0.	0.	0.	0.	0.	49.
0121	T	A	2.	0.	23.	23.	0.	0.	0.	0.	0.	0.	0.	0.	48.
0122	T	A	0.	1.	5.	2.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0123	T	A	0.	0.	2.	5.	0.	0.	0.	0.	0.	0.	0.	0.	7.
0129	T	A	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	1.
0131	T	A	0.	0.	0.	0.	0.	1.	5.	0.	0.	0.	0.	0.	6.
0133	T	A	1.	5.	1.	0.	0.	0.	8.	0.	0.	0.	0.	0.	15.
0133	T	B	0.	0.	2.	0.	0.	0.	14.	0.	0.	0.	0.	0.	16.
0141	T	A	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0142	T	A	1.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	2.
0144	T	A	0.	0.	19.	3.	0.	26.	0.	0.	0.	0.	0.	0.	48.

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE II
DOP A

DATE 1 JUNE 1972
YEAR FY 74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1554657.	0.	0.	1554657.	1554657.	2094000.	0.	2093999.	0.	2093999.	0.	74.
ENGINE	340608.	0.	552746.	893354.	893354.	1400000.	0.	1399999.	0.	1399999.	0.	64.
ACC/COMP	502579.	0.	654753.	1157332.	1157332.	1908000.	0.	1907999.	0.	1907999.	0.	61.
ELEC/ARM	296490.	0.	658048.	954538.	954538.	958000.	0.	958000.	0.	958000.	0.	100.
SUPPORT	438694.	0.	13625.	452319.	452319.	510000.	0.	510000.	0.	510000.	0.	89.
MFG'NG	592613.	0.	138048.	730661.	730661.	812000.	0.	812000.	0.	812000.	0.	90.
SUB TOTAL	3725641.	0.	2017220.	5742861.	5742861.	7682000.	0.	7681997.	0.	7681997.	0.	
VARIANCE					5742861.	7682000.	0.		0.		0.	75.
OTHER	165301.	0.	13625.	178926.								
TOTAL	3890942.	0.	2030845.	5921787.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE II
DOP B

DATE 1 JUNE 1972
YEAR FY 74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1343934.	0.	137835.	1481769.	1481769.	1820000.	0.	1819999.	0.	1819999.	0.	81.
ENGINE	401398.	0.	225426.	626824.	626824.	836000.	0.	836000.	0.	836000.	0.	75.
ACC/COMP	574531.	0.	414961.	989492.	989492.	1300000.	0.	1299999.	0.	1299999.	0.	76.
ELEC/ARM	568439.	0.	595648.	1164087.	1164087.	1198000.	0.	1197999.	0.	1197999.	0.	97.
SUPPORT	485892.	0.	38977.	524869.	524869.	622000.	0.	622000.	0.	622000.	0.	84.
MFG'NG	354211.	0.	78313.	432524.	432524.	674000.	0.	674000.	0.	674000.	0.	64.
SUB TOTAL	3728405.	0.	1491160.	5219565.	5219565.	6450000.	0.	6449997.	0.	6449997.	0.	
VARIANCE					5219565.	6450000.	0.		0.		0.	81.
OTHER	320986.	0.	22077.	343063.								
TOTAL	4049391.	0.	1513237.	5562628.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE II
DOP C

DATE 1 JUNE 1972
YEAR FY 74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD+ SHIFT 2&3	L.P. ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1286675.	0.	615159.	1901834.	1456000.	1456000.	445834.	1455999.	0.	1455999.	0.	131.
ENGINE	204425.	0.	525513.	729938.	729938.	800000.	0.	800000.	0.	800000.	0.	91.
ACC/COMP	685852.	0.	777997.	1463849.	1463849.	2028000.	0.	2027999.	0.	2027999.	0.	72.
ELEC/ARM	397565.	0.	579177.	976742.	976742.	1220000.	0.	1219999.	0.	1219999.	0.	80.
SUPPORT	591598.	0.	52645.	644243.	524000.	524000.	120243.	524000.	0.	524000.	0.	123.
MFG'NG	653034.	0.	226198.	879232.	879232.	1118000.	0.	1117999.	0.	1117999.	0.	79.
SUB TOTL	3819159.	0.	2776689.	6595838.	6029761.	7146000.	566077.	7145996.	0.	7145996.	0.	
VARIANCE					6029761.	7146000.	566077.		0.		0.	92.
OTHER	473788.	0.	117648.	591436.								
TOTAL	4292937.	0.	2894337.	7187274.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE II
DOP D

DATE 1 JUNE 1972
YEAR FY 74

SHOP CATEGORY	BASE WORKLOAD	+ INCREMENT BASEWKLD SHIFT 2&3	+ L.P. ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	524283.	0.	159360.	683643.	488000.	488000.	195643.	488000.	0.	488000.	0.	140.
ENGINE	40476.	0.	274836.	315312.	315312.	412000.	0.	412000.	0.	412000.	0.	77.
ACC/COMP	146534.	0.	238612.	385146.	385146.	592000.	0.	592000.	0.	592000.	0.	65.
ELEC/ARM	68102.	0.	188095.	256197.	256197.	360000.	0.	360000.	0.	360000.	0.	71.
SUPPORT	59138.	0.	0.	59138.	59138.	92000.	0.	92000.	0.	92000.	0.	64.
MFG'NG	287359.	0.	109319.	356678.	358000.	358000.	38678.	358000.	0.	358000.	0.	111.
SUB TOTAL	1125892.	0.	970222.	2096114.	1861793.	2302000.	234321.	2302000.	0.	2302000.	0.	
VARIANCE					1861793	2302000.	234321.		0.		0.	91.
OTHER	108281.	0.	1.	108282.								
TOTAL	1234173.	0.	970223.	2204396.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE II
DOP E

DATE 1 JUNE 1972
YEAR FY 74

SHOP CATEGORY	BASE + WORKLOAD	INCREMENT BASEWKLD + SHIFT 2&3	L.P. ASSIGNED = WORKLOAD	TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	578122.	0.	135388.	713510.	713510.	768000.	0.	768000.	0.	768000.	0.	93.
ENGINE	278831.	0.	209507.	488338.	488338.	660000.	0.	660000.	0.	660000.	0.	74.
ACC/COMP	236290.	0.	249413.	485703.	485703.	924000.	0.	924000.	0.	924000.	0.	53.
ELEC/ARM	81376.	0.	177315.	258691.	258691.	652000.	0.	652000.	0.	652000.	0.	40.
SUPPORT	227958.	0.	11396.	239354.	239354.	246000.	0.	246000.	0.	246000.	0.	97.
MFG'NG	142519.	0.	47367.	189886.	189886.	510000.	0.	510000.	0.	510000.	0.	37.
SUB TOTL	1545096.	0.	830386.	2375482.	2375482.	3760000.	0.	3760000.	0.	3760000.	0.	
VARIANCE					2375482.	3760000.	0.		0.		0.	63.
OTHER	118119.	0.	9768.	127887.								
TOTAL	1663215.	0.	840154.	2503369.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE II
DOP F

DATE 1 JUNE 1972
YEAR FY 74

SHOP CATEGORY	BASE WORKLOAD	+ INCREMENT BASEWKLD SHIFT 2 &3	+ L.P. ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	201334.	0.	562644.	763978.	702000.	702000.	61978.	702000.	0.	702000.	0.	109.
ENGINE	222612.	0.	207614.	430226.	416000.	416000.	14226.	416000.	0.	416000.	0.	103.
ACC/COMP	286545.	0.	548980.	835525.	632000.	632000.	203525.	632000.	0.	632000.	0.	132.
ELEC/ARM	62928.	0.	117341.	180269.	180269.	206000.	0.	206000.	0.	206000.	0.	88.
SUPPORT	203409	0.	55849.	259258.	212000.	212000.	47258.	212000.	0.	212000.	0.	122.
MFG'NG	210888.	0.	135567.	346455.	346455.	374000.	0.	374000.	0.	374000.	0.	93.
SUB TOTL	1187716.	0.	1627995.	2815711.	2488724.	2542000.	326987.	2542000.	0.	2542000.	0.	
VARIANCE					2488724.	2542000.	326987.		0.		0.	111.
OTHER	51686.		49857.	101543.								
TOTAL	1239402.	0.	1677852.	2917254.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE II
DOP G

DATE 1 JUNE 1972
YEAR FY 74

SHOP CATEGORY	BASE + WORKLOAD	INCREMENT BASEWKLD + SHIFT 2 & 3	L.P. ASSIGNED = WORKLOAD	TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1351112.	0.	11466.	1362578.	1192000.	1192000.	170578.	1191999.	0.	1191999.	0.	114.
ENGINE	372609.	0.	73119.	445728.	436000.	436000.	9728.	436000.	0.	436000.	0.	102.
ACC/COMP	677686.	0.	254169.	931855.	931855.	1430000.	0.	1429999.	0.	1429999.	0.	65.
ELEC/ARM	298987.	0.	189180.	488167.	488167.	640000.	0.	640000.	0.	640000.	0.	76.
SUPPORT	295482.	0.	11466.	306948.	86000.	86000.	86000.	86000.	86000.	86000.	48948.	357.
MFG'NG	491505.	0.	68798.	560303.	550000.	550000.	10303.	550000.	0.	550000.	0.	102.
SUB TOTL	3487381.	0.	608198.	4095579.	3684022.	4334000.	276609.	4333998.	86000.	4333998.	48948.	
VARIANCE					3684022.	4334000.	276609.		86000.		48948.	94.
OTHER	273859.	0.	0.	273859.								
TOTAL	3761240.	0.	608198.	4369438.								

DOP COST REPORT

RUN NO./NAME CASE II — DATE 1 JUNE 1972

DOP A — YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P.WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	31592841.	0.	31592841.	1702068.	0.	1702068.	33294909.
MISSILE	2018451.	0.	2018451.	237203.	3076909.	3314112.	5332563.
ENGINE	5430715.	13145928.	18576643.	0.	0.	0.	18576643.
F/J	42535.	29634359.	29676894.	0.	0.	0.	29676894.
OTHER	7636282.	0.	7636282.	0.	0.	0.	7636282.
SPECIAL	3415555.	0.	3415555.	14145962.	0.	14145962.	17561517.
INCREMENTAL 2ND SHIFT							0.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	50136379.	42780287.	92916666.	16085233.	3076909.	19162142.	112078808.
COST/VOLUME ADJ.							254527.
SUB TOTAL							112333335.
INCREASE TO MANNING LEVEL							57441.
DECREASE TO MANNING LEVEL							0.
GRAND TOTAL							112390776.

DOP COST REPORT

RUN NO./NAME CASE II
DOP B

DATE 1 JUNE 1972
YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	30334890.	3787289.	34122179.	0.	0.	0.	34122179.
MISSILE	3262874.	0.	3262874.	316575.	2400951.	2717526.	5980400.
ENGINE	10785251.	3605979.	14391230.	0.	0.	0.	14391230.
F/J	40380.	19850842.	19891222.	0.	0.	0.	19891222.
OTHER	4734157.	0.	4734157.	0.	0.	0.	4734157.
SPECIAL	2572786.	0.	2572786.	11502731.	0.	11502731.	14075517.
INCREMENTAL 2ND SHIFT							0.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	51730338.	27244110.	78974448.	11819306.	2400951.	14220257.	93194705.
COST/VOLUME ADJ.							-1358394.
SUB TOTAL							91836311.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							728833.
GRAND TOTAL							92565144.

DOP COST REPORT

RUN NO./NAME CASE II
DOP C

DATE 1 JUNE 1972
YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	26814366.	16928640.	43743006.	4397813.	272612.	4670425.	48413431.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	2284178.	11748081.	14032259.	3464721.	263219.	3727940.	17760199.
F/J	191874.	28704548.	28896422.	0.	0.	0.	28896422.
OTHER	9259941.	0.	9259941.	0.	0.	0.	9259941.
SPECIAL	3838767.	0.	3838767.	21122077.	0.	21122077.	24960844.
INCREMENTAL 2ND SHIFT							118876.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	42389126.	57381269.	99770395.	28984611.	535831.	29520442.	129409713.
COST/VOLUME ADJ.							32343.
SUB TOTAL							129442056.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							0.
GRAND TOTAL							129442056.

DOP COST REPORT

RUN NO./NAME CASE II DATE 1 JUNE 1972

DOP D YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	8917558.	4396516.	13314074.	0.	0.	0.	13314074.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	0.	6171479.	6171479.	188270.	211168.	399438.	6570917.
F/J	19470.	9110941.	9130411.	0.	0.	0.	9130411.
OTHER	2102637.	0.	2102637.	0.	0.	0.	2102637.
SPECIAL	1329121.	0.	1329121.	5774315.	0.	5774314.	7103436.
INCREMENTAL 2ND SHIFT							32805.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	12368786.	19678936.	32047722.	5962585.	211168.	6173752.	38254280.
COST/VOLUME ADJ.							-260167.
SUB TOTAL							37994113.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1688064.
GRAND TOTAL							39682177.

DOP COST REPORT

RUN NO./NAME CASE II — DATE 1 JUNE 1972

DOP E — YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	12187591.	3511810.	15699401.	0.	0.	0.	15699401.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	5097583.	7794488.	12892071.	15674494.	0.	15674494.	28566565.
F/J	0.	9654956.	9654956.	0.	0.	0.	9654956.
OTHER	3022851.	0.	3022851.	0.	0.	0.	3022851.
SPECIAL	2415487.	0.	2415487.	8094594.	0.	8094594.	10510081.
INCREMENTAL 2ND SHIFT							0.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	22723511.	20961254.	43684766.	23769088.	0.	23769088.	67453854.
COST/VOLUME ADJ.							-91866.
SUB TOTAL							67361988.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1568627.
GRAND TOTAL							64930615.

DOP COST REPORT

RUN NO./NAME CASE II — DATE 1 JUNE 1972

DOP F — YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	1143059.	13892322.	15035381.	189474.	0.	189474.	15224855.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	3833721.	4179401.	8013122.	2716980.	223134.	2940114.	10953236.
F/J	665168.	11616288.	12281456.	0.	0.	0.	12281456.
OTHER	4196602.	0.	4196602.	0.	0.	0.	4196602.
SPECIAL	1615670.	0.	1615670.	6767594.	0.	6767594.	8383264.
INCREMENTAL 2ND SHIFT							42508.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	11454220.	29688011.	41142231.	9674048.	223134.	9897182.	51081921.
COST/VOLUME ADJ.							-336466.
SUB TOTAL							50745455.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							92013.
GRAND TOTAL							50837468.

DOP COST REPORT

RUN NO./NAME CASE II DATE 1 JUNE 1972

DOP G YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	29337062.	0.	29337062.	5773879.	0.	5773879.	35110941.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	4456126.	881734.	5337860.	4417921.	0.	4417921.	9755781.
F/J	5407246.	12163423.	17570669.	0.	0.	0.	17570669.
OTHER	4451550.	0.	4451550.	0.	0.	0.	4451550.
SPECIAL	1381624.	0.	1381623.	11033179.	0.	11033179.	12414801.
INCREMENTAL 2ND SHIFT							35959.
INCREMENTAL 3RD SHIFT							27520.
INCREMENTAL POST THIRD SHIFT							104260.
SUB TOTAL	45033608.	13045157.	58078764.	21224979.	0.	21224979.	79471481.
COST/VOLUME ADJ.							-231011.
SUB TOTAL							79240470.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1191493.
GRAND TOTAL							80431963.

PROGRAM COST REPORT

RUN NO./NAME ALL NARFS CASE II

DATE 1 JUNE 1972

YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	173998103.	42516577.	216514680.	13493165.	272612.	13765777.	230280457.
MISSILE	6474424.	0.	6474424.	848338.	5477860.	6326198.	12800622.
ENGINE	41911306.	47527090.	89438396.	26516385.	697520.	27213905.	116652301.
F/J	67642378.	120735355.	188377733.	0.	0.	0.	188377733.
OTHER	40389988.	0.	40389988.	0.	0.	0.	40389988.
SPECIAL	23976860.	0.	23976860.	166239429.	0.	166239429.	190216289.
INCREMENTAL 2ND SHIFT							230149.
INCREMENTAL 3RD SHIFT							27520.
INCREMENTAL POST THIRD SHIFT							104260.
SUB TOTAL	354393059.	210779022.	565172081.	207097317.	6447992.	213545309.	779079319.
COST/VOLUME ADJ.							-1991031.
SUB TOTAL							777088288.
INCREASE TO MANNING LEVEL							57441.
DECREASE TO MANNING LEVEL							5269030.
GRAND TOTAL							782414759.

DOP WORKLOAD - COST SUMMARY REPORT

RUN NO./NAME CASE II DATE 1 JUNE 1972

DOP	MANHOURS	COSTS
ALA	5921787.	112390776.
NOR	5562628.	92565144.
N.I.	7187274.	129442056.
Q.P.	2204396.	39682177.
JAX	2503369.	64930615.
C.P.	2917254.	50837468.
PNS	4369438.	80431963.
TOTAL	30666146.	570280199.

SECTION 4

CASE III, ±10% VARIATION OF ASSIGNMENTS

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

PROGRAM A — YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0022	D	A	0.	0.	0.	0.	11.	0.	0.	0.	0.	0.	0.	0.	11.
0023	D	A	0.	0.	0.	0.	44.	0.	0.	0.	0.	0.	0.	0.	44.
0056	D	A	0.	0.	14.	0.	0.	27.	0.	0.	0.	0.	0.	0.	41.
0059	D	A	0.	0.	56.	0.	0.	68.	0.	0.	0.	0.	0.	0.	124.
0062	D	A	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0063	D	A	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0064	D	A	0.	11.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0065	D	A	0.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0084	D	A	0.	0.	0.	13.	0.	0.	0.	0.	0.	0.	0.	0.	13.
0086	D	L	0.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0087	D	A	0.	0.	2.	20.	0.	0.	0.	0.	0.	0.	0.	0.	22.
0088	D	A	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0089	D	A	0.	0.	1.	13.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0089	F	A	0.	0.	1.	9.	0.	0.	0.	0.	0.	0.	0.	0.	10.
0094	D	A	0.	0.	80.	0.	0.	17.	0.	0.	0.	0.	0.	0.	97.
0094	D	B	0.	0.	12.	0.	0.	7.	0.	0.	0.	0.	0.	0.	19.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III

PROGRAM B

DATE 1 JUNE 1972

YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0182	S	L	127.	126.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	253.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

PROGRAM E — YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0146	A	A	44.	0.	0.	0.	0.	36.	0.	0.	0.	0.	0.	0.	80.
0147	A	A	96.	0.	0.	0.	0.	8.	0.	0.	0.	0.	0.	0.	104.
0148	A	A	18.	0.	0.	0.	0.	42.	0.	0.	0.	0.	0.	0.	60.
0149	A	A	135.	0.	0.	0.	0.	111.	0.	0.	0.	0.	0.	0.	246.
0151	A	A	116.	0.	0.	0.	0.	322.	0.	0.	0.	0.	0.	0.	438.
0154	A	A	31.	0.	0.	0.	0.	60.	0.	0.	0.	0.	0.	0.	91.
0160	P	A	0.	0.	0.	0.	0.	8.	106.	0.	0.	0.	0.	0.	114.
0161	A	A	55.	0.	0.	0.	128.	0.	0.	0.	0.	0.	0.	0.	183.
0161	P	A	14.	42.	0.	0.	43.	0.	97.	0.	0.	0.	0.	0.	196.
0162	A	A	21.	0.	0.	0.	15.	0.	0.	0.	0.	0.	0.	0.	36.
0162	P	A	22.	0.	0.	0.	32.	0.	0.	0.	0.	0.	0.	0.	54.
0163	A	A	74.	0.	0.	0.	59.	0.	0.	0.	0.	0.	0.	0.	133.
0163	A	B	4.	0.	0.	0.	5.	0.	0.	0.	0.	0.	0.	0.	9.
0163	P	A	36.	39.	0.	0.	56.	0.	47.	0.	0.	0.	0.	0.	178.
0163	P	B	7.	0.	0.	0.	8.	0.	0.	0.	0.	0.	0.	0.	15.
0166	P	A	18.	37.	23.	0.	0.	0.	0.	0.	0.	0.	0.	0.	78.
0168	P	A	0.	16.	28.	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.
0168	P	B	0.	24.	8.	0.	0.	0.	0.	0.	0.	0.	0.	0.	32.
0169	P	A	0.	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0172	A	Q	0.	0.	0.	12.	0.	0.	0.	0.	0.	0.	0.	0.	12.
0173	A	A	24.	0.	0.	6.	0.	0.	0.	0.	0.	0.	0.	0.	30.
0173	A	B	8.	0.	0.	35.	0.	0.	0.	0.	0.	0.	0.	0.	43.
0173	P	A	0.	0.	0.	8.	13.	0.	0.	0.	0.	0.	0.	0.	21.
0173	P	B	18.	0.	0.	10.	0.	0.	0.	0.	0.	0.	0.	0.	28.
0175	A	A	0.	0.	102.	33.	0.	0.	0.	0.	0.	0.	0.	0.	135.
0175	A	B	0.	0.	6.	5.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0175	P	A	0.	0.	146.	33.	16.	50.	0.	0.	0.	0.	0.	0.	245.
0175	P	B	0.	0.	13.	8.	0.	0.	0.	0.	0.	0.	0.	0.	21.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

PROGRAM E (Continued) — YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0176	A	A	0.	0.	75.	48.	0.	0.	0.	0.	0.	0.	0.	0.	123.
0176	P	A	0.	0.	159.	36.	0.	99.	0.	0.	0.	0.	0.	0.	294.
0202	P	A	24.	69.	0.	0.	16.	0.	0.	0.	0.	0.	0.	0.	109.
0204	P	A	12.	17.	0.	0.	24.	0.	0.	0.	0.	0.	0.	0.	53.
0204	P	B	12.	8.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	20.
0205	P	A	61.	0.	0.	0.	49.	0.	0.	0.	0.	0.	0.	0.	110.
0209	P	A	13.	3.	15.	0.	0.	0.	0.	0.	0.	0.	0.	0.	31.
0211	P	A	43.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.
0211	P	B	14.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	17.
0212	P	A	96.	8.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	104.
0213	P	A	5.	4.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.
0218	A	N	0.	0.	13.	0.	0.	19.	0.	0.	0.	0.	0.	0.	32.
0218	P	N	0.	0.	10.	0.	0.	14.	0.	0.	0.	0.	0.	0.	24.
0219	A	A	0.	0.	0.	0.	0.	8.	0.	0.	0.	0.	0.	0.	8.
0220	A	A	0.	0.	11.	0.	0.	23.	0.	0.	0.	0.	0.	0.	34.
0220	P	A	0.	0.	58.	55.	0.	25.	0.	0.	0.	0.	0.	0.	138.
0221	A	A	0.	0.	17.	0.	0.	19.	0.	0.	0.	0.	0.	0.	36.
0221	A	B	0.	0.	5.	0.	0.	7.	0.	0.	0.	0.	0.	0.	12.
0221	B	A	0.	0.	30.	0.	0.	33.	0.	0.	0.	0.	0.	0.	63.
0221	B	B	0.	0.	8.	0.	0.	13.	0.	0.	0.	0.	0.	0.	21.
0221	P	A	0.	0.	53.	175.	0.	0.	0.	0.	0.	0.	0.	0.	228.
0221	P	B	0.	0.	46	0.	0.	30.	0.	0.	0.	0.	0.	0.	76.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III   DATE 1 JUNE 1972

PROGRAM F   YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0001	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0002	T	A	4.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.
0003	T	A	11.	3.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	16.
0004	T	A	11.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0005	T	A	8.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0006	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0007	T	A	16.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	19.
0007	T	B	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.
0008	T	A	7.	0.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	9.
0009	T	A	0.	0.	0.	7.	0.	4.	46.	0.	0.	0.	0.	0.	57.
0009	T	B	6.	0.	0.	0.	0.	0.	11.	0.	0.	0.	0.	0.	17.
0010	T	A	27.	0.	0.	0.	0.	5.	12.	0.	0.	0.	0.	0.	44.
0010	T	B	26.	0.	0.	0.	1.	0.	55.	0.	0.	0.	0.	0.	82.
0011	T	A	2.	4.	0.	0.	1.	3.	25.	0.	0.	0.	0.	0.	35.
0012	T	A	62.	0.	0.	0.	0.	0.	18.	0.	0.	0.	0.	0.	80.
0013	T	A	0.	0.	0.	0.	1.	9.	54.	0.	0.	0.	0.	0.	64.
0014	T	A	0.	0.	0.	0.	0.	37.	228.	0.	0.	0.	0.	0.	265.
0015	T	B	10.	0.	0.	0.	0.	9.	53.	0.	0.	0.	0.	0.	72.
0016	T	A	2.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0017	T	A	0.	0.	4.	5.	23.	0.	0.	0.	0.	0.	0.	0.	32.
0018	T	A	104.	147.	0.	0.	0.	6.	0.	0.	0.	0.	0.	0.	257.
0019	T	A	8.	13.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	22.
0020	T	A	12.	20.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	34.
0021	T	A	21.	24.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	45.
0022	T	A	32.	8.	0.	0.	19.	8.	0.	0.	0.	0.	0.	0.	67.
0022	T	B	21.	4.	0.	0.	6.	4.	0.	0.	0.	0.	0.	0.	35.
0023	T	A	53.	13.	0.	0.	32.	12.	0.	0.	0.	0.	0.	0.	110.
0024	T	A	11.	4.	0.	0.	15.	0.	0.	0.	0.	0.	0.	0.	30.
0025	T	A	59.	25.	0.	0.	85.	0.	0.	0.	0.	0.	0.	0.	169.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

PROGRAM F (Continued) — YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0027	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0029	T	A	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0032	T	A	0.	2.	1.	2.	4.	2.	2.	0.	0.	0.	0.	0.	13.
0033	T	A	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
0034	T	A	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	1.
0035	T	A	2.	4.	0.	0.	0.	0.	3.	0.	0.	0.	0.	0.	9.
0035	T	B	4.	8.	0.	0.	0.	4.	0.	0.	0.	0.	0.	0.	16.
0036	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0037	T	B	2.	0.	0.	2.	0.	1.	0.	0.	0.	0.	0.	0.	5.
0038	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0039	T	A	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0041	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0042	T	A	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.
0043	T	A	13.	5.	0.	0.	0.	2.	0.	0.	0.	0.	0.	0.	20.
0043	T	B	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0044	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0045	T	A	5.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.
0046	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0047	T	A	3.	5.	1.	2.	0.	4.	1.	0.	0.	0.	0.	0.	16.
0049	T	A	2.	12.	17.	18.	0.	0.	0.	0.	0.	0.	0.	0.	49.
0050	T	A	0.	3.	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0053	T	A	0.	4.	2.	13.	0.	0.	0.	0.	0.	0.	0.	0.	19.
0053	T	B	0.	3.	3.	8.	0.	0.	0.	0.	0.	0.	0.	0.	14.
0054	T	A	0.	16.	20.	0.	0.	4.	0.	0.	0.	0.	0.	0.	40.
0056	T	A	0.	24.	67.	20.	0.	41.	0.	0.	0.	0.	0.	0.	152.
0056	T	B	0.	0.	6.	0.	0.	3.	0.	0.	0.	0.	0.	0.	9.
0057	T	A	0.	0.	9.	0.	0.	7.	0.	0.	0.	0.	0.	0.	16.
0057	T	B	0.	0.	3.	0.	0.	3.	0.	0.	0.	0.	0.	0.	6.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

PROGRAM F (Continued) — YEAR FY74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0059	T	A	0.	33.	155.	33.	0.	29.	0.	0.	0.	0.	0.	0.	250.
0062	T	A	0.	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0063	T	A	0.	13.	7.	0.	0.	0.	0.	0.	0.	0.	0.	0.	20.
0063	T	B	0.	8.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0064	T	A	0.	20.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	22.
0064	T	B	0.	0.	15.	6.	0.	0.	0.	0.	0.	0.	0.	0.	21.
0065	T	A	0.	14.	27.	0.	0.	0.	0.	0.	0.	0.	0.	0.	41.
0065	T	B	0.	13.	16.	0.	0.	0.	0.	0.	0.	0.	0.	0.	29.
0066	T	B	0.	6.	0.	0.	0.	0.	3.	0.	0.	0.	0.	0.	9.
0067	T	A	0.	3.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	4.
0067	T	B	0.	11.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.	13.
0068	T	A	0.	0.	0.	0.	0.	6.	38.	0.	0.	0.	0.	0.	44.
0069	T	A	0.	32.	14.	0.	0.	0.	0.	0.	0.	0.	0.	0.	46.
0071	T	A	0.	0.	4.	0.	0.	7.	3.	0.	0.	0.	0.	0.	14.
0071	T	B	0.	0.	2.	0.	0.	1.	1.	0.	0.	0.	0.	0.	4.
0072	T	A	0.	0.	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0074	T	A	0.	0.	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.	3.
0074	T	B	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0075	T	A	0.	0.	0.	0.	0.	6.	1.	0.	0.	0.	0.	0.	7.
0076	T	A	0.	0.	2.	0.	0.	0.	2.	0.	0.	0.	0.	0.	4.
0080	T	A	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0082	T	A	0.	0.	20.	23.	0.	2.	0.	0.	0.	0.	0.	0.	45.
0083	T	A	0.	0.	24.	20.	0.	2.	0.	0.	0.	0.	0.	0.	46.
0084	T	A	0.	0.	8.	13.	0.	2.	0.	0.	0.	0.	0.	0.	23.
0085	T	A	0.	0.	0.	1.	0.	1.	0.	0.	0.	0.	0.	0.	2.
0087	T	A	0.	0.	11.	28.	0.	3.	0.	0.	0.	0.	0.	0.	42.
0088	T	A	0.	0.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0089	T	A	0.	0.	40.	42.	0.	4.	0.	0.	0.	0.	0.	0.	86.
0089	T	B	0.	0.	14.	15.	0.	1.	0.	0.	0.	0.	0.	0.	30.
0090	T	A	0.	0.	4.	5.	0.	0.	0.	0.	0.	0.	0.	0.	9.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

PROGRAM F (Continued) — YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0095	T	A	0.	0.	109.	0.	0.	114.	0.	0.	0.	0.	0.	0.	223.
0095	T	B	0.	0.	14.	0.	0.	22.	0.	0.	0.	0.	0.	0.	36.
0096	T	A	0.	0.	72.	18.	0.	27.	0.	0.	0.	0.	0.	0.	117.
0096	T	B	0.	0.	13.	0.	0.	8.	0.	0.	0.	0.	0.	0.	21.
0097	T	A	0.	0.	8.	0.	0.	8.	0.	0.	0.	0.	0.	0.	16.
0098	T	A	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0101	T	A	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0104	T	B	39.	34.	0.	0.	0.	4.	0.	0.	0.	0.	0.	0.	77.
0105	T	A	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0106	T	A	31.	29.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	61.
0106	T	B	17.	18.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	35.
0107	T	A	54.	39.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	96.
0108	T	A	56.	38.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	95.
0111	T	A	5.	6.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11.
0112	T	A	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0113	T	A	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.
0114	T	A	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2.
0115	T	A	0.	0.	2.	18.	0.	0.	92.	0.	0.	0.	0.	0.	112.
0116	T	A	0.	10.	10.	19.	0.	7.	10.	0.	0.	0.	0.	0.	56.
0116	T	B	0.	0.	4.	8.	0.	0.	5.	0.	0.	0.	0.	0.	17.
0117	T	A	0.	3.	4.	9.	0.	0.	6.	0.	0.	0.	0.	0.	22.
0118	T	A	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0119	T	A	0.	0.	13.	18.	0.	0.	0.	0.	0.	0.	0.	0.	31.
0119	T	B	0.	0.	11.	17.	0.	0.	15.	0.	0.	0.	0.	0.	43.
0120	T	A	0.	8.	20.	21.	0.	0.	0.	0.	0.	0.	0.	0.	49.
0121	T	A	0.	0.	22.	26.	0.	0.	0.	0.	0.	0.	0.	0.	48.
0122	T	A	0.	2.	4.	2.	0.	0.	0.	0.	0.	0.	0.	0.	8.
0123	T	A	0.	0.	1.	6.	0.	0.	0.	0.	0.	0.	0.	0.	7.
0129	T	A	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	1.

WORKLOAD ASSIGNMENT

RUN NO./NAME CASE III　　　　DATE 1 JUNE 1972

PROGRAM F (Continued)　　　　YEAR FY 74

TEC	S/P	CUST	ALA	NOR	N.I.	Q.P.	JAX	C.P.	PNS	OTHER	XCNUS	ARMY	USAF	COMM	TOTAL
0131	T	A	0.	0.	0.	0.	0.	2.	4.	0.	0.	0.	0.	0.	6.
0133	T	A	1.	5.	1.	0.	0.	0.	8.	0.	0.	0.	0.	0.	15.
0133	T	B	0.	0.	1.	0.	0.	0.	15.	0.	0.	0.	0.	0.	16.
0141	T	A	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
0142	T	A	1.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	2.
0144	T	A	0.	0.	16.	6.	0.	26.	0.	0.	0.	0.	0.	0.	48.

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE III
DOP A

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. + ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1554657.	0.	0.	1554657.	1554657.	2094000.	0.	2093999.	0.	2093999.	0.	74.
ENGINE	340608.	0.	507934.	848542.	848542.	1400000.	0.	1399999.	0.	1399999.	0.	61.
ACC/COMP	502579.	0.	597339.	1099918.	1099918.	1908000.	0.	1907999.	0.	1907999.	0.	58.
ELEC/ARM	296490.	0.	599801.	896291.	896291.	958000.	0.	958000.	0.	958000.	0.	94.
SUPPORT	438694.	0.	12410.	451104.	451104.	510000.	0.	510000.	0.	510000.	0.	88.
MFG'NG	592613.	0.	125742.	718355.	718355.	812000.	0.	812000.	0.	812000.	0.	88.
SUB TOTL	3725641.	0.	1843226.	5568867.	5568867.	7682000.	0.	7681997.	0.	7681997.	0.	
VARIANCE					5568867.	7682000.	0.		0.		0.	72.
OTHER	165301.	0.	12411.	177712.								
TOTAL	3890942.	0.	1855637.	5746579.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE III
DOP B

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	+ INCREMENT BASEWKLD SHIFT 2&3	+ L.P. ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1343934.	0.	139633.	1483567.	1483567.	1820000.	0.	1819999.	0.	1819999.	0.	82.
ENGINE	401398.	0.	233505.	634903.	634903.	836000.	0.	836000.	0.	836000.	0.	76.
ACC/COMP	574531.	0.	476138.	1050669.	1050669.	1300000.	0.	1299999.	0.	1299999.	0.	81.
ELEC/ARM	568439.	0.	693060.	1261499.	1198000.	1198000.	63499.	1197999.	0.	1197999.	0.	105.
SUPPORT	485892.	0.	46176.	532068.	532068.	622000.	0.	622000.	0.	622000.	0.	86.
MFG'NG	354211.	0.	90940.	445151.	445151.	674000.	0.	674000.	0.	674000.	0.	66.
SUB TOTL	3728405.	0.	1679452.	5407857.	5344358.	6450000.	63499.	6449997.	0.	6449997.	0.	
VARIANCE					5344358.	6450000.	63499.		0.		0.	84.
OTHER	320986.	0.	22077.	343063.								
TOTAL	4049391.	0.	1701529.	5750920.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE III
DOP C

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. + ASSIGNED = WORKLOAD	TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	1286675.	0.	586922.	1873597.	1456000.	1456000.	417597.	1455999.	0.	1455999.	0.	129.
ENGINE	204425.	0.	517596.	722021.	722021.	800000.	0.	800000.	0.	800000.	0.	90.
ACC/COMP	685852.	0.	737411.	1423263.	1423263.	2028000.	0.	2027999.	0.	2027999.	0.	70.
ELEC/ARM	397565.	0.	526243.	923808.	923808.	1220000.	0.	1219999.	0.	1219999.	0.	76.
SUPPORT	591598.	0.	47604.	639202.	524000.	524000.	115202.	524000.	0.	524000.	0.	122.
MFG'NG	653034.	0.	215229.	868263.	868263.	1118000.	0.	1117999.	0.	1117999.	0.	78.
SUB TOTL	3819149.	0.	2631005.	6450154.	5917355.	7146000.	532799.	7145996.	0.	7145996.	0.	
VARIANCE					5917355.	7146000.	532799.		0.		0.	90.
OTHER	473788.	0.	115135.	588923.								
TOTAL	4292937.	0.	2746140.	7039077.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE III
DOP D

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	524283.	0.	158218.	682501.	488000.	488000.	194501.	488000.	0.	488000.	0.	140.
ENGINE	40476.	0.	261280.	301756.	301756.	412000.	0.	412000.	0.	412000.	0.	73.
ACC/COMP	146534.	0.	262384.	408918.	408918.	592000.	0.	592000.	0.	592000.	0.	69.
ELEC/ARM	68102.	0.	225902.	294004.	294004.	360000.	0.	360000.	0.	360000.	0.	82.
SUPPORT	59138.	0.	0.	59138.	59138.	92000.	0.	92000.	0.	92000.	0.	64.
MFG'NG	287359.	0.	121188.	408547.	358000.	358000.	50547.	358000.	0.	358000.	0.	114.
SUB TOTL	1125892.	0.	1028972.	2154864.	1909816.	2302000.	245048.	2302000.	0.	2302000.	0.	
VARIANCE					1909816.	2302000.	245048.		0.		0.	94.
OTHER	108281.	0.	1.	108282.								
TOTAL	1234173	0.	1028973.	2263146.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE III
DOP E

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	+ INCREMENT BASEWKLD SHIFT 2&3	+ L.P. ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	478122.	0.	135388.	713510.	713510.	768000.	0.	768000.	0.	768000.	0.	93.
ENGINE	278831.	0.	213757.	492588.	492588.	660000.	0.	660000.	0.	660000.	0.	75.
ACC/COMP	236290.	0.	231438.	467728.	467728.	924000.	0.	924000.	0.	924000.	0.	51.
ELEC/ARM	81376.	0.	156301.	237677.	237677.	652000.	0.	652000.	0.	652000.	0.	36.
SUPPORT	227958.	0.	9931.	237889.	237889.	246000.	0.	246000.	0.	246000.	0.	97.
MFG'NG	142519.	0.	44816.	187335.	187335.	510000.	0.	510000.	0.	510000.	0.	37.
SUB TOTL	1545096.	0.	791631.	2336727.	2336727.	3760000.	0.	3760000.	0.	3760000.	0.	
VARIANCE					2336727.	3760000.	0.		0.		0.	62.
OTHER	118119.	0.	9280.	127399.								
TOTAL	1663215.	0.	800911.	2464126.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE III
DOP F

DATE 1 JUNE 1972
YEAR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILIZED
AIRFRAME	201334.	0.	595792.	797126.	702000.	702000.	95126.	702000.	0.	702000.	0.	114.
ENGINE	222612,	0.	223099.	445711.	416000.	416000.	29711.	416000.	0.	416000.	0.	107.
ACC/COMP	286545.	0.	576360.	862905.	632000.	632000.	230905.	632000.	0.	632000.	0.	137.
ELEC/ARM	62928.	0.	124915.	187843.	187843.	206000.	0.	206000.	0.	206000.	0.	91.
SUPPORT	203409.	0.	59252.	262661.	212000.	212000.	50661.	212000.	0.	212000.	0.	124.
MFG'NG	210888.	0.	139279.	350167.	350167.	374000.	0.	374000.	0.	374000.	0.	94.
SUB TOTL	1187716.	0.	1718697.	2906413.	2500010.	2542000.	406403.	2542000.	0.	2542000.	0.	
VARIANCE					2500010.	2542000.	406403.		0.		0.	114.
OTHER	51686.	0.	52045.	103731.								
TOTAL	1239402.	0.	1770742.	3010144.								

WORKLOAD VARIANCE REPORT

MANHOURS

RUN NO./NAME CASE III
DOP G

DATE 1 JUNE 1972
YR FY74

SHOP CATEGORY	BASE WORKLOAD	INCREMENT + BASEWKLD SHIFT 2&3	L.P. +ASSIGNED WORKLOAD	= TOTAL WORKLOAD	SHIFT 1 WORKLOAD	SHIFT 1 CAPACITY	SHIFT 2 WORKLOAD	SHIFT 2 CAPACITY	SHIFT 3 WORKLOAD	SHIFT 3 CAPACITY	POST SHIFT 3 WORKLOAD	PERCENT UTILITIZED
AIRFRAME	1351112.	0.	11149.	1362261.	1192000.	1192000.	170261.	1191999.	0.	1191999.	0.	114.
ENGINE	372609.	0.	75470.	448079.	436000.	436000.	12079.	436000.	0.	436000.	0.	103.
ACC/COMP	677686.	0.	247383.	925069.	925069.	1430000.	0.	1429999.	0.	1429999.	0.	65.
ELEC/ARM	298987.	0.	183949.	482936.	482936.	640000.	0.	640000.	0.	640000.	0.	75.
SUPPORT	295482.	0.	11149.	306631.	86000.	86000.	86000.	86000.	86000.	86000.	48631.	357.
MFG'NG	491505.	0.	66896.	558401.	550000.	550000.	8401.	550000.	0.	550000.	0.	102.
SUB TOTAL	3487381.	0.	595996.	4083377.	3672005.	4334000.	276741.	4333998.	86000.	4333998.	48631.	
VARIANCE					3672005.	4334000.	276741.		86000.		48631.	94.
OTHER	273859.	0.	0.	273859.								
TOTAL	3761240.	0.	595996.	4357236.								

DOP COST REPORT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

DOP A — YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	31592841.	0.	31592841.	1702068.	0.	1702068.	33294909.
MISSILE	2018451.	0.	2018451.	237203.	2811277.	3048480.	5066931.
ENGINE	5430715.	12073610.	17504325.	0.	0.	0.	17504325.
F/J	42535.	26991610.	27034145.	0.	0.	0.	27034145.
OTHER	7636282.	0.	7636282.	0.	0.	0.	7636282.
SPECIAL	3415555.	0.	3415555.	14145962.	0.	14145962.	17561517.
INCREMENTAL 2ND SHIFT							0.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	50136379.	39065220.	89201599.	16085233.	2811277.	18896510.	108098109.
COST/VOLUME ADJ.							547008.
SUB TOTAL							108645117.
INCREASE TO MANNING LEVEL							19650.
DECREASE TO MANNING LEVEL							0.
GRAND TOTAL							108664767.

DOP COST REPORT

RUN NO./NAME CASE III DATE 1 JUNE 1972

DOP B YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	30334890.	3787289.	34122179.	0.	0.	0.	34122179.
MISSILE	3262874.	0.	3262874.	316575.	2653683.	2970258.	6233132.
ENGINE	10785251.	3480491.	14265742.	0.	0.	0.	14265742.
F/J	40380.	23517351.	23557731.	0.	0.	0.	23557731.
OTHER	4734157.	0.	4734157.	0.	0.	0.	4734157.
SPECIAL	2572786.	0.	2572786.	11502731.	0.	11502731.	14075517.
INCREMENTAL 2ND SHIFT							10795.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	51730338.	30785131.	82515469.	11819306.	2653683.	14472989.	96999253.
COST/VOLUME ADJ.							-2107712.
SUB TOTAL							94891541.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							399322.
GRAND TOTAL							95290863.

DOP COST REPORT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

DOP C — YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	26814366.	16457261.	43271627.	4397813.	272612.	4670425.	47942052.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	2284178.	11989749.	14273927.	3464721.	243283.	3708004.	17981931.
F/J	191874.	25955938.	26147812.	0.	0.	0.	26147812.
OTHER	9259941.	0.	9259941.	0.	0.	0.	9259941.
SPECIAL	3838767.	0.	3838767.	21122077.	0.	21122077.	24960844.
INCREMENTAL 2ND SHIFT							111888.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	43289126.	54402948.	96792074.	28984611.	515895.	29500506.	126404468.
COST/VOLUME ADJ.							575093.
SUB TOTAL							126979561.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							174234.
GRAND TOTAL							127153795.

DOP COST REPORT

RUN NO./NAME CASE III DATE 1 JUNE 1972

DOP D YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	8917558.	4240176.	13157734.	0.	0.	0.	13157734.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	0.	5519107.	5519107.	188270.	211168.	399438.	5918545.
F/J	19470.	11137399.	11156869.	0.	0.	0.	11156869.
OTHER	2102637.	0.	2102637.	0.	0.	0.	2102637.
SPECIAL	1329121.	0.	1329121.	5774315.	0.	5774315.	7103435.
INCREMENTAL 2ND SHIFT							34307.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	12368786.	20896682.	33265468.	5962585.	211168.	6173753.	39473527.
COST/VOLUME ADJ.							-343235.
SUB TOTAL							39130292.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1585627.
GRAND TOTAL							40715919.

DOP COST REPORT

RUN NO./NAME CASE III — DATE 1 JUNE 1972

DOP E — YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	12187591.	3511810.	15699401.	0.	0.	0.	15699401.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	5097583.	8030202.	13127785.	15674494.	0.	15674494.	28802279.
F/J	0.	8413080.	8413080.	0.	0.	0.	8413080.
OTHER	3022851.	0.	3022851.	0.	0.	0.	3022851.
SPECIAL	2415487.	0.	2415487.	8094594.	0.	8094594.	10510081.
INCREMENTAL 2ND SHIFT							0.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	22723512.	19955092.	42678603.	23769088.	0.	23769088.	66447692.
COST/VOLUME ADJ.							28950.
SUB TOTAL							66476642.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1637305.
GRAND TOTAL							68113947.

DOP COST REPORT

RUN NO./NAME CASE III DATE 1 JUNE 1972

DOP F YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	1143059.	14397732.	15540791.	189474.	0.	189474.	15730265.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	3833721.	4487080.	8320801.	2716980.	236787.	2953767.	11274568.
F/J	665168.	12324053.	12989221.	0.	0.	0.	12989221.
OTHER	4196602.	0.	4196602.	0.	0.	0.	4196602.
SPECIAL	1615670.	0.	1615670.	6767594.	0.	6767594.	8383264.
INCREMENTAL 2ND SHIFT							52832.
INCREMENTAL 3RD SHIFT							0.
INCREMENTAL POST THIRD SHIFT							0.
SUB TOTAL	11454220.	31208865.	42663085.	9674048.	236787.	9910835.	52626752.
COST/VOLUME ADJ.							-509454.
SUB TOTAL							52117298.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							0.
GRAND TOTAL							52117298.

DOP COST REPORT

RUN NO./NAME CASE III DATE 1 JUNE 1972

DOP G YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	29337062.	0.	29337062.	5773879.	0.	5773879.	35110941.
MISSILE	0.	0.	0.	0.	0.	0.	0.
ENGINE	4456126..	973914.	5430040.	4417921.	0.	4417921.	9847961.
F/J	5407246.	11827048.	17234294.	0.	0.	0.	17234294.
OTHER	4451550.	0.	4451550.	0.	0.	0.	4451550.
SPECIAL	1381624.	0.	1381624.	11033179.	0.	11033179.	12414803.
INCREMENTAL 2ND SHIFT							35976.
INCREMENTAL 3RD SHIFT							27520.
INCREMENTAL POST THIRD SHIFT							103585.
SUB TOTAL	45033608.	12800962.	57834570.	21224979.	0.	21224979.	79226630.
COST/VOLUME ADJ.							-189614.
SUB TOTAL							79037016.
INCREASE TO MANNING LEVEL							0.
DECREASE TO MANNING LEVEL							1212848.
GRAND TOTAL							80249864.

PROGRAM COST REPORT

RUN NO./NAME ALL NARFS CASE III

DATE 1 JUNE 1972

YEAR FY 74

PROGRAM	BASE WKLD FUND ONE	L.P. WKLD FUND ONE	FUND ONE SUB TOTAL	BASE WKLD FUND TWO	L.P. WKLD FUND TWO	FUND TWO SUB TOTAL	FUNDING TOTAL
AIRCRAFT	173998103.	42394268.	216392371.	13493165.	272612.	13765777.	230158148.
MISSILE	6474424.	0.	6474424.	848338.	5464960.	6313298.	12787722.
ENGINE	41911306.	46554153.	88465459.	26516385.	691237.	27207622.	115673081.
F/J	67642378.	120166479.	187808857.	0.	0.	0.	187808857.
OTHER	40389988.	0.	40389988.	0.	0.	0.	40389988.
SPECIAL	23976860.	0.	23976860.	166239429.	0.	166239429.	190216289.
INCREMENTAL 2ND SHIFT							245798.
INCREMENTAL 3RD SHIFT							27520.
INCREMENTAL POST THIRD SHIFT							103585.
SUB TOTAL	354393059.	209114900.	563507959.	207097317.	6428809.	213526126.	777410988.
COST/VOLUME ADJ.							-1998961.
SUB TOTAL							775412027.
INCREASE TO MANNING LEVEL							19650.
DECREASE TO MANNING LEVEL							5008962.
GRAND TOTAL							780440639.

DOP WORKLOAD - COST SUMMARY REPORT

RUN NO./NAME CASE III

DATE 1 JUNE 1972

DOP	MANHOURS	COSTS
ALA	5746579.	108664767.
NOR	5750920.	95290863.
N.I.	7039077.	127153795.
Q.P.	2263146.	40715919.
JAX	2464126.	68113947.
C.P.	3010144.	52117298.
PNS	4357236.	80249864.
TOTAL	30631228.	572306453.

INDEX OF CODES

DOP/NARF

A - ALAMEDA

B - NORFOLK

C - NORTH ISLAND

D - QUONSET POINT

E - JACKSONVILLE

F - CHERRY POINT

G - PENSACOLA

PROGRAM

A - AIRCRAFT

B - MISSILES

E - ENGINES

F - F/J (COMPONENTS)

SUB-PROGRAM

D - PAR

F - PAR/CONVERSION

P - REPAIR

S - MISSILE REWORK

T - F/J

CUSTOMER

A - NAVY FLEET/TRAINING COMMAND

B - BIS/PROJDEV/DRONE

L - AIR FORCE

N - COAST GUARD

Q - INTERNATIONAL