MEMORANDUM
RM-4072-PR
SEPTEMBER 1964

BASE OPERATIONS-MAINTENANCE SIMULATOR

Allen S. Ginsberg and Barbara A. King

PREPARED FOR:
UNITED STATES AIR FORCE PROJECT RAND

The RAND Corporation
SANTA MONICA • CALIFORNIA

MEMORANDUM
RM-4072-PR
SEPTEMBER 1964

BASE OPERATIONS-MAINTENANCE SIMULATOR

Allen S. Ginsberg and Barbara A. King

This research is sponsored by the United States Air Force under Project RAND—Contract No. AF 49(638)-700 monitored by the Directorate of Development Plans, Deputy Chief of Staff, Research and Development, Hq USAF. Views or conclusions contained in this Memorandum should not be interpreted as representing the official opinion or policy of the United States Air Force.

The RAND Corporation
1700 MAIN ST • SANTA MONICA • CALIFORNIA • 90406

PREFACE

Because of the vast amount of Air Force resources devoted to maintenance activities at base level and the relationship between these activities and operational effectiveness, RAND has undertaken a number of studies that examine ways of improving maintenance management.

The Base Operations-Maintenance Simulator (BOMS), described in this Memorandum, was developed in connection with one of these studies, known as Logistics Problem IV (LP-IV). A significant portion of the LP-IV methodology involved the construction of a man-machine simulation model. As the work progressed, however, it became clear that this type of simulation could not answer all the questions we wished to ask. Therefore, the BOMS, an all-computer simulation, was constructed to supplement the man-machine simulation.

This Memorandum describes the simulator at two levels. The main body contains a word description and a set of flow charts of the simulator's essential characteristics. A detailed and technical description, intended primarily for potential users of the simulator, appears in the Appendix. The kinds of studies presently under way, which will be presented in a subsequent Memorandum, are enumerated in the Introduction.

This Memorandum should be of interest to personnel at Headquarters USAF concerned with research and development of base maintenance policies, and to operating commands concerned with short range planning.

SUMMARY

The computer program described below, the Base Operations-Maintenance Simulator (BOMS), simulates the essential characteristics of an Air Force Base. In its present form it represents a SAC B-52/KC-135 organization, but it can, with slight modifications represent most other single-base operations.

To study complex base maintenance management systems, analytical techniques (e.g., linear and dynamic programming queueing theory) are, as yet, of limited use. Simulation techniques, on the other hand show greater promise. Not only do they afford better understanding of such systems, but also they can predict, with relatively high degrees of confidence, how a system will react to various changes such as variations in policies (decision rules) or in levels of resources (sensitivity tests). We are presently using the BOMS to study both these kinds of changes. We are exploring ways of improving the effectiveness of the base at little or no added cost, or maintaining the effectiveness at reduced cost. This simulation technique allows us to look at long periods of simulated activity and also supplies certain output data which cannot be obtained from present base data systems.

Three separate computer programs make up the BOMS: the Data Generator combines a flying schedule with random failures, generated by a Monte Carlo process, and with the resources required for repair. This data, along with input parameters describing pertinent characteristics of the base, is fed to the Main Program. The Main Program simulates, in great detail, the minute-by-minute activities of the base. Then the Analysis Program summarizes the output of the Main Program and prints the reports.

The body of this Memorandum desdribes in general terms each of these programs. The Appendix provides technical details.

CONTENTS

I. INTRODUCTION

The Base Operations-Maintenance Simulator (BOMS) is a computer program, written in the SIMSCRIPT* language, which simulates the principal characteristics of an Air Force aircraft base. It was written as a part of LP-IV** for use in RAND's studies of base maintenance policies.

The main body of this Memorandum is intended for those who wish to know what the simulator is, what basic assumptions it makes in attempting to model the real world, and what are some of the purposes to which the model may be put. A more detailed knowledge of the inner workings of the simulator can be gained from the Appendix.

We shall not discuss the advantages and pitfalls of simulation, other than briefly to indicate why we chose simulation as our principal tool for investigating base maintenance management. Two characteristics of any management problem make analytical and judgmental solutions very difficult to obtain. These are:

1. A large number of relevant (i.e., having a non-trivial effect on the system) factors which interact with each other in a complex manner.
2. A number of elements in the system whose behavior is stochastic (i.e., varying with time in some non-fixed manner).

Base maintenance management generously exhibits both these characteristics. Just two examples of many for the first condition are: the interactions between such factors as operational plans (e.g., flying schedules) and levels of available resources (e.g., men and parts); or among shift policies (e.g., overtime, time of shift change), specialist dispatch rules, and levels of available resources. Examples of the second condition are "break-rates" (i.e., frequency of malfunctions), the time required to fix various malfunctions, and flight lengths. As a result, we feel that, for the range of problems we wish to investigate, simulation appears to be the most useful

---

*H. M. Markowitz, B. Hausner, H. W. Karr, SIMSCRIPT: A Simulation Programming Language, The RAND Corporation, RM-3310-PR, November 1962.

**I. K. Cohen, Design and Objectives of Laboratory Problem IV, The RAND Corporation, RM-3354-PR, January 1963.

technique. We might add that purely analytical solutions to problems, with characteristics as in 1. and 2. above, can sometimes be obtained by simplifying assumptions. These assumptions usually neglect the interactions of some of the factors and ignore the stochastic behavior of all or most of the elements. In base maintenance management, it is unclear what assumptions can safely be permitted. We hope that our simulation studies lead to enhanced understanding of the problem and to the clear determination of permissible assumptions.

In addition to understanding of the maintenance system gained by building and using the BOMS, we see the model as serving the following purposes:

1. A tool for investigating the effects on selected measures of performance, such as turnaround, cancellation rate, etc., of various maintenance policies, and operating policies which interact with the maintenance function. For example, we currently use the simulator to investigate the following policies:

   a) Assignment of aircraft to specific missions. The policy in question here is how much in advance of a planned mission should the specific aircraft be assigned. Assigning the tail number irrevocably one week or more in advance allows advance planning and assures equal usage of all aircraft, but assigning, say, eight hours in advance may give more flexibility, allowing for lower cancellation and lateness rates and/or less pressure on the maintenance organization.

   b) Priority dispatching rules. Regardless of how much advance planning of unscheduled maintenance is attempted, the problem may arise as to which of the malfunctions (jobs) waiting for a particular resource should be started next. This problem arises whenever more than one job waits for a resource. If the order of service affects performance, it is important to find the best rule for assigning priorities.

   c) Scheduling of missions. Much of the workload at a base occurs when aircraft land after a mission. Judicious assignment of mission times may level the peaks in manpower requirements, and

substantially reduce the size of the maintenance force.

The results of these and other experiments discussed below will be documented in a forthcoming publication.

Some other policies which could be investigated with the BCMS are:

d) Shift policy -- e.g., when to use overtime, when should the shift changes take place?

e) Cannibalization -- e.g., what is its value and when should it be done?

f) Pre-emption (i.e., stopping work on one job in order to complete another) -- e.g., what is its worth and when should it be done?

2. A device for measuring the sensitivity of measures of base performance to change in selected input parameters. Examples of the parameters which we are currently studying are:

a) Manpower assignments. Determining an efficient manning is a many-sided problem. Not only can the total number of men available affect performance, but the distribution of these men among the different shops and among the different shifts can also be important. We are currently using the BCMS to determine the effects of various mannings.

b) Supply fill-rate. The fill-rate (i.e., the percentage of supply demands that can be met immediately upon demand) is affected not only by supply levels but also by the "pipeline" time (the time it takes to replace a part either by repair at base or resupply from the depot). We are currently studying the effects of variation in this fill-rate.

c) Manpower skills. Since our model distinguishes between workers on the basis of skill, we can measure the extent to which substituting unskilled for skilled personnel is economical.

d) Flying Program. Here we wish to determine the effects of various changes in the flying program, such as changes in the number of training flights or changes in the level of ground and airborne alert, and certain combinations of the above variations.

Other kinds of sensitivity tests that might be performed with this simulator are investigation of the effects of delays (e.g., delays in starting work on a job or delays caused by pre-emption or cannibalization), or changes in the malfunction rates.

3. The prototype of a planning tool for use in the day-to-day operations of an aircraft base. In this application, the model would estimate the ability of the maintenance organization to support a given flying program and anticipate trouble spots or bottlenecks. The use of simulation as an "on-line" planning tool has roused much interest, and in at least one case, was employed in industry.* In an Air Force environment, the BOMS could be used to answer questions with more speed and accuracy than either "back-of-the-envelope calculations" or intuition. Some of these questions are:

a. Given the proposed flight schedule and available resources for the coming period, when and where are the trouble spots likely to occur?

b. What are the consequences of proposed changes in the flight program?

c. What are the consequences of proposed changes in resource availabilities, where the changes can be either variations in time (e.g., changing the distribution of men amongst shifts) or variations in the levels of availability.

d. When are the low activity periods likely to occur? During these periods manpower may be utilized in other activities, such as training, bench repair, and miscellaneous details.

The principal advantage of using the simulator as a planning tool is that it predicts the future, a far more useful function than analyzing the past. Prediction permits quick and inexpensive insights into the effects of policy changes and resource-allocation changes, and pinpoints potential trouble spots before they occur. To fulfill all these purposes requires a device with flexibility. The

---

*Earl LeGrande, "The Development of a Factory Simulation Using Actual Operating Data," Management Technology, Vol. 3, No. 1, May 1963, pp. 1-19.

design of the simulator and the structure of the SIMSCRIPT language are the two factors that create the required flexibility. The simulator is, to a degree, modular so that chosen blocks of logic representing decision rules can be lifted out and replaced by the policy to be tested. The schedule of missions, the principal driving force of the simulation, is an input readily changed by the user. The input parameters describing the base and some of the characteristics of its operation (for example, the number of aircraft, the number of each type of personnel available, and whether missions are assigned to a particular aircraft far in advance or immediately preceding the missions) are simply punched on cards by the user prior to running the simulator.

As the main body of this report shows, the simulator is a highly detailed representation of a base. Perhaps we incorporated trivia. But we felt that certain details absent from other models (e.g., bench repair and pre-emption) should be incorporated because of their remotely possible effects on our simulations. Other RAND models,* like BOMS, are simulators of base activities. But, inasmuch as they they were built for different purposes, and have different levels of aggregation, they are, in effect, different models. This, plus the following considerations, largely determined the make-up of the simulator.

1. It was not clear in all cases which characteristics of the real world we could leave out or abstract without affecting the validity of the outputs.
2. In order to make the model useful as a planning tool and for investigating a wide range of policies, we chose to incorporate into the model many characteristics of base operations.
3. In order to avoid an extensive data collection effort, we decided to use the data already collected for the LP-IV man-machine simulation. If it was to be used as input without substantial scaling and aggregating, the model would have to accommodate itself to the data.

---

*T. C. Smith, SAMSOM: Support-Availability Multi-System Operations Model, The RAND Corporation, RM-4077-PR, May 1964; R. A. Levine, and R. B. Rainey, The Base Maintenance-Operations Model Used in RAND Logistics Research, The RAND Corporation, RM-2374-FR (DDC No. AD 220605), May 1959.

For a number of reasons, the simulation process was broken into three separate programs: the Data Generator Program, the Main Program, and the Analysis Program. The size of the model and the dimensions of the planned experiment (e.g., number of shops, aircraft, parts, etc.) were such that one large program would have exceeded our computer's memory. In addition, there were several advantages to the division of programs. The design of some of the experiments required using the same input data for many runs. Generating the data in a separate program obviated the need for regenerating this data each time a run was made, thus saving much computer time. Performing the analysis in a separate routine allows changes in final outputs without rerunning the Main Program.

The simulator works by accepting a data tape containing the flying schedule and all the pertinent data of the malfunctions which are to occur on each sortie. This data tape may be generated in any manner the user chooses, but must have a specific format. In this data generation the Monte Carlo sampling, or the drawing against probability distributions, can be done. The main simulator uses this data, along with its built-in rules, to "play through" the various events in the life history of each sortie. As each of these events occurs, a message is written on an "analysis" tape telling what the event is, what time it occurred, and what is the state of certain pertinent variables. This analysis tape can then be fed to another program which analyzes the results in various ways. The main body of this report describes each of these three programs in more detail.

II. THE DATA GENERATOR PROGRAM

The Data Generator Program supplies data for the Main Program. It creates an Exogenous Events Tape which carries exogenous events (e.g., "training mission"), the time the event occurs (e.g., "Day 5.24"), and the details of the malfunctions during the event (e.g., "Non-critical part 95 fails at the end of preflight and requires two skilled men from shop 5 to spend 1 hour and 30 minutes to remove and replace"). This tape starts the simulation, starts the chain of events associated with each sortie, and finally ends the simulation.

The Program generates data in three steps:

Step 1, Failure Generation, supplies malfunctions for each sortie by random sampling techniques. Information for each malfunction includes time of discovery, time to fix, resources required, criticality, etc.

Step 2, Merge 1, combines malfunctions with resources needed for repair (including bench resources when appropriate).

Step 3, Merge 2, combines the results of Merge 1 with the flying schedule deck. Each card in the flying schedule deck contains type of aircraft, aircraft number, type of sortie, special inspection (if any). If the sortie is a ground alert, the card also contains the number of days spent on ground alert, and the "exercise days" for the plane during its ground alert.

The Exogenous Events Tape may be used as long as flying schedule and failure rates remain unchanged. To change either of these requires a new tape. A change in the flying schedule requires a rerun of Merge 2. A change in failure rate necessitates rerun of both Merge 1 and Merge 2, but flying schedule cards can remain the same. A user may write his own Exogenous Events Tape provided the output harmonizes with the format shown on page 35 of the Appendix.

In simulating a SAC B-52/KC-135 squadron, preparing the input data was a major undertaking. Using forms from the Air Force data collection system we collated and summarized probability distributions for each of the 975 parts on both aircraft. These distributions give the probability of failure, type of action required (repair in place, remove and replace, etc.), probabilities of man-hours required for

repair, disposition of the part (discard or save and repair), etc. The Air Force data collection forms also informed us about resources required to repair each part. Team size (or its effective equivalent, clock hours) does not, however, appear on current forms. For this important data we relied on expert opinion.

Inherent in this method is one important assumption -- that malfunctions occur independently. To obviate this assumption, the user would have to perform an additional simulation prior to the Main Program in order to generate sets of dependent malfunctions.

III. THE MAIN PROGRAM

The Main Program simulates in great detail the minute activities of an air base. The failure of aircraft parts, the activities of shop personnel, as well as the flights of each plane fall within its scope. Associated with each flight is a list of events -- unload weapons, preflight, fly, postflight, service, download, etc. -- which may occur on any particular sortie. Also malfunctions and maintenance may occur as in the real world, during preflight, at the end of preflight, or at the end of postflight.

Inputs into the Main Program include events from the Exogenous Events Tape developed by the Data Generator Program plus a set of input parameters such as the number and kinds of parts in stock, and the time required to deliver a part from the depot. (See "Initial Conditions Deck" page 47 of the Appendix). The sortie events, read from the Exogenous Events Tape, drive the simulator. The simulator creates all the other activities in the life of the sortie endogenously, relying in part upon subroutines which perform specific tasks when called into action. Subroutines include "Start team action," "Stop maintenance," "Priority of part." (See "Explanation of Routines in Simulator," page 55 of Appendix.)

Below we describe the action of this simulator by first tracing the flow of aircraft, then the flow of maintenance, and finally by describing other key features of the model. We would emphasize that this description represents only our present program. Innumerable changes for specific decision points might be made to fit unique conditions. Some of these we outlined in the Introduction.

FLOW OF AIRCRAFT

During simulation, the first routine called upon is the Exogenous Event START which sets the day and time simulation is to be started and places the proper shift of men in the shops. (See Fig. 1 for a flow chart of the flow of aircraft.) Subsequent shift changes occur at eight-hour intervals to maintain the correct manning on each shift.

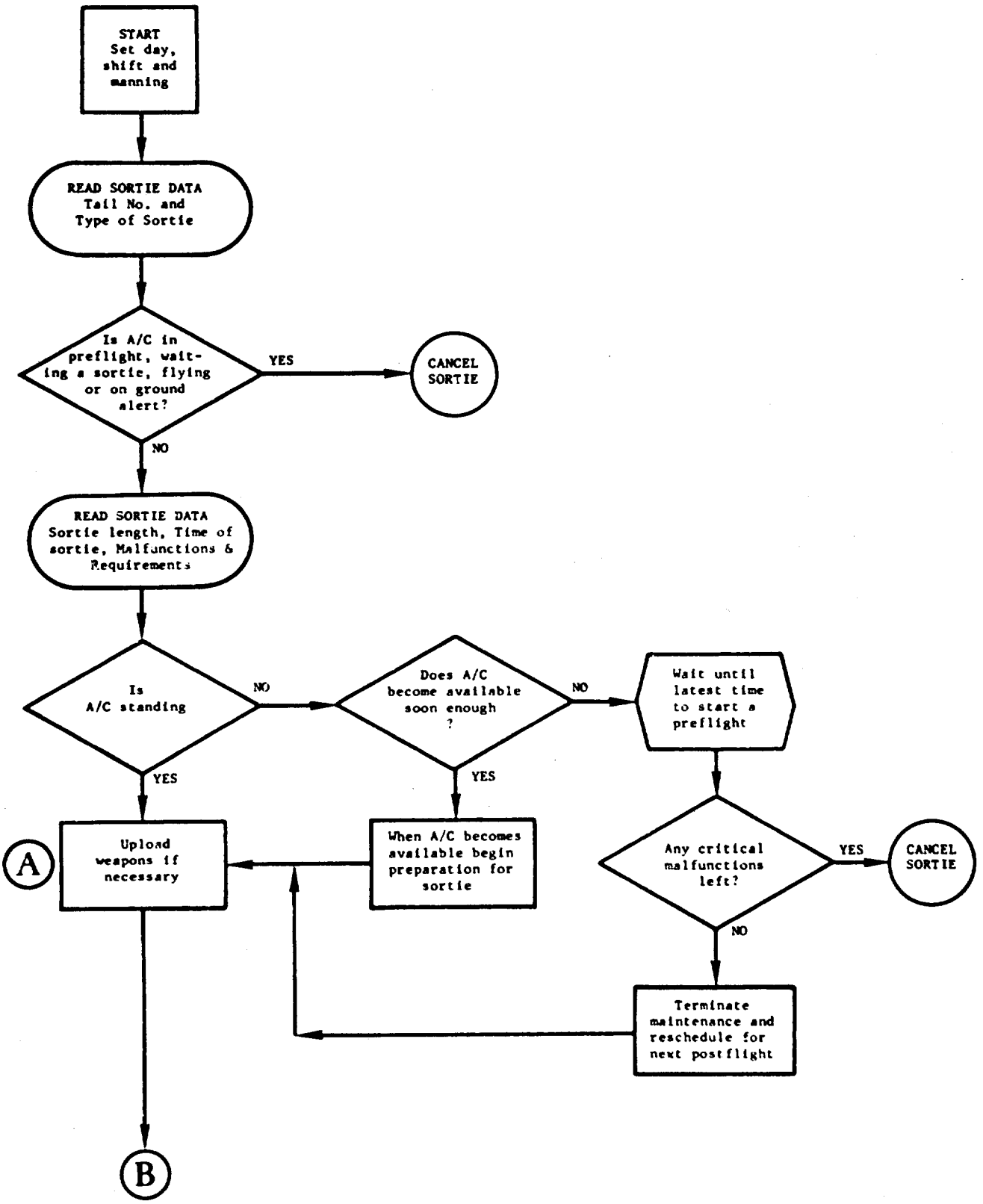
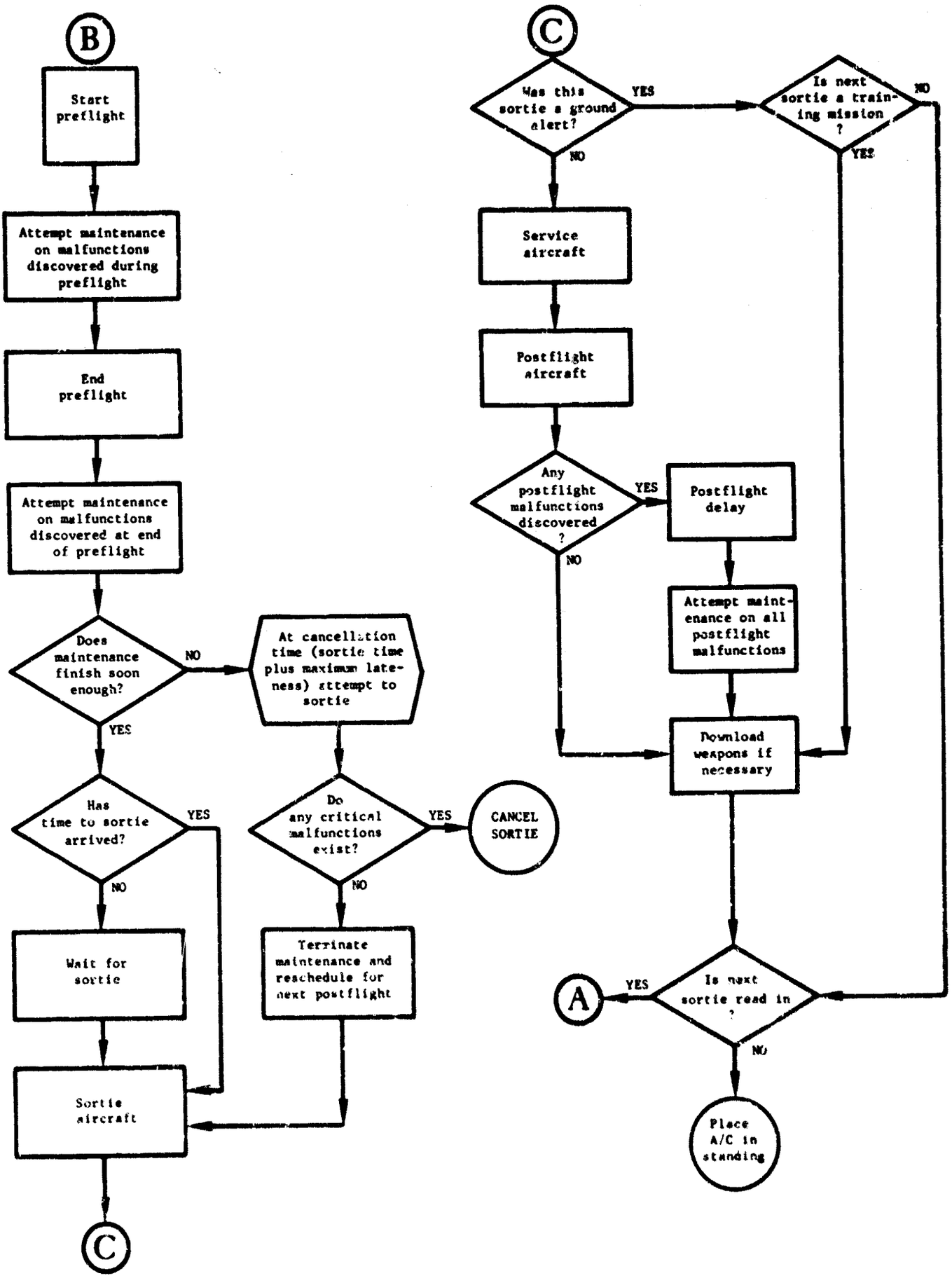

START
Set day, shift and manning
READ SORTIE DATA
Tail No. and Type of Sortie
Is A/C in preflight, waiting a sortie, flying or on ground alert?
YES
CANCEL SORTIE
NO
READ SORTIE DATA
Sortie length, Time of sortie, Malfunctions & Requirements
Is A/C standing
NO
Does A/C become available soon enough ?
NO
Wait until latest time to start a preflight
YES
YES
A
Upload weapons if necessary
When A/C becomes available begin preparation for sortie
Any critical malfunctions left?
YES
CANCEL SORTIE
NO
Terminate maintenance and reschedule for next postflight
B

Fig. 1 --



Logic of Flow of Aircraft Through a Sortie

As simulated time proceeds, each sortie is read in and prepared for flight. The program assigns aircraft to sorties by one of two methods: tail number and non-tail number. In "tail number," if the aircraft whose number appears on the sortie notice is presently in preflight, waiting for a sortie, on a sortie, or on ground alert, the new sortie is immediately cancelled. In "non-tail number" the aircraft number is ignored. The program first attempts to assign the newly read-in sortie to an aircraft which is of the correct type, has the proper weapon configuration, and is ready. If none is ready, the assignment goes to the aircraft most nearly ready to start a new sortie. In either method, if the assigned aircraft is presently ready, preparation for the new sortie immediately begins. But, if the aircraft is in any other state, the program will wait until the latest time to start a preflight and will again attempt to start the new sortie. At that time, if non-critical malfunctions are being repaired, they can be stopped, but work on critical malfunctions must continue, and the new sortie cancelled.

Loading of weapons (an upload), if necessary, is done before preflight. A preflight is then started, requiring the time specified by an input parameter. Malfunctions may be discovered and work started on them immediately, if possible, either 1/3 or 2/3 of the way through or at the end of the preflight. If maintenance on a preflight malfunction continues past sortie time, the aircraft will sortie immediately after completion of maintenance. However, if maintenance is still in process when the time to cancel the sortie arrives, an attempt is made to sortie the aircraft by terminating non-critical malfunctions. Critical malfunctions, though, will cancel the sortie, for they cannot be stopped. If the aircraft sorties with non-critical malfunctions outstanding, these malfunctions will be fixed at the end of this sortie.

The aircraft remains on its sortie the required time, then lands. If the sortie is a ground alert, malfunctions will be discovered and fixed during the sortie. After the sortie, the aircraft is serviced. In the case of a ground alert, if the next sortie is an air alert, no service is necessary and the aircraft is classified in standing (e.g., "ready and waiting"). If the next sortie after ground alert

is a training mission, a servicing to unload fuel is required before the aircraft is put in a standing condition.

After servicing of an air alert or a training sortie, the aircraft has a postflight inspection at the end of which malfunctions may be discovered. The program attempts to start work on all malfunctions after a specified delay. If no malfunctions appear during postflight, the aircraft is downloaded if necessary. At the end of the last malfunction or at the end of the download, the sortie is complete. The next sortie if it has been read in then begins. Otherwise the aircraft goes into standing. If the next sortie of the aircraft is read in during postflight maintenance and if no critical malfunctions are outstanding, all maintenance on the aircraft will be stopped when it becomes necessary to start this sortie.

FLOW OF MAINTENANCE

When attempting to start work on a malfunction or a team action (e.g., upload, download, or service), the model assumes that two types of resources may both be required to start the work:

1. The "replaceable-in-time" type (i.e., parts)
2. The "replaceable immediately" type (i.e., men)

That is, when a part is consumed it may, in time, be replaced by fixing it or by shipment from the depot, whereas men are available immediately upon completion of their current work.

When starting work on a malfunction, the program first checks to see if the required part, if any, is available (see Fig. 2 for chart showing the flow of maintenance). If not, the malfunction is filed in a queue awaiting that part or, if the malfunction is critical, the program cannibalizes another plane. (See "Other Features.")

Whether or not the part is available, the program checks for the availability of men. Any malfunction may require any number of skilled men and/or unskilled, from any number of shops. To differentiate in skill we let shop i be the skilled class and shop $i+1$ be the unskilled level. All the required men must be available before work may start on a job. If unskilled men from any of the required shops are unavailable, a substitution of the corresponding skilled men will be attempted.

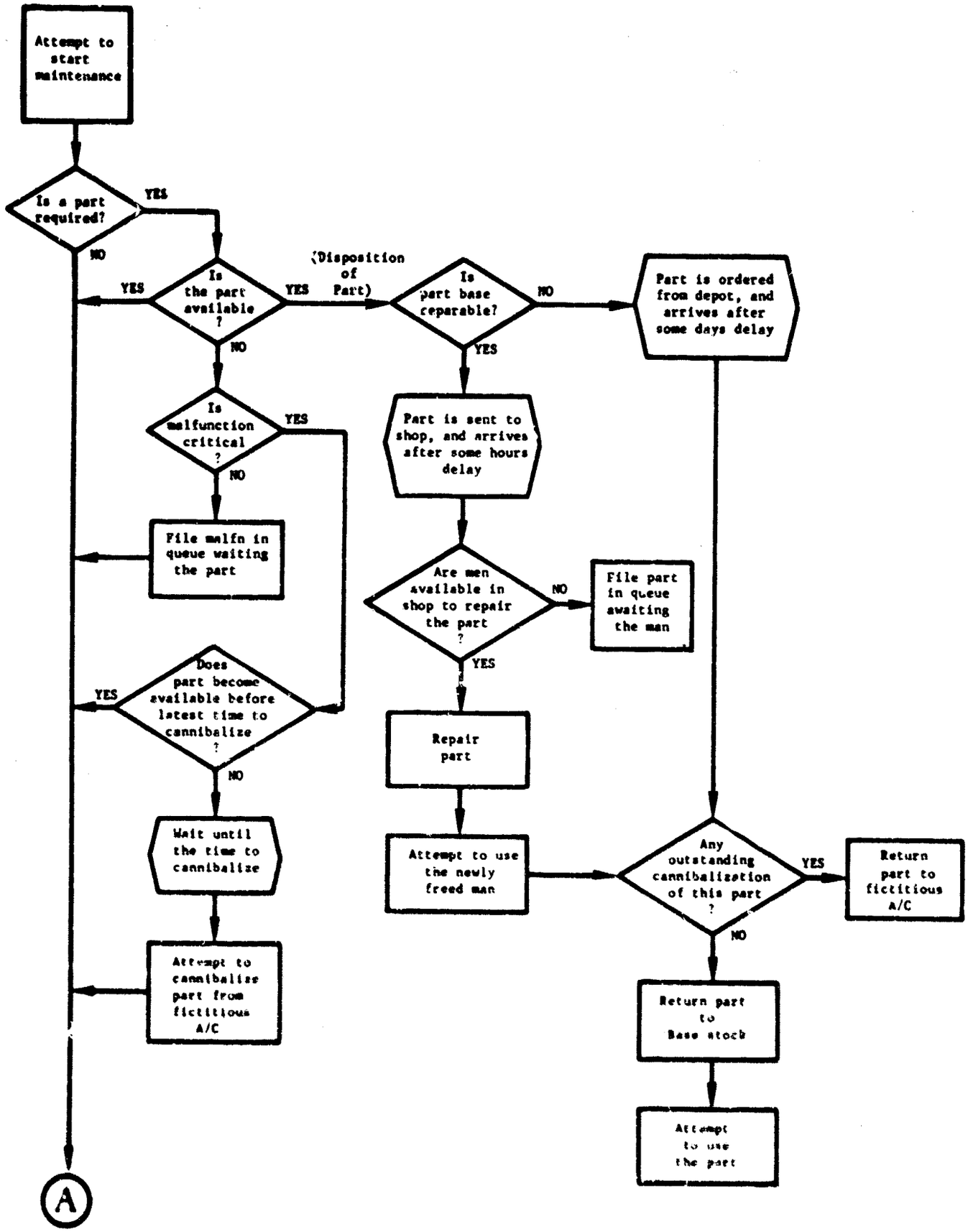
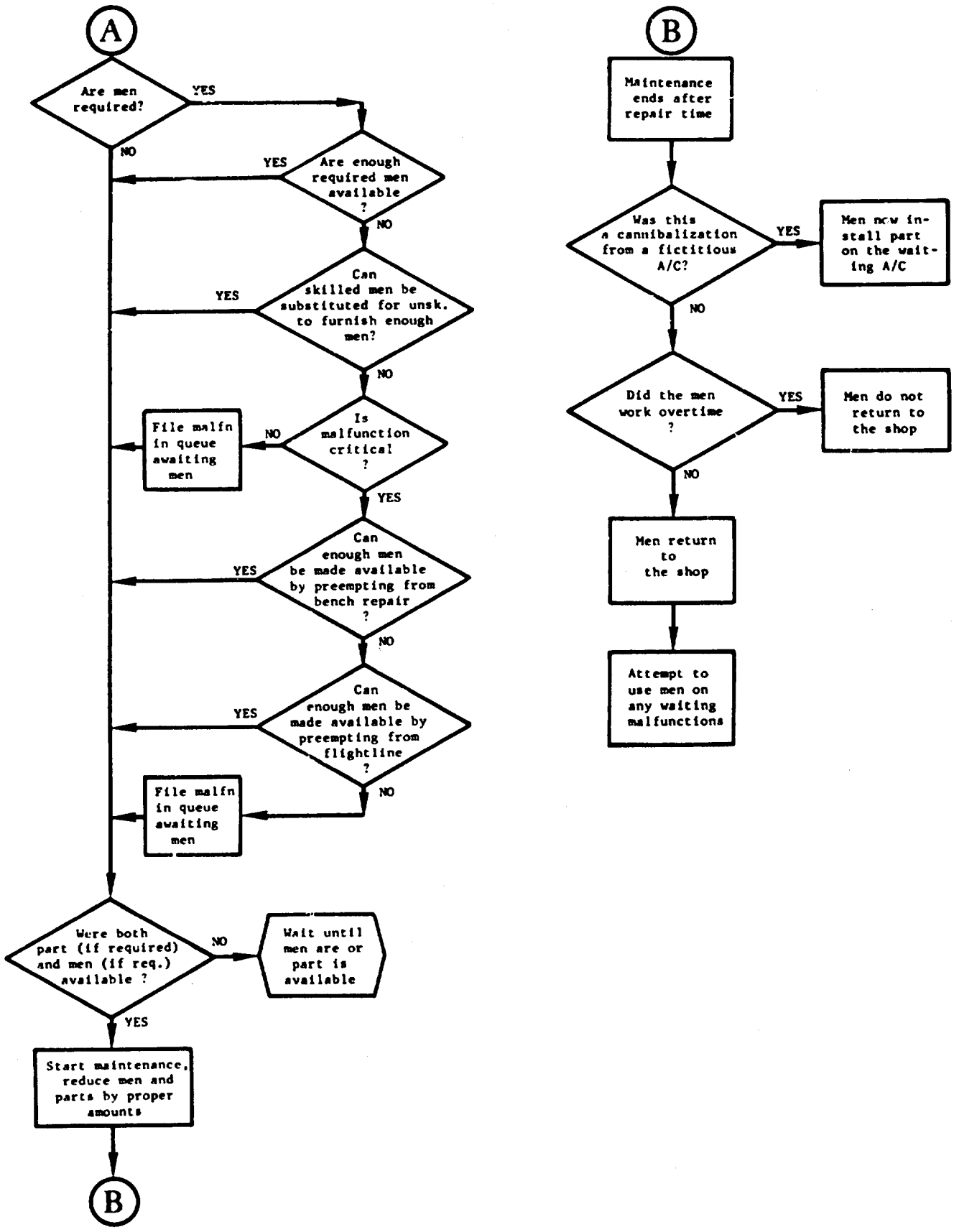

Attempt to start maintenance
Is a part required?
YES
NO
Is the part available ?
YES
NO
(Disposition of Part)
Is part base reparable?
YES
NO
Part is ordered from depot, and arrives after some days delay
Is malfunction critical ?
YES
NO
File malfn in queue waiting the part
Part is sent to shop, and arrives after some hours delay
Are men available in shop to repair the part ?
NO
File part in queue awaiting the man
YES
Repair part
Does part become available before latest time to cannibalize ?
YES
NO
Wait until the time to cannibalize
Attempt to cannibalize part from fictitious A/C
Attempt to use the newly freed man
Any outstanding cannibalization of this part ?
YES
Return part to fictitious A/C
NO
Return part to Base stock
Attempt to use the part
A

Fig. 2 --



Logic of Repair of a Malfunction

If substitution is not possible and if the malfunction is critical, a pre-emption will be attempted. Pre-emption implies that work will be stopped on any non-critical malfunctions of a lower priority if enough of the proper men can be made available. "Other Features," below, gives further details. If enough men cannot be found in any of the shops, the malfunction is filed in the queues of those shops. When men become available, the malfunctions in queues are removed by any desired priority rule, and work is started on them if enough men and parts are available.

When both the required men and parts are available, work starts immediately and ends after the programmed repair time. If the maintenance action indicated is a "remove and replace" and the part is designated "reparable on the base," the part is sent to the proper shop for bench repair (see "Other Features," "Bench Repair"), arriving after a delay specified in the Initial Conditions Deck. If the part is not base reparable, a replacement comes from the depot, arriving after its specified delay.

OTHER FEATURES

Shift Changes

After simulation begins, the first shift is caused exogenously by specifying the time of starting. Subsequent shift changes happen every eight hours. The Initial Conditions Deck specifies the number of men in each shop, on each of three shifts, for weekdays and weekends. Though new men come into each shop and the old men leave, in some instances maintenance work performed by men already in the job continues past a shift change. Any time a job continues past a shift change, but is scheduled to end before an initially specified overlap time, men already on the job continue until they finish. However, when maintenance is scheduled to extend beyond the overlap time, the men may or may not work overtime, depending on the type of job and availability of new men. On critical malfunctions, new men are assigned immediately to continue the work without interruption. If enough new men of the type required are not available in the next shift, the old men work overtime until the critical job is completed.

If non-critical maintenance or bench repair extends past the allowable overlap, it terminates and goes to its proper queue.

After all the shops have been looked at in this termination process, an attempt is made in each shop to use any remaining new men to start work on jobs in the queues. In all attempts to assign idle men, flight-line malfunctions receive priority over bench repairs.

As described, the simulator assumes a fixed shift manning for the whole simulation, but will allow changing the number of men in each shop on any shift(s) during the simulation by insertion of an alternate version of the appropriate routine.

Supply and Bench Repair

Initial stock levels for each part are specified at the start of simulation. The program presently assumes at least one of each part initially available. Draws are made from this stock for each flight-line malfunction that is a "remove and replace." Replenishments to stock are from reparables made serviceable by bench repair or from replacement from the depot for items that were NRTS (not base reparable), condemned or consumed. Bench repairs always require exactly one man from the proper shop. These men are completely interchangeable between flight-line work and bench repair, but flight-line work receives a higher priority when queues develop.

Cannibalization

Cannibalization consists of removing from some fictitious aircraft an out-of-stock part needed for a critical malfunction. Cannibalization normally starts before sortie time at an interval which is the sum of six hours plus double the normal repair time. If discovery of the malfunction occurs after the time cannibalization should have started, it starts immediately. When the part finally becomes available, it is not returned to stock; this simulates the fact that the part would normally go to the cannibalized aircraft.

Substitution

Whenever a flight-line malfunction calls for more unskilled men than are available at the time, the program substitutes skilled men if enough are available. Substitution of unskilled for skilled is not permitted.

Pre-emption

Pre-emption occurs when, during a critical malfunction, substitution fails to find enough men. The simulator first pre-empts bench repairs. If this does not find enough help, the simulator pre-empts flight-line repairs in the order of priority until enough men are found, reassigns men who are idled by the pre-empting, and adds a delay to the job which caused the pre-emption.

Cancellations

For each of the three types of sorties (training, air alert, ground alert), the program allows for specification of maximum allowable lateness after which the sortie cancels. When a sortie cancels before preflight, the program ignores those malfunctions which would have been discovered during preflight. But if the preflight occurs, the preflight-discovered malfunctions are fixed even though the sortie cancels. In neither case does the simulator attend to malfunctions programmed for discovery during postflight.

Planes with only non-critical malfunctions, fly their sorties. The program checks criticality at two times: at the latest time a preflight may begin and/or cancel time. If at either of these times the plane has no outstanding critical malfunctions, it flies a sortie, and all remaining malfunctions are designated postflight malfunctions on this sortie.

IV. THE ANALYSIS PROGRAM

In this section we present our Analysis Program. Additionally we would like to suggest to the reader's imagination the enormous potential for other analyses offered by the flow of data cascading out of the Main Program.

Every change of every variable is recorded on the analysis tape. Further, the Analysis Program can be set to prepare reports on any list of variables at any intervals of time selected by the user. This bulk of data thus available for accumulation, collation, comparison, and analysis suggests the wide spectrum of applications accessible to the needs and interests of diverse users. This program amply demonstrates that feature of simulation which permits programming outputs which would be unavailable from real-world data systems.

Our own analysis consists of a set of reports divided into the following subject groups:

1. "Shop Statistics" summarizes various activities in each of the shops. The statistics on malfunctions and reparables waiting indicate delays which the work encounters at each shop. The overtime, substitutions and number of pre-empts show the extent of special measures taken to complete jobs. Detailed explanations of this report and all other reports appear on page 21.

2. "Aircraft Statistics" indicates the amount of maintenance generated on each aircraft (No. of Maint. Malfns.) the amount of maintenance delayed for lack of men (No. of Man Malfns.) and for lack of parts (No. of Part Malfns.).

3. "Aircraft Status" shows the number of hours spent by each aircraft in each of the possible statuses.

4. "Shop Utilization" lists man-hours used and the per cent utilization for each shop during each shift.

5. "System Statistics" presents a selection of measures relating to the base as a whole, such as number of late and cancelled sorties, turnaround times, operational ready rates, and others.

A sample set of these reports follows. Before each computer output is a list of explanations for the terms which might not be self-explanatory. On page 68 of the Appendix is a complete list of the inputs for these reports.

SHOP STATISTICS

Shop No. -- Odd-numbered shops represent the skilled men in a particular shop, and the succeeding even-number represents the unskilled men in the same shop.

Malfunctions Awaiting-Average -- The average number of malfunctions (excluding bench repairs) waiting at this shop. This number is averaged over the time since the last report, as are all averages in all reports.

Overtime Reg. -- The number of man-hours of overtime (keeping men past their normal shift departure) expended in this shop.

Overtime Extra -- The number of man-hours of overtime used as a result of the normal shift manning not being large enough to fix certain malfunctions. In a sense, this represents the men called in to work on a shift other than their regularly assigned shift.

No. of Men Substituted -- The total, over the current period, of the number of men supplied to this shop by substitution. The negative numbers in the skilled shops represent the skilled personnel used as unskilled labor.

Minimum No. of Men Available -- The lowest value, during the current report period, of the number of idle men.

Malfunctions-In-Process -- The average number of malfunctions being worked on, again, averaged over the time since the last report.

Man-hours Per Sortie -- The total man-hours expended on flight line malfunctions and bench repair divided by the total aircraft landings.

GRD -- The Grand Averages are the simple means of the numbers for each shop. The Grand Standard Deviations are the standard deviations of the numbers for each shop computed around grand averages.

INTERIM REPORT - DAY 7 HOUR 0

SHOP STATISTICS

SHOP NO.	MALFUNCTIONS WAITING AVG.	STD.DEV.	MAX	REPARABLES WAITING AVG.	STD.DEV.	MAX	OVERTIME REG.	EXTRA	NO. OF MEN SUBSTITUTED	NO. OF PRE-EMPTS	MINIMUM NO.OF MEN AVAILABLE	MALFNS-IN-PROCESS AVG.	STD.DEV.	MANHOURS PER SORTIE
1	0.39	0.89	4	0.22	0.53	2	0.0	0.	0	2	0	0.35	0.626	2.99
2	0.38	0.71	2	0.	0.00	0	0.0	0.	0	0	0	0.14	0.352	0.74
3	0.06	0.30	2	0.20	0.49	2	0.0	0.	-5	1	0	0.54	0.632	4.44
4	0.13	0.34	1	0.	0.00	0	0.	0.	5	0	-0	0.12	0.319	0.23
5	0.79	1.35	5	0.32	0.65	4	0.1	0.	-2	1	0	0.65	0.756	4.83
6	0.	0.	0	0.	0.00	0	0.	0.	2	0	-0	0.03	0.169	0.
7	0.70	1.43	7	0.10	0.31	2	0.8	0.	-6	0	0	0.82	0.928	6.88
8	0.45	0.96	5	0.	0.00	0	0.3	0.	6	0	0	0.23	0.466	0.52
9	0.32	0.78	4	0.00	0.05	1	0.0	0.	0	0	0	0.23	0.421	1.70
10	0.32	0.78	4	0.	0.00	0	0.0	0.	0	0	0	0.19	0.394	0.99
11	0.25	0.44	1	0.	0.00	0	0.	0.	0	0	0	0.01	0.072	0.03
12	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	0.
13	0.58	1.09	5	0.	0.00	0	0.1	0.	-2	0	0	0.56	0.640	3.87
14	0.05	0.22	1	0.	0.00	0	0.	0.	2	0	0	0.07	0.260	0.25
15	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	-0.00
16	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	-0.00
17	0.62	1.35	7	0.	0.00	0	0.6	0.	-1	1	0	1.59	1.378	11.60
18	0.51	0.99	5	0.	0.00	0	0.5	0.	1	1	0	0.71	0.801	5.97
19	0.56	0.98	3	0.08	0.27	1	0.6	4.8	0	1	0	0.39	0.588	2.46
20	0.62	0.82	3	0.	0.00	0	0.4	11.4	0	0	0	0.15	0.357	0.50
21	0.15	0.42	2	0.09	0.28	1	0.6	0.	-3	1	0	0.34	0.508	3.09
22	0.25	0.55	2	0.	0.00	0	0.4	0.	3	1	0	0.28	0.465	2.05
23	0.17	0.57	5	0.02	0.14	1	0.3	3.3	-1	1	0	0.57	0.814	4.30
24	0.02	0.14	1	0.	0.00	0	0.2	13.3	1	0	0	0.22	0.427	1.50

SHOP STATISTICS

SHOP NO.	MALFUNCTIONS WAITING AVG.	STD.DEV.	MAX	REPARABLES WAITING AVG.	STD.DEV.	MAX	OVERTIME REG.	EXTRA	NO. OF MEN SUBSTITUTED	NO. OF PRE-EMPTS	MINIMUM NO.OF MEN AVAILABLE	MALFNS-IN-PROCESS AVG.	STD.DEV.	MANHOURS PER SORTIE
25	0.	0.	1	0.	0.00	0	0.	9.1	0	0	0	0.05	0.227	0.
26	0.	0.	1	0.	0.00	0	0.	1.9	0	0	0	0.01	0.105	0.
27	0.19	0.56	4	0.18	0.41	2	0.8	0.	-6	2	0	0.57	0.771	5.31
28	0.28	0.53	2	0.	0.00	0	0.	0.	6	0	-0	0.10	0.298	0.
29	0.74	1.35	5	0.43	0.95	4	0.1	0.	-1	1	0	0.76	0.787	4.61
30	0.07	0.25	1	0.	0.00	0	0.	0.	1	0	-0	0.01	0.090	0.
31	0.15	0.49	2	0.10	0.43	2	0.0	0.	0	0	0	0.22	0.541	1.47
32	0.17	0.52	2	0.	0.00	0	0.0	0.	0	0	0	0.09	0.292	0.52
33	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	-0.00
34	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	0.
35	0.35	0.70	2	0.	0.00	0	0.1	0.	0	0	0	0.10	0.297	0.49
36	0.	0.	1	0.	0.00	0	0.	12.7	0	0	0	0.08	0.265	0.
37	0.08	0.27	2	0.	0.00	0	1.3	0.	0	0	0	0.36	0.496	4.97
38	0.08	0.27	2	0.	0.00	0	0.9	0.	0	0	0	0.36	0.496	3.31
39	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	0.
40	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	0.
41	0.10	0.29	1	0.	0.00	0	0.3	0.	0	0	0	0.05	0.213	0.87
42	0.10	0.29	1	0.	0.00	0	0.1	0.	0	0	0	0.05	0.213	0.43
43	0.	0.	0	0.30	0.60	2	0.0	0.	0	0	1	0.	0.	1.67
44	0.	0.	0	0.	0.00	0	0.	0.	0	0	9999	0.	0.	0.00
GRAND	0.22	0.237	7	0.05	0.10	4	8.6	56.5	22	13		0.25	0.311	82.60

AIRCRAFT STATISTICS

Number of Sorties -- The number of landings during the current period.

No. of Maintenance Malfunctions-Average -- The average number of malfunctions being worked on, averaged over the current period. This, then, is a measure of the workload on the aircraft.

No. of Man Malfunctions-Average -- The average number of malfunctions waiting for men. This, then, is a measure of the amount of delay due to manpower shortages.

No. of Part Malfunctions-Average -- Same as above, except for parts rather than men.

AIRCRAFT STATISTICS

TAIL NO.	NUMBER OF SORTIES	NO.OF MAINT.MALFNS AVG.	STD.DEV.	NO.OF MAN MALFNS. AVG.	STD.DEV.	NO.OF PART MALFNS AVG.	STD.DEV.
1	0	0.	0.	0.	0.	0.	0.
2	2	0.60	2.41	0.15	0.42	0.	0.
3	3	1.06	2.37	1.40	3.51	0.17	0.37
4	2	0.52	1.72	0.31	1.04	0.11	0.31
5	0	0.04	0.19	0.	0.	0.	0.
6	0	0.	0.	0.	0.	0.	0.
7	2	0.77	1.50	1.32	3.14	0.	0.
8	2	0.83	2.96	0.57	1.89	0.11	0.31
9	2	0.68	1.58	1.01	2.75	0.27	0.45
10	0	0.05	0.21	0.	0.	0.	0.
11	0	0.00	0.06	0.	0.	0.	0.
12	0	0.11	0.31	0.04	0.20	0.	0.
13	1	0.22	1.42	0.25	0.43	0.	0.
14	0	0.	0.	0.	0.	0.	0.
15	3	0.97	1.59	1.42	2.65	0.08	0.27
16	4	0.53	1.53	0.05	0.22	0.	0.
17	3	0.43	1.14	0.21	0.48	0.	0.
18	0	0.	0.	0.	0.	0.	0.
19	0	0.	0.	0.	0.	0.	0.
20	0	0.	0.	0.	0.	0.	0.
21	3	0.42	1.01	0.37	0.99	0.05	0.22
22	1	0.09	0.54	0.	0.	0.	0.
23	2	0.38	0.95	0.55	1.38	0.	0.
24	0	0.04	0.27	0.09	0.29	0.	0.
25	0	0.02	0.13	0.	0.	0.	0.
GRAND	30	0.58	0.27	0.58	0.50	0.06	0.08

AIRCRAFT STATUS

In Maintenance-RX -- The number of hours spent in maintenance (preflight or postflight malfunctions) with one or more critical malfunctions outstanding.

In Maintenance-No RX -- The number of hours spent in maintenance (preflight or postflight maintenance) with only non-critical malfunctions outstanding.

G.A. Maintenance-RX and no RX -- Same as "In Maintenance" except only for maintenance during a ground alert.

Standing -- The number of hours spent doing nothing and with no malfunctions outstanding.

Await Sortie -- Time spent waiting prior to a sortie with the preflight and all preflight malfunctions completed.

AIRCRAFT STATUS (HOURS)

TAIL NO.	IN MAINT. RX	IN MAINT. NO RX	FLY-ING	GND. ALERT	G.A. MAINT. RX	G.A. MAINT. NO RX	STAND-ING	AWAIT SORTIE	PRE-FLIGHT	POST-FLIGHT	SERVICE	UP-LOAD	DOWN LOAD	TOTAL	AVAIL-ABLE
1	0.	0.	0.	158.92	0.	0.	0.08	6.50	2.50	0.	0.	0.	0.	168.00	168.00
2	11.62	21.75	58.16	0.	0.	0.	49.60	10.87	7.50	2.00	4.00	2.50	0.	168.00	168.00
3	55.74	7.07	27.68	0.	0.	0.	51.96	8.00	7.50	3.00	7.05	0.	0.	168.00	168.00
4	39.75	6.63	49.21	0.	0.	0.	52.34	8.00	3.55	2.00	4.02	2.50	0.	168.00	168.00
5	2.95	0.	0.	155.77	3.15	0.	0.08	3.55	2.50	0.	0.	0.	0.	168.00	168.00
6	0.	0.	0.	158.92	0.	0.	0.08	6.50	2.50	0.	0.	0.	0.	168.00	168.00
7	49.83	1.25	18.06	0.	0.	0.	80.47	4.39	3.75	2.00	8.25	0.	0.	168.00	168.00
8	14.38	27.59	18.04	0.	0.	0.	92.87	4.00	5.00	2.00	4.13	0.	0.	168.00	168.00
9	32.12	23.10	17.72	0.	0.	0.	82.90	1.32	3.33	2.00	5.52	0.	0.	168.00	168.00
10	0.	6.48	0.	157.58	0.	1.33	0.08	1.68	0.83	0.	0.	0.	0.	168.00	168.00
11	0.	0.55	0.	158.92	0.	0.	0.08	6.50	1.95	0.	0.	0.	0.	168.00	168.00
12	0.	1.50	0.	135.64	15.21	8.07	0.08	6.50	1.00	0.	0.	0.	0.	168.00	168.00
13	5.10	0.	24.01	0.	0.	0.	84.64	4.00	2.50	1.00	2.00	44.75	0.	168.00	168.00
14	0.	0.	0.	158.92	0.	0.	0.08	6.50	2.50	0.	0.	0.	0.	168.00	168.00
15	60.14	31.67	22.83	0.	0.	0.	23.83	8.06	5.83	3.00	7.64	0.	0.	168.00	168.00
16	28.27	9.07	18.04	0.	0.	0.	81.31	9.24	10.00	4.00	8.07	0.	0.	168.00	168.00
17	22.33	17.83	13.72	0.	0.	0.	91.92	6.27	6.65	3.00	6.29	0.	0.	168.00	168.00
18	0.	0.	0.	158.92	0.	0.	0.08	6.50	2.50	0.	0.	0.	0.	168.00	168.00
19	0.	0.	0.	158.92	0.	0.	0.08	6.50	2.50	0.	0.	0.	0.	168.00	168.00
20	0.	0.	0.	158.92	0.	0.	0.08	6.50	2.50	0.	0.	0.	0.	168.00	168.00
21	32.70	5.60	13.63	0.	0.	0.	83.69	12.00	7.50	3.00	9.88	0.	0.	168.00	168.00
22	6.03	0.	4.46	0.	0.	0.	148.01	4.00	2.50	1.00	2.00	0.	0.	168.00	168.00
23	34.54	1.80	9.11	0.	0.	0.	105.34	6.20	5.00	2.00	4.00	0.	0.	168.00	168.00
24	16.41	0.	0.	146.21	4.47	0.	0.08	0.	0.83	0.	0.	0.	0.	168.00	168.00
25	0.	0.	0.	155.86	3.06	0.	0.08	6.50	2.50	0.	0.	0.	0.	168.00	168.00
TOT.	411.91	161.88	299.65	1863.47	25.89	9.40	1029.88	150.08	95.23	30.00	72.85	49.75	0.	4200.00	4200.00
O/O	9.81	3.85	7.13	44.37	0.62	0.22	24.52	3.57	2.27	0.71	1.73	1.18	0.		

SHOP UTILIZATION

Overall Per Cent -- The overall per cent utilization is the total man-hours used in fixing malfunctions and in bench repair divided by the total man-hours available during the current period.

Man-hours Used -- The total man-hours used in fixing malfunctions and in bench repair, excluding overtime. Shift 1 is from 0:00 to 8:00, Shift 2 is 8:00 to 16:00, and Shift 3 is 16:00 to 24:00.

Shift Utilization

Avg. -- The per cent of the available man-hours used, averaged for each type of shift.

S.D. -- The standard deviation of the individual shift utilizations around the average for the period. Thus, if there are seven full days in the period, the average utilization for Shift 1 will be the mean of the seven Shift 1 utilizations, and the standard deviation is the variability of these seven numbers around this mean.

GRD. Grand Totals -- The man-hours used are sums over all shops. The grand average utilizations are the ratio of the total man-hours used to the man-hours available for each shift, over all shops.

SHOP UTILIZATION OVERALL PER-CENT = 33.89

	MANHOURS USED						SHIFT UTILIZATION (FRACTION)											
	WEEKDAY SHIFTS			WEEKEND SHIFTS			WEEKDAY SHIFTS						WEEKEND SHIFTS					
	1	2	3	1	2	3	1		2		3		1		2		3	
SHOP							AVG.	S.D.	AVG.	S.D.	AVG.	S.D.	AVG.	S.D.	AVG.	S.D.	AVG.	S.D.
1	17.4	15.1	43.3	6.4	0.	7.7	0.43	0.429	0.38	0.385	0.54	0.351	0.40	0.397	0.	0.	0.48	0.
2	11.1	0.	8.6	0.	0.	2.5	0.28	0.247	0.	0.	0.22	0.183	0.	0.	0.	0.	0.31	0.
3	41.5	33.0	27.5	23.2	0.0	8.0	0.52	0.377	0.41	0.278	0.34	0.178	0.73	0.087	0.00	0.	1.00	0.
4	0.	0.	5.7	1.0	0.	-0.0	0.	0.	0.	0.	0.14	0.287	0.07	0.065	0.	0.	-0.00	0.
5	24.2	26.5	55.9	11.0	10.6	16.7	0.61	0.301	0.66	0.424	0.35	0.190	0.69	0.313	0.66	0.335	0.70	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	51.9	52.2	94.2	5.3	0.0	2.9	0.65	0.277	0.65	0.387	0.39	0.334	0.16	0.164	0.00	0.	0.12	0.
8	0.	0.	13.1	2.5	0.	-0.0	0.	0.	0.	0.	0.33	0.223	0.15	0.153	0.	0.	-0.00	0.
9	0.	15.0	19.6	7.3	2.1	7.1	0.	0.	0.37	0.353	0.25	0.295	0.46	0.343	0.13	0.120	0.44	0.
10	0.	12.3	7.0	3.3	0.	7.1	0.	0.	0.31	0.385	0.18	0.230	0.21	0.093	0.	0.	0.88	0.
11	0.	0.	0.9	0.	0.	0.	0.	0.	0.	0.	0.02	0.044	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	45.6	15.2	24.3	7.0	13.0	10.8	0.57	0.324	0.19	0.234	0.30	0.166	0.44	0.362	0.81	0.187	0.67	0.
14	0.	0.	1.6	0.6	0.	5.2	0.	0.	0.	0.	0.04	0.081	0.04	0.039	0.	0.	0.65	0.
15	0.0	0.0	-0.0	0.0	0.	-0.0	0.00	0.000	0.00	0.000	-0.00	0.000	0.00	0.	0.	0.	-0.00	0.
16	0.	0.	-0.0	0.0	0.	-0.0	0.	0.	0.	0.	-0.00	0.000	0.00	0.	0.	0.	-0.00	0.
17	77.6	73.0	137.7	32.5	8.0	19.4	0.65	0.369	0.46	0.351	0.43	0.240	0.68	0.306	0.50	0.500	0.48	0.
18	25.9	46.4	75.5	13.7	8.0	9.6	0.65	0.370	0.58	0.475	0.47	0.317	0.86	0.142	0.50	0.500	0.60	0.
19	23.2	13.6	29.0	0.0	0.	8.0	0.58	0.257	0.34	0.379	0.36	0.321	0.00	0.	0.	0.	1.00	0.
20	0.	0.	11.8	0.	0.	3.3	0.	0.	0.	0.	0.29	0.225	0.	0.	0.	0.	0.41	0.
21	47.4	10.1	33.3	0.	0.	2.0	0.59	0.321	0.25	0.387	0.28	0.230	0.	0.	0.	0.	0.25	0.
22	31.3	8.0	22.3	0.	0.	-0.0	0.78	0.393	0.20	0.400	0.56	0.395	0.	0.	0.	0.	-0.00	0.
23	47.6	35.6	39.7	3.7	2.5	-0.0	0.40	0.294	0.45	0.406	0.33	0.113	0.11	0.115	0.16	0.155	-0.00	0.
24	14.3	10.7	19.3	0.7	0.	-0.0	0.36	0.312	0.27	0.389	0.48	0.286	0.04	0.044	0.	0.	-0.00	0.
25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27	19.0	31.4	80.1	6.3	10.0	12.4	0.47	0.434	0.39	0.297	0.67	0.255	0.40	0.185	0.62	0.375	0.78	0.
28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29	23.9	30.1	36.5	16.0	16.0	16.0	0.60	0.369	0.38	0.281	0.30	0.224	1.00	0.	1.00	0.	1.00	0.
30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	4.8	3.8	14.5	9.7	0.	11.2	0.12	0.113	0.10	0.142	0.18	0.119	0.61	0.256	0.	0.	0.70	0.
32	3.8	2.9	3.6	0.	0.	5.1	0.10	0.109	0.07	0.146	0.05	0.053	0.	0.	0.	0.	0.64	0.
33	0.	0.	-0.0	0.	0.	0.	0.	0.	0.	0.	-0.00	0.000	0.	0.	0.	0.	0.	0.
34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
35	0.	0.	14.7	0.	0.	0.	0.	0.	0.	0.	0.37	0.345	0.	0.	0.	0.	0.	0.
36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	36.0	15.6	82.4	12.0	3.0	0.	0.30	0.245	0.13	0.164	0.69	0.155	0.25	0.250	0.06	0.029	0.	0.
38	24.0	10.4	54.9	8.0	2.0	0.	0.30	0.245	0.13	0.164	0.69	0.155	0.25	0.250	0.06	0.029	0.	0.
39	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
41	26.0	0.0	0.	0.0	0.	0.	0.16	0.144	0.00	0.000	0.	0.	0.00	0.	0.	0.	0.	0.
42	13.0	0.0	0.	0.	0.	0.	0.16	0.144	0.00	0.000	0.	0.	0.00	0.	0.	0.	0.	0.
43	11.0	14.7	24.5	0.	0.	0.	0.14	0.195	0.12	0.119	0.20	0.191	0.	0.	0.	0.	0.	0.
44	0.	0.0	0.	0.	0.	0.	0.	0.	0.00	0.000	0.	0.	0.	0.	0.	0.	0.	0.
GRD	620.7	475.4	951.5	170.3	75.2	154.9	0.40		0.27		0.35		0.30		0.31		0.46	

SYSTEM STATISTICS

Number of Late Sorties -- A sortie is considered late if it takes off any time after its scheduled take-off time.

Per Cent of Sorties Late -- This percentage is equal to the total number of late sorties divided by the number of landings during the period.

Overall Fill-Rate

Number of Demands -- A demand is tallied the first time maintenance on a malfunction, which requires a part, is attempted.

Number of Fills -- If the part required is available immediately on the first try at maintenance, a fill is tallied in this count.

Fill Rate -- Dividing the number of fills by the number of demands yields the fill-rate.

Sortie Count by Type of Sortie -- This is a count of the number of landings during the period.

Stopping Postflight Maintenance to Start New Sortie

Attempts -- The number of times an attempt was made to terminate maintenance on postflight malfunctions in order to start the preflight for the next sortie.

Successes -- The number of times the above attempts were successful by virtue of the fact that no outstanding malfunctions were critical.

Turn-Around Data

Touchdown to Completion of All Maintenance -- The turn-around time to the completion of all maintenance is the time from landing to the completion of maintenance on all malfunctions, or to termination of maintenance in order to start the next sortie, whichever happens first. The Average Time is the mean of all turn-arounds completed during the period, the Maximum and Minimum times are the biggest

and smallest of the individual turn-around and the Standard Deviation is the standard deviation of the individual turn-around around the mean.

Touchdown to Completion of All Red-X Maintenance -- Same as above except the turn-around is completed when the last Red X or critical malfunction is fixed.

Number of Malfunctions Completed in Less than Specified Time -- The number of malfunctions repaired in some specified fraction of the normal time in order to prevent a cancellation.

Operational Ready Rate -- The percentage of the total aircraft hours available spent in the following statuses: In Maint-No RX, Flying, Ground Alert, G. A. Maint. - No RX, Standing, and Await Sortie.

SYSTEM STATISTICS

NUMBER OF LATE SORTIES

TRAIN.	GND.ALERT	AIR ALERT	TOTAL	PER-CENT OF SORTIES LATE
3	1	0	4.	13.33

LATE TAKE-OFF HOURS

TRAIN.	GND.ALERT	AIR ALERT	TOTAL	AVG.HOURS LATE PER SORTIE
0.27	0.34	0.	0.61	0.02

CANCELLATIONS

TRAIN.	GND.ALERT	AIR ALERT	TOTAL	PER-CENT OF SORTIES CANCELLED
1	0	1	2.	6.25

OVERTIME SUMMARY

TOTAL HOURS	PER-CENT OF AVAILABLE HOURS
8.57	0.06

CANABALIZATION SUMMARY

TOTAL	PER-CENT OF SORTIES
0	0.

OVERALL FILL-RATE

NUMBER OF DEMANDS	NUMBER OF FILLS	FILL-RATE
211	204	0.97

SORTIE COUNT BY TYPE OF SORTIE

TRAINING	GND. ALERT	AIR ALERT	TOTAL
25	0	5	30

TOTAL NUMBER OF BENCH REPAIRS	STOPPING POSTFLT.MAINT.TO START NEW SORTIE ATTEMPTS	SUCCESSES
99	3	2

TURN - AROUND DATA (HOURS)

TOUCHDOWN TO COMPLETION OF ALL MAINTENANCE

A/C	NO. OF TURNAROUNDS	AVERAGE TIME	MAXIMUM TIME	MINIMUM TIME
B-52	16	23.45	40.57	7.93
KC-135	13	14.60	29.86	7.22

TOUCHDOWN TO COMPLETION OF ALL RED-X MAINTENANCE

A/C	NO. OF TURNAROUNDS	AVERAGE TIME	MAXIMUM TIME	MINIMUM TIME
B-52	17	18.84	40.57	7.87
KC-135	13	12.51	24.26	4.97

NUMBER OF MALFUNCTIONS COMPLETED IN LESS THAN SPECIFIED TIME

PREFLIGHT MALFNS	POSTFLIGHT MALFNS
3	3

OPERATIONAL READY RATE (PER-CENT)

B-52	KC-135
82.06	86.10

CANCELLED SORTIES

TAIL NO.	TYPE OF SORTIE	TIME OF SORTIE
13	3	2.64
23	1	2.96

NUMBER OF AIRCRAFT WITH WEAPONS

AVERAGE	STD. DEV.	MAXIMUM
9.20	1.95	10

Appendix A

OUTPUT TAPE FORMAT - EXOGENOUS EVENT TAPE

The format of the card images on this tape which is the input to the Main Program is as below. Each sortie consists of one each of the type 1 and 2 cards and as many pairs of type 3 and 4 cards as there are malfunctions.

Type 1 Card	-	1 per event
Cols. 1-3	-	Event type*
Cols. 4-12	-	Time of event (days, hours, minutes)
Cols. 13-16	-	Tail number
Cols. 17-18	-	Type of sortie**
Type 2 Card	-	1 per event (only for type 1 events, all other event types have only the type 1 card)
Cols. 1-6	-	Length of sortie (hours)
Cols. 7-16	-	Time of this sortie (days, hours, minutes)
Cols. 17-26	-	Time of next sortie (days, hours, minutes)
Cols. 27-29	-	Type of next sortie**
Cols. 30-32	-	Number of preflight malfunctions
Cols. 33-35	-	Number of postflight malfunctions
Cols. 36-38	-	Number of ground alert malfunctions
Type 3 & 4 Cards	-	1 each per malfunction
Type 3		
Cols. 1-5	-	Total man hours required to fix (hours, mins.)
Cols. 6-7	-	When discovered code***
Cols. 8-9	-	Criticality (0 = non-critical, 1 = critical)
Cols. 10-11	-	Overtime flag (same as 8-9)
Cols. 12-13	-	NRTS flag (0 = remove and replace, 1 = NRTS)
Cols. 14-15	-	Time of discovery****
Cols. 16-19	-	Part number (0 - 975) 0 if none (repair in place)
Cols. 20-22	-	Shop to do bench repair on part. 0 if part number (16-19) = 0, or NRTS (12-13) = 1
Cols. 23-27	-	Time to do bench repair (hours, minutes)
Cols. 28-29	-	Number of different shops required to fix

For footnotes see page 36.

Type 4

Cols. 1-2 - Shop number of first shop required

Cols. 3-4 - Number of men required from first shop

Cols. 5 - Skill level of first shop (0 = skilled, 1 = unskilled)

Cols. 1-5 repeated for as many shops required as shown in Cols. 28-29 on Type 3 Card up to a maximum of 14 shops.

*1 = sortie; 2 = start of simulation; 3 = end of simulation; 4 = memory dump; 5 = analysis time.

**-1 = training sortie; 0 = ground alert; +1 = air alert.

***0 = preflight; 1 = postflight; 6 = ground alert.

****For a preflight malfunction (when discovered code (w.d.c.) = 0) the time of discovery code has the following meaning:

1 = discovered 1/3 of the way through the preflight
2 = discovered 2/3 of the way through the preflight
0 = discovered at the end of the preflight.

For a ground alert malfunction (w.d.c. = 6) this code shows the day on which the malfunction is to be discovered, counting from the start of the ground alert. (For example, if the time of sortie was 5.10.15 and this code is an 8, the malfunction is to be discovered on 13.10.15.)

For a postflight malfunction (w.d.c. = 1) this code is always zero, meaning the malfunction is discovered at the end of the postflight inspection.

Appendix B

DETAILS OF THE MAIN PROGRAM

Table I

VOCABULARY OF VARIABLES USED IN THE SIMULATOR

Following are the names given the SIMSCRIPT variables, the definitions given the names, the entities for which the variables are an attribute, and the sets and functions used in the Main Program.

Temporary Attributes

Attribute Name	Definition	Attribute of Entity
CANAD	Cannibalization flag	MALFN
CANAR	Cannibalization notice	MALFN
CLSSP	Part class	MALFN
CRIT	Criticality	MALFN
DISCV*	Discovery	MALFN
FINTM	Finish time	MALFN
FG	Not used	
FQUES	First in QUES	MALFN
FREQS	First in REQS	MALFN
LQUES	Last in QUES	MALFN
LREQS	Last in REQS	MALFN
MAN	Man	MREQ
MFN	Malfunction	MTN, CLMTC
MLFTN	Malfunction	CARD
MREPP	Man to repair part	MALFN
MTNR	End of maintenance notice	MALFN
NOMEN	Number of men	MREQ
NOREP	Not used	
NRTS	Not reparable this station	MALFN
OTFLG	Overtime flag	MALFN
PART	Part	MALFN
PCANB	Part cannibalized	MTN
PMALM	Predecessor in MALM	CARD
PMALP	Predecessor in MALP	MALFN
PMLFN	Predecessor in MLFN	MALFN

*See page 45.

Table I (cont'd)

Temporary Attributes (cont'd)

Attribute Name	Definition	Attribute of Entity
PQREP	Predecessor in QREP	REPAR
PQUES	Predecessor in QUES	CARD
PREQS	Predecessor in REQS	MREQ
PRIP	Predecessor in RIP	REPAR
PTYM	Priority in MALM	CARD
PTYP	Priority in MALP	MALFN
PTYR	Priority in QREP	REPAR
PWIP	Predecessor in WIP	CARD
REPLT	Not Used	
REPTM	Repair time	MALFN
SHFLG	Shift flag	REPAR
SHOPN	Shop number	MREQ
SKILL	Skill	MREQ
SMALM	Successor in MALM	CARD
SMALP	Successor in MALP	MALFN
SMLFN	Successor in MLFN	MALFN
SQREP	Successor in QREP	REPAR
SQUES	Successor in QUES	CARD
SREQS	Successor in REQS	MREQ
SRIP	Successor in RIP	REPAR
STOVT	Start of overtime	MALFN
SUB	Substitute	MREQ
SWIP	Successor in WIP	CARD
TDISC	Time of discovery	MALFN
TLNO	Tail number	MALFN
TREPP	Time to repair the part	MALFN

Table I (cont'd)

Permanent System Variables

Variable Name	Definition	Attribute of Entity
1 AC	Aircraft	Entity
2 PRT	Part	Entity
3 SHOP	Shop	Entity
7 RSHP	Rush percentage	System
8 ENDSE	End of sortie	AC
9 TCURS	Type of current sortie	AC
10 TMNXS	Time of next sortie	AC
11 TYFLS	Type of following sortie	AC
11 TYNXS	Type of next sortie	AC
1 PFLAG	Preflight flag	AC
12 NPREM	Number of preflight malfunctions	AC, SENON(AC) or SENOO(AC)
13 SELEN	Sortie length	AC, SENON(AC) or SENOO(AC)
14 NOOSM	Number of outstanding malfunctions	AC
14 NREDX	Number of red-x (critical) malfunctions	AC
15 CLAS	Class of aircraft	AC
15 PREFN	Preflight finished flag	AC
16 NOPTM	Number of part malfunctions	AC
17 NOWEP	First a/c with no weapons	System
18 SENOO	Sortie number, old	AC
18 SENON	Sortie number, new	AC
19 MAXMN	Not used	
20 TMPOT	Time to do a postflight	System
21 DELAG	Delay from depot	System
22 PODLA	Postflight delay	System
23 NWIP	Number of work in process	SHOP
24 FMLFN	First malfunction in MLFN	AC, SENON(AC) or SENOO(AC)
26 SACST	Successor aircraft in ACST	AC
26 PACST	Predecessor aircraft in ACST	AC

Table I (cont'd)

Permanent System Variables (cont'd)

Variable Name	Definition	Attribute of Entity
27 FWIP	First card in WIP	SHOP
28 PREDY	Pre-empt delay time	System
29 FMALP	First malfunction in MALP	PRT
29 LMALP	Last malfunction in MALP	PRT
30 NPRTA	Number of parts available	PRT
30 NCANB	Number of cannibalizations	PRT
30 NMALP	Number of malfunctions waiting for a part	PRT
31 SHPDY	Shop delay	System
32 NQREP	Number of reparables in QREP	SHOP
33 DTCAN	Delay to cannibalize	System
34 NTEAM	Number of teams	Dummy
35 SFTNO	Shift number	System
36 FSAT	First Saturday	System
37 FACST	First aircraft in ACST	System
38 NMASD	Number of men, weekday	SHOP, SHIFT
39 OVTMH	Overtime manhours	SHOP
40 FLAG	Flag for shift change	System
42 NACST	Number of aircraft standing	System
43 NAOCP	Number of aircraft out of commission, parts	System
44 NACCM	Number of aircraft out of commission, maintenance	System
45 NACMN	Number of aircraft out of commission, men	System
46 LTP	LTPRE notice	AC
47 KORE	Number of locations to dump	System
48 TACTM	Trace time (for debugging)	System
49 NGAMN	Number of ground alert malfunctions	AC, SENON(AC) or SENOO(AC)
50 WHERE	Where	System
51 ENDSH	End of shift	System
52 NOMNM	Number of man malfunctions	AC

Table I (cont'd)

Permanent System Variables (cont'd)

Variable Name	Definition	Attribute of Entity
53 NOMEN	Number of maintenance malfunctions	AC
55 OVLAP	Overlap for overtime	System
56 FQREP	First reparable in QREP	SHOP
56 LQREP	Last reparable in QREP	SHOP
57 FRIP	First reparable in RIP	SHOP
57 LRIP	Last reparable in RIP	SHOP
61 NMASE	Number of men, weekend	SHOP, SHIFT
62 MISSD	Not used	
63 FMALM	First malfunction in MALM	SHOP
63 LMALM	Last malfunction in MALM	SHOP
64 NMENA	Number of men available	SHOP
65 MAXLT	Maximum lateness	Dummy
66 IDYCL	Indicator to destroy "cancel sortie"	AC
66 ISECL	Indicator sortie canceled	AC
67 NMALM	Number of malfunctions waiting for men	SHOP
68 NRIP	Number of reparables in process	SHOP
69 LMLFN	Last malfunction in MLFN	AC, SENON(AC) or SENOO(AC)
70 LACST	Last aircraft in ACST	System
71 FSUN	First Sunday	System
72 TMPRT	Time to do a preflight	System
73 NPOSM	Number of postflight malfunctions	AC, SENON(AC) or SENOO(AC)
74 TMFLS	Time of following sortie	AC
75 WEPST	Weapon status	AC
76 SHPNO	Shop number	Dummy
77 NOMN	Number of men	Dummy
78 SKLL	Skill	Dummy
79 TIMET	Time of team action	Dummy

Table I (cont'd)

Permanent System Variables (cont'd)

Variable Name	Definition	Attribute of Entity
80 NACWW	Number of aircraft with weapons	System
81 RUN	Run number	System
82 TNS	Tail number scheduling flag	System
83 BIG	Location of longest malfunction	AC
84 BIGTM	Length of longest malfunction	AC

Table I (cont'd)

Sets

Set Name	Definition	Owned by Entity	Member Entity	Attribute Used in Ranking
ACST	Aircraft standing	System	Aircraft (AC)	FIFO*
MALM	Malfunctions waiting for men	Shops	Cards (CARD)	PTYM
MALP	Malfunctions waiting for parts	Parts	Malfunctions (MALFN)	PTYP
MLFN	Malfunctions	Aircraft	Malfunctions (MALFN)	DISCV
QREP	Reparables in queue	Shops	Reparables (REPAR)	PTYR
QUES	Queues in which the malfunctions are filed	Malfunction	Cards (CARD)	FIFO
REQS	Man requirements	Malfunction	Man requirements (MREQ)	FIFO
RIPS	Reparables in process	Shops	Reparables (REPAR)	PTYR
WIP	Malfunctions in process	Shops	Cards (CARD)	PTYM

Functions

Function Name	Definition	Purpose
PCARD	Priority of card	Sets priority of card = priority of malfunction
ZERO	Zero	Makes a ranked set, into a FIFO set

*FIFO = First-Come, First-Served

Table II

DISCOVERY (DISCV) CODES

These are the possible values of the attribute DISCV, which describe at what stage of a sortie a malfunction is discovered.

Code	When Malfunction Discovered
0	Preflight
1	Postflight
2	Not used
3	Upload Action
4	Download Action
5	Service Action
6	Ground Alert

Table III

VOCABULARY OF ROUTINES USED IN THE SIMULATOR

The following is a list of all the routines in the Main Program.

EXOGENOUS EVENTS

DUMPP -- dump

ENDSM -- end simulation

SORTI -- sortie (read input)

START -- start

ENDOGENOUS EVENTS**
(temporary event notices)

CALLM -- call maintenance

CANAB -- cannibalize

CLMTC -- call maintenance

CLSE -- cancel sortie

LTPRE -- latest time to preflight

MTN -- maintenance

PDLAY -- postflight delay

POSFL -- postflight

PREFL -- preflight

PTARR -- part arrival (from depot)

PTREP -- part repair

REPAR -- reparable part arrival (from flightline to shop)

SHIFT -- shift

SORTE -- sortie

WTSOR -- wait for sortie

FUNCTIONS

PCARD (CARD) -- priority of card

ZERO (CARD) -- zero

REPORTS

INTLZ -- initialization report

ERRR (N) -- error report

SUBROUTINES*

BENCH -- bench

CANCL -- cancel

CLASS -- classify

CREPT -- create part repair

DELAY -- delay

DOPRE -- do pre-emption

FCRDM -- file card in malfunctions waiting for men

FCRDW -- file card in work in process

MTCE -- maintenance

OUT -- out

PREFT -- preflight

PREMP -- pre-empt

PTYMR -- priority of men

PTYPR -- priority of part

PTYRR -- priority of reparable

RCRDM -- remove card from waiting for men

RCRDW -- remove card from work in process

RDM -- remove and destroy malfunction

SPOFL -- start postflight

STEAM -- start team action

STNXS -- start next sortie

STOMT -- stop maintenance

TERM -- terminate maintenance

USEMN -- use men

USEPT -- use part

ERR -- error

*SUBROUTINES = start of an activity

**ENDOGENOUS EVENTS = end of an activity

THE INITIAL CONDITIONS DECK

The initial conditions deck is a package of punched cards which are inserted at the end of the main deck. The initial value of the permanent system variables can be changed for each run of the deck, thereby changing the outcome of each run. The permanent system variables are each assigned an array number, and the initialization deck must include all array numbers in sequence.* A report is generated with each run which lists the currently used input values for each permanent variable (see sample on page after next).

Some of the variables always are set to zero at the beginning of each run, and change their values as simulated time increases. See a copy of the Initialization Report for the names of the variables set to zero.

The array numbers and names shown in the right-hand column on the next page are set to the desired initial figure, not necessarily zero, but change during the running of the program.

The left-hand column shows those permanent system attributes which are set to the desired number or time lengths and remain constant during the run.

The initially set constants of this last group which bear heavily in giving the different results of each run are those with a star. For instance, the number of men allotted per shift, or the number of parts available, or the time to do a preflight, postflight, etc.

---

*See H. M. Markowitz, B. Hausner, H. W. Karr, SIMSCRIPT: A Simulation Programming Language, RM-3310-PR, November 1962.

These variables are set at the beginning of a run and remain at that value until a change is desired for another run.

1	AC
2	PRT
3	SHOP
17	NOWEP
20	TMPOT*
21	DELAG*
22	PODLA*
28	PREDY*
31	SHPDY*
33	DTCAN*
36	FSAT
47	KORE
48	TACTM
55	OVLAP
72	TMPRT*
81	RUN
34	NTEAM
79	TIMET
65	MAXLT*
76	SHPNO
77	NOMN
78	SKLL
38	NMASD*
61	NMASE*

These variables are set at the beginning, but change their value during the run.

19	MAXMN
37	FACST
42	NACST
70	LACST
80	NACWW
15	CLAS
26	SACST
26	PACST
75	WEPST
30	NPRTA*

*Variables whose initial condition can affect the results of a run.

INPUT VALUES FOR INITIAL CONDITIONS

INITIALIZATION VARIABLES - RUN NO. 16

ZERO SUBSCRIPTED VARIABLES

1	NC	25	22	PODLA	.	47	KORE	25500
2	PRT	975	28	PREDY	.020833	48	TACTM	0
3	SHOP	44	31	SHPDY	.625000	55	OVLAP	.022222
17	NOWEP	16	33	DTCAN	.041667	70	LACST	25
19	MAXMN	2	36	FSAT	6	72	TMPRT	.104167
20	TMPOT	.041667	37	FACST	1	80	NACWW	7
21	DELAG	4.0	42	NACST	25	81	RUN	16

SINGLE SUBSCRIPTED VARIABLES

ATTRIBUTES OF AIRCRAFT

AC	15 CLAS	26 SACST	26 PACST	75 WEPST
1	5	2	0	1
2	5	3	1	0
3	5	4	2	0
4	5	5	3	0
5	5	6	4	1
6	5	7	5	1
7	5	8	6	0
8	5	9	7	0
9	5	10	8	0
10	5	11	9	1
11	5	12	10	1
12	5	13	11	1
13	5	14	12	0
14	5	15	13	1
15	5	16	14	0
16	5	17	15	0
17	5	18	16	0
18	5	19	17	0
19	5	20	18	0
20	5	21	19	0
21	5	22	20	0
22	5	23	21	0
23	5	24	22	0
24	5	25	23	0
25	5	0	24	0

INPUT VALUES FOR INITIAL CONDITIONS (CONT'D)

ATTRIBUTES OF PART

30 NPRTA FOR THOSE PARTS NOT SHOWN EQUALS ONE	
PART	30 NPRTA
386	2
390	3
397	2
414	2
415	2
416	2
417	2
421	2
426	3
429	2
431	2
432	3
433	4
442	2
447	2
448	2
449	2
452	2
455	2
456	2
460	2
461	3
475	4
489	2
500	2
505	2
524	2
537	3
538	2
541	2
543	2
544	3
545	3
550	5
551	9
552	3
557	2
623	4
627	2
638	2
647	2
668	3
682	2
692	2
698	3
704	3
706	2
708	2
710	5
714	2
719	4

ATTRIBUTES OF PART

30 NPRTA FOR THOSE PARTS NOT SHOWN EQUALS ONE	
PART	30 NPRTA
4	2
17	2
50	2
68	5
71	2
96	4
110	2
124	2
127	3
128	2
137	3
143	5
153	8
167	2
173	2
176	6
182	2
189	2
207	5
214	4
215	5
216	2
223	2
226	2
250	2
258	2
269	2
281	2
283	2
286	2
287	2
302	2
308	2
310	2
315	2
320	8
323	2
324	2
325	2
329	3
333	3
334	2
343	2
344	2
345	2
351	5
355	2
363	5
370	8
375	2
383	3

INPUT VALUES FOR INITIAL CONDITIONS (CONT'D)

ATTRIBUTES OF PART

30 NPRTA FOR THOSE PARTS NOT SHOWN EQUALS ONE

PART	30 NPRTA
729	2
730	3
752	2
762	2
773	2
777	2
812	2
813	2
820	2
824	2
861	2
875	2
876	2
886	2
897	2
905	2
909	2
911	2
912	2
915	2
920	2
925	3
926	4
944	2
948	2
951	2
953	2
957	2
959	2
963	2
964	2
965	2
966	3

ATTRIBUTES OF DUMMY ENTITY

	UPLOAD	DOWNLOAD	SERVICE
34 NTEAM	5	5	2
79 TIMET	.104167	.062500	.083333
	AIR ALERT	GND.ALERT	TRAINING
65 MAXLT	.125000	.000000	.125000

INPUT VALUES FOR INITIAL CONDITIONS (CONT'D)

DOUBLE SUBSCRIPTED VARIABLES

ATTRIBUTES OF SHOP AND SHIFT NUMBER

SHOP	38 NMASD SHIFT1	SHIFT2	SHIFT3	61 NMASE SHIFT1	SHIFT2	SHIFT3
1	1	1	2	1	0	2
2	1	0	1	0	0	1
3	2	2	2	2	1	1
4	0	0	1	1	0	1
5	1	1	4	1	1	3
6	0	0	0	0	0	0
7	2	2	6	2	1	3
8	0	0	1	1	0	1
9	0	1	2	1	1	2
10	0	1	1	1	0	1
11	0	0	1	0	0	0
12	0	0	0	0	0	0
13	2	2	2	1	1	2
14	0	0	1	1	0	1
15	1	1	3	1	0	2
16	0	0	1	1	0	1
17	3	4	8	3	1	5
18	1	2	4	1	1	2
19	1	1	2	1	0	1
20	0	0	1	0	0	1
21	2	1	3	0	0	1
22	1	1	1	0	0	1
23	3	2	3	2	1	2
24	1	1	1	1	0	1
25	0	0	0	0	0	0
26	0	0	0	0	0	0
27	1	2	3	1	1	2
28	0	0	0	0	0	0
29	1	2	3	1	1	2
30	0	0	0	0	0	0
31	1	1	2	1	0	2
32	1	1	2	0	0	1
33	0	0	1	0	0	0
34	0	0	0	0	0	0
35	0	0	1	0	0	0
36	0	0	0	0	0	0
37	3	3	3	3	3	0
38	2	2	2	2	2	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	4	4	0	4	0	0
42	2	2	0	2	0	0
43	2	3	3	0	0	0
44	0	1	0	0	0	0

INPUT VALUES FOR INITIAL CONDITIONS (CONT'D)

DOUBLE SUBSCRIPTED ATTRIBUTES OF DUMMY ENTITY

	76 SHPNO					77 NOMN					78 SKLL				
UPLOAD	5	7	13	41	42	1	1	2	4	2	0	0	0	0	1
DOWNLOAD	5	7	13	41	42	1	1	1	4	2	0	0	0	0	1
SERVICE	37	38				3	2				0	1			

INITIALIZATION VARIABLES - INITIALLY SET TO ZERO

ZERO SUBSCRIPTED VARIABLES

4 --- 2
5 --- 3
35 SFTNO
40 FLAG
43 NAOCP
44 NAOCM
45 NACMN
50 WHERE
51 ENDSH
71 FSUN

SINGLE SUBSCRIPTED VARIABLES

ATTRIBUTES OF AIRCRAFT
8 ENDSE
9 TCURS
10 TMNXS
11 TYFLS
11 TYNXS
11 PFLAG
14 NOOSM
14 NREDX
15 PREFN
16 NOPTM
18 SENOO
18 SENON
46 LTP
52 NCMNM
53 NCMEM
66 IDYCL
66 ISECL
74 TMFLS

ATTRIBUTES OF SHOP
23 NWIP
27 FWIP
27 LWIP
32 NREQ
39 OVTMH
56 FQREP
56 LQREP
57 FRIP
57 LRIP
63 FMALM
63 LMALM
64 NMENA
67 NMALM
68 NRIP

ATTRIBUTES OF PART
29 FMALP
29 LMALP
30 NC4NA
30 NMALP

ATTRIBUTE OF DUMMY ENTITY
62 MISSD

DOUBLE SUBSCRIPTED VARIABLES

ATTRIBUTES OF AIRCRAFT AND OF SORTIE NUMBER NEW OR OLD
12 NPREM
13 SELEN
24 FMLFN
49 NGAMN

WORK CENTER CODING

The present simulator allows for the manning of 44 shops. These shops correspond roughly to the SAC Work Centers required to maintain aircraft. A work center is given two numbers in the simulator to differentiate between skilled and unskilled men. The skilled portion of a shop is denoted by an odd number, and the succeeding even number denotes the unskilled portion of that shop.

SAC Work Center	SAC Code	Simulator Shop Number	
Armament and Electronics		Skilled	Unskilled
Radio communication	26310	1	2
Electronic-navigation equipment	26320	3	4
ECM	26330	5	6
Bomb/navigation	26410	7	8
Autopilot flight control	26420	9	10
Photo	26430	11	12
Fire control	26510	13	14
Weapon system	26520	15	16
Field Maintenance			
Unit change (engine flight line)	24211	17	18
Engine shop	24212	43	44
A/C repair and reclamation	24310	19	20
Fuel system	24320	21	22
Pneudraulic	24420	23	24
Inflight refueling	24430	25	26
Electric	24440	27	28
Instrument	24450	29	30
Structural repair	24520	31	32
Survival equipment	24550	33	34
Wheel and tire	24370	35	36
CMS			
Servicing and handling	21830	37	38
MMS			
Weapon loading teams		41	42

EXPLANATION OF ROUTINES IN SIMULATOR

SUBROUTINE BENCH (M)

CALLED by USEMN to start bench work on reparables waiting in queues, if any. CALLS CREPT to create and cause repair.

ENDOG EVENT CALLM

CAUSED by TERM to attempt to start maintenance using men made available during pre-emption. CALLS USEMN to determine what work can be started.

ENDOG EVENT CANAB

CAUSED by MTCE to start a remove action on a fictitious aircraft. It tests to determine if the part has become available since this event was caused, if so, no action is necessary. If no part is available yet, it sets the remove time at 6/10 of the remove and replace time, and CALLS MTCE to start the remove action.

SUBROUTINE CANCL (I)

CALLED by PREFT to cancel sortie if it is found that the aircraft can not finish the preflight in time to sortie. Or CALLED by CLSE to cancel the sortie if it is already the latest time to sortie and aircraft is not ready. CALLS RDM to destroy any malfunctions that have not been discovered

SUBROUTINE CLASS (I)

CALLED by TERM if maintenance is being stopped; or CALLED by MTN at the end of maintenance if there are outstanding malfunctions, or CALLED by MTCF after each malfunction. Sets class of aircraft to 3 if there are any malfunctions currently being worked on, sets class to 2 if there are any malfunctions waiting for men, or sets class to 1 if there are any malfunctions waiting for parts.

ENDOG EVENT CLMTC

CAUSED by WTSOR if sortie is a ground alert in order to CALL MTCE at the proper day to start work on ground alert malfunctions. Or CAUSED by PREFT to call MTCE for malfunctions discovered 1/3 or 2/3 through preflight. Or CAUSED by MTCE if the number of men required

exceeded the maximum ever available, and the number required was reduced to this maximum, in order to try to start maintenance again.

ENDOG EVENT CLSE

CAUSED by SORTI to occur at the time the a/c should fly or the event will be cancelled. If aircraft has already taken off or sortie is already cancelled, nothing happens. If preflight is not finished, CALL CANCL. If preflight is finished CALL STOMT to stop maintenance if no critical malfunctions exist. If critical malfunctions exist CALL CANCL, otherwise CAUSE WTSOR.

SUBROUTINE CREPT(REPAR)

CALLED by BENCH to start work on reparable that was waiting in queue or CALLED by REPAR to start repair of part just arrived at the shop. If the repair can be completed before the end of shift plus the overlap time CAUSE PTREP to end repair. If work extends past shift plus overlap time, repair will be stopped at shift time by SHIFT and remaining repair time noted.

SUBROUTINE DELAY(X)

CALLED by POSFL at end of postflight. If postflight malfunctions exist a delay time before start of maintenance is set.

SUBROUTINE DOPRE(L,M,B)

CALLED by MTCE to do the pre-emption so that maintenance on a critical malfunction can proceed. It pre-empts only from bench repairs first, then if there are still not enough men, it pre-empts from flight line malfunctions until enough men are available. CANCELS PTREP to delay the end of bench repair and CALLS TERM to stop flight line work to make the men available.

EXOG EVENT DUMPP

The dump calls CORE for a print of memory at the time specified on the event tape.

EXOG EVENT ENDSM

The event to end the simulation.

SUBROUTINE ERR(N)

Called by any routine when an error occurs. Calls ERRR(N) for a printed report, and supplies a CORE memory dump.

REPORT ERRR (N)

Called by ERR(N). Prints the number of the error.

SUBROUTINE FCRDM(L,M)

CALLED by MTCE if men are not available to start maintenance or CALLED by TERM if men are being pre-empted. Files the card of the malfunction in a set of malfunctions waiting for men of a particular shop, and in the set of queues of the malfunction.

SUBROUTINE FCRDW(L,M)

CALLED by MTCE when men and parts are available and maintenance begins. Files the malfunction in a set of work in process in a particular shop.

ENDOG EVENT LTPRE

CAUSED by SORTI at the latest time to start a preflight in order to sortie on time. If the aircraft is in postflight delay or in postflight maintenance or waiting parts or men to do postflight maintenance, it CALLS STOMT to attempt to stop any maintenance. If malfunctions are critical, work on them continues, but if there are no critical malfunctions, STNXS is called to start the next sortie. If aircraft is in any other status, no action is taken.

SUBROUTINE MTCE(L,NN)

This routine attempts to start maintenance on a flight line malfunction. CALLED by CANAB to start removing a part from a fictitious aircraft for a cannibalization, CALLED by CLMTC to start on malfunctions discovered 1/3 or 2/3 through preflight, or to start maintenance on malfunctions discovered during ground alert. Or CALLED by CLMTC to recall MTCE after reducing the number of men required if the maximum ever available had been exceeded. CALLED by MTN after the remove action of a canabalization in order to start the remove and replace

action. CALLED by PDLAY to start maintenance on postflight malfunctions. CALLED by PREFL to start work on malfunctions discovered at the end of preflight. CALLED by STEAM to start upload, download, or service. CALLED by USEMN to attempt to start work using men who have just been made available. CALLED by USEPT to start any malfunctions waiting for a part which has just become available.

Part I - Part availability

The priority of the malfunction is set by calling PTYMR. Part availability is tested. If no part is required, if this maintenance is the start of a remove action during a cannibalization, if this is the remove and replace action of a cannibalization (part is available since it had just been cannibalized), or if the required part is available in base stock, no action is taken (see Part II for man availability).

If part not available, CALL PTYPR which sets the priority for the part. The malfunction is filed in a set of malfunctions waiting for the part. The number of malfunctions waiting that part, and the number of part malfunctions on the aircraft are increased. If the part is not critical, maintenance waits until the part becomes available. If the part is critical, CAUSE CANAB to cannibalize from a ficticious aircraft at the latest time which will allow the next sortie to be started. After any of the above cases, man availability is checked as in II below.

Part II - Man Availability

If no men are required, see part III. If men are required and enough are available, or if not enough available but a substitution of skilled men for unskilled men is possible, CALL RCRDM to remove the malfunction from the set of malfunctions waiting for men (it may or may not be in the set.) CALL FCRDW to file the malfunction in work in process of each required shop, and reduce the men available in those shops, including the substitutions, when called for. Proceed to part III. But if men are not available and substitution not possible, test criticality. If not critical, CALL FCRDM to file it in malfunction waiting for men, and proceed to part IV. If the malfunction is critical,

CALL PREMP to check possibility of a pre-emption. If not possible, CALL FCRDM to file the malfunction into the set waiting for men and proceed to Part IV. If pre-emption is possible, CALL RCRDM to remove from the set of malfunctions waiting men (it may or may not be a member of the set). CALL FCRDW to file the malfunction in work in process for each required shop. CALL DOPRE to do the actual pre-emption of men.

Part III - Start Work

Calculate the finish time, dependent on the length of repair. If men had been pre-empted, add a delay to the finish time. CAUSE MTN, the end of maintenance at finish time. If it is a regular preflight, postflight or ground alert malfunction, increase the number of maintenance malfunctions on the aircraft. If no part was required, CALL CLASS to classify the aircraft. When a part is required, or when starting maintenance using a cannibalized part, reduce the number of parts available. If the part is reparable this station, CAUSE REPAR, the arrival of the reparable at the shop, after maintenance is completed plus a delay time. If the part is NRTS, CAUSE PTARR, the arrival of a new part from the depot. CALL CLASS to classify the aircraft. If this is the start of a cannibalization, increase the number of cannibalizations of the part.

Part IV - Not Enough Men

When men are not available, increase the number of man malfunctions. Check if men will ever be available to do the maintenance. If men can never be available because the number required exceeds the maximum ever available, reduce the men required to the maximum. CAUSE CLMTC to recall MTCE to try again to start maintenance. If men should be available at some time, CALL CLASS to classify the aircraft.
CALL CLASS to classify the aircraft.

ENDOG EVENT MTN

End of maintenance, CAUSED by MTCE which is the start of maintenance. CALL RCRDW to remove the malfunction from work in process of each shop used. If the malfunction was completed on overtime, accumulate overtime hours for each shop; do not reassign men. If not completed on

overtime, the men are returned to their respective shops. CALL USKMN to attempt to assign new work to the available men. If this was a cannibalization, then do not reassign these men, but CALL MTCE to start the replace action with them.

If a regular preflight, postflight, or ground alert malfunction, reduce the number of red-x (if critical). CALL RDM to destroy and remove the malfunction from the set of malfunctions belonging to this aircraft. Reduce the number of outstanding malfunctions and the number of maintenance malfunctions.

If the aircraft is still in preflight and has no more outstanding malfunctions, re-classify the aircraft into preflight. If it is in preflight but still has outstanding malfunctions, CALL CLASS to classify the aircraft. If this maintenance was on the last preflight malfunction, CAUSE WTSOR either now or later, depending on the sortie time. If the aircraft is not in preflight, and still has outstanding malfunctions, CALL CLASS to classify the aircraft. If this was the end of maintenance on a ground alert malfunction, classify the aircraft back on ground alert.

If an end of upload action, CALL PREFT to start a preflight. If the end of a download action, CALL STNXS to start the next sortie. If this maintenance is the end of a service action, and the current sortie was an air alert or a training mission, CALL SPOFL to start postflight. But if, after a service action, the current sortie was a ground alert, CALL STEAM to download (if necessary). Otherwise CALL STNXS to attempt to start the next sortie.

SUBROUTINE OUT (A,B,C,D,E)

Called by all routines with 4 words of information which will be stored on the binary tape.

FUNCTION PCARD (CARD)

Sets the priority of a card equal to the priority of the corresponding malfunction.

ENDOG EVENT PDLAY

End of postflight delay, CAUSED by POSFL if there are postflight

malfunctions. CALL MTCE to attempt to start work on each postflight malfunction.

ENDOG EVENT POSFL

End of postflight, CAUSED by SPOFL. Discovers postflight malfunctions; increases the number of red-x malfunctions each time a critical malfunction is discovered. CALLS DELAY to set the postflight delay time and causes PDLAY at the end of that time. If no postflight malfunctions exist, it tests if a down load is necessary and CALLS STEAM to start this action. If it is not necessary then STNXS is CALLED to start next sortie.

ENDOG EVENT PREFL

End of preflight, CAUSED by PREFT. Discovers preflight malfunctions and CALLS MTCE for each, and increases the number of red-x for each critical one. If there are no outstanding malfunctions it CAUSES WTSOR at the proper time.

SUBROUTINE PREFT(I)

Start of a preflight, CALLED by SORTE if aircraft is standing when sortie is read in, and it does not need an upload. CALLED by MTN if when read in the aircraft needed an upload action. CALLED by SORTE when aircraft was on ground alert and is going next on an air alert since it then will not need service or uploading or downloading and will not have postflight malfunctions. Or CALLED by STNXS if the next sortie data had been read in and the aircraft does not need an upload action. If this sortie has already been cancelled, file aircraft in standing. If there is time to do the preflight, CAUSE PREFL for end of preflight time and CAUSE CLMTC for those malfunctions discovered 1/3 or 2/3 through preflight. If too late for preflight, CALL CANCL and file aircraft in standing.

SUBROUTINE PREMP (L,M,X)

CALLED by MTCE when enough men are not available for a critical malfunction. Determine if pre-emption is possible by seeing if bench repairs could free the required number of men. If still not enough men, it then checks which flight line malfunctions can be stopped. If men

can be made available it notes that pre-emption is possible. But if it finds that pre-empting can not furnish enough men, it notes then that pre-emption is not possible.

ENDOG EVENT PTARR

Part arrival from depot, CAUSED by MTCE when the part had been removed and was found not reparable this station. Base stock is increased by one, and USEPT, is CALLED to attempt to use the part on any waiting malfunction.

ENDOG EVENT PTREP

End of bench repair, CAUSED by CREPT. Increases the number of parts available by one, increases the men available in the shop used by one, and decreases by one the number of reparables in process for that shop. CALLS USEPT to attempt to use the part on any waiting malfunction, and calls USEMN to attempt to use the newly freed man.

SUBROUTINE PTYMR (L,M)

CALLED by MTCE and FCRDM. Sets the priority to use men required for a malfunction.

SUBROUTINE PTYPR (L,N)

CALLED by MTCE. Sets the priority to use a part when it becomes available.

SUBROUTINE PTYRR (REPAR)

CALLED by CREPT if the reparable had been in queue or CALLED by REPAR if the reparable has just arrived at the shop. Sets the priority of the reparable equal to the present time, making the queue a first-in first-out discipline.

SUBROUTINE RCRDM (L,M)

CALLED by MTCE when maintenance is started, or CALLED by STOMT when a malfunction is not critical and is being postponed. Removes the card of the malfunction from the set of malfunctions waiting for

men of the required shop and from the set of queues of the malfunction. Reduces the number of malfunctions waiting for men of the shop.

SUBROUTINE RCRDW (L,M)

CALLED by MTN at the end of maintenance or CALLED by TERM when maintenance is stopped. Removes the card of the malfunction from work in process of each required shop and reduces the number of work in process of each required shop.

SUBROUTINE RDM (I,J,L)

CALLED by MTN at the end of maintenance or CALLED by CANCL to destroy malfunctions that would have been postflight malfunctions had the aircraft flown. Destroys the malfunction and the man requirements of the malfunction.

ENDOG EVENT REPAR

The end of shipment of a reparable to the shop, CAUSED by MTCE when maintenance begins. If the man to repair is available CREPT is CALLED to start the bench repair. If the man to repair is not available, PTYRR is CALLED and the reparable is added to the queue of reparables waiting for a man from the required shop.

ENDOG EVENT SHIFT

Shift is CAUSED at the beginning of simulation by the START routine. After this SHIFT is CAUSED by itself. Shift number is changed to 1, 2, or 3 and it is determined if time is a weekday or a weekend. All shops are manned with the number of men specified for the particular day and shift. All bench work is stopped by filing work in a queue of reparables of each shop unless bench work can be finished within a specified overlap time. Work in process at each shop is terminated by CALLING TERM unless held on overtime or re-started immediately as follows: If a service action or a ground alert malfunction, continue on overtime. If a malfunction can be completed within the overlap time, continue on overtime. If a malfunction is critical, assign new men immediately, but if enough new men are not available, then continue on overtime. Then CALL USEMN to try to assign the remaining new men

to the malfunctions that had been terminated, to waiting malfunctions and then to bench repair. CAUSE SHIFT, end of next shift at a specified time, usually 8 hours or 1/3 of a day.

ENDOG EVENT SORTE

The end of a sortie is CAUSED by WTSOR. If the sortie was a training mission or an air alert, STEAM is CALLED to start a service action. Otherwise the current sortie was a ground alert: If the following sortie of the aircraft will be a ground alert or an air alert, the present sortie is finished, and if the next sortie has been read in, PREFT is CALLED to start preflight for this next sortie; if not read in, the aircraft is placed in standing. However if the current ground alert aircraft is next going on a training mission, STEAM is CALLED to start a service reducing the amount of fuel.

EXOG EVENT SORTI

The aircraft number and the type of sortie is read in. Test the class of the aircraft, if the aircraft is presently in preflight, waiting for takeoff time, on a sortie, or on a ground alert the new sortie is immediately cancelled. Otherwise, read the rest of the sortie data. CAUSE CLSE to cancel the sortie, if necessary, at the maximum lateness time depending on the type of sortie. If the aircraft is presently in standing, remove it from standing and CALL STEAM to start an upload if weapons are required and are not already on board, or CALL PREFT to start the preflight. If the aircraft is in any other category, CAUSE LTFRF, which again trys to preflight at the latest time to get the aircraft ready.

SUBROUTINE SPOFL (I)

Start of postflight, CALLED by MTN at the end of service. Classifies the aircraft into postflight and CAUSES POSFL, the end of postflight, after the proper postflight time.

EXOG EVENT STAR

The start of simulation. Sets the first Saturday and the first Sunday to occur at the time indicated in the initialization, and

CAUSES SHIFT immediately to man each shop with the men for that day and shift.

SUBROUTINE STEAM(I,J)

The attempt to start upload, download or service team action. CALLED by MTN at the end of service of an aircraft going from a ground alert or an air alert to a training mission, to start a download. CALLED by POSFL, the end of postflight, if no malfunctions exist, but a download is necessary. CALLED by SORTI when the sortie data is read in and the aircraft is ready to start an upload. CALLED by SORTE at the end of an air alert or training mission to service and CALLED by SORTE if a ground alert is next going on a training mission and therefore needs a service action. CALLED by STNXS to start a download or an upload, if either is necessary. A critical malfunction is created, setting its repair time, shops, men, and skills, depending on the type of action. MTCE is CALLED to attempt to start the work. If this is an upload action the number of aircraft with weapons is increased, and if a download action the number of aircraft with weapons is decreased.

SUBROUTINE STNXS(I)

Attempt to start the next sortie. CALLED by LTPRE if the aircraft is in postflight delay or postflight maintenance or waiting men or parts for postflight maintenance and there are no critical malfunctions. CALLED by MTN at the end of postflight maintenance. CALLED by POSFL at the end of postflight and there are no postflight malfunctions and no download necessary. If a download is necessary, CALL STEAM to start the download action. If the next sortie data has not been read in, file the aircraft in standing. Otherwise, if the next sortie needs weapons, CALL STEAM to start the upload action. If no weapons required, CALL PREFT to start preflight on the next sortie.

SUBROUTINE STOMT (I,K,CI)

An attempt to stop maintenance. CALLED by CLSE to stop preflight maintenance at the maximum late take-off time, or CALLED by LTPRE to stop postflight maintenance at the latest time to start a preflight for the next sortie. If any critical malfunctions exist, the maintenance

must continue. If no critical malfunctions exist work can be stopped. Any remaining preflight malfunctions are changed to postflight malfunctions on this sortie, or any remaining postflight malfunctions are changed to postflight malfunctions after the following sortie. For those malfunctions that are in process, TERM is CALLED to terminate maintenance. And those malfunctions waiting in a queues for men are removed from the queues by CALLING RCRDM.

SUBROUTINE TERM(L,MM,J)

Termination of maintenance, CALLED by DOPRE when pre-emption of men is necessary and possible. CALLED by STOMT in order to sortie or start the next preflight on time. Or CALLED by SHIFT if the maintenance is not critical and would extend past the overlap time. Repair time is changed to the amount of repair time remaining. The MTN event is CANCELLED. RCRDW is CALLED to remove the malfunction from work in process of each shop. When called by SHIFT or DOPRE, FCRDM is CALLED to file the malfunction into the set waiting for men of its required shops. When CALLED by DOPRE, CALLM is CAUSED to attempt to use men made available during pre-emption. And when CALLED by STOMT, USEMN is CALLED to attempt to use the newly freed men. Then the aircraft maintenance malfunctions are decreased, and the number of man malfunctions is increased. CLASS is CALLED to re-classify the aircraft.

SUBROUTINE USEMN(M)

An attempt to use available men. CALLED by MTN at the end of maintenance. CALLED by TERM when men are freed by stopping work on other malfunctions. CALLED by CALLM to see if men made free by pre-emption can work on other maintenance. Or CALLED by SHIFT to attempt to assign the new men who were not put to work immediately on jobs in process. If there are malfunctions waiting for the available men, MTCE is CALLED to attempt to start maintenance. If, after starting as many maintenance jobs as possible, men are still available, BENCH is CALLED to repair waiting parts, if any.

SUBROUTINE USEPT(N,J)

An attempt to use a part. CALLED by PTREP when repair of a part

is finished. Or CALLED by PTARR when a part arrives from the depot. If there are any outstanding cannibalizations of the part, the part is replaced on a fictitious aircraft. If there were no cannibalizations, it searches for any malfunctions waiting for the part. If none, the part remains in base stock. If any malfunctions were waiting for the part, MTCP is CALLED to attempt to start maintenance.

ENDOG EVENT WTSOR

End of wait for sortie. CAUSED by PREFL if there are no malfunctions to fix before sortie time. CAUSED by CLSE if simulated time is past sortie time and non critical malfunctions have been stopped. Or CAUSED by MTN at the end of preflight maintenance. If the sortie has already been cancelled, file the aircraft in standing. If not cancelled, CAUSE SORTE, the end of the sortie to occur after the proper sortie length. If this sortie is a ground alert, CAUSE CLMTC to call maintenance on the proper day of discovery of ground alert malfunctions.

FUNCTION ZERO (CARD)

Makes a ranked set a first-in first-out set.

Appendix C

EXPLANATION OF MESSAGES ON THE ANALYSIS TAPE

#	Routine	Words	Explanation
8	CANCL	I TYNXS(I) TMNXS(I)	After a sortie has been cancelled and the malfunctions removed and destroyed, list the aircraft number, type of sortie, and the time it was scheduled to take off.
9	CLASS	I CLAS(I) NREDX(I)	When reclassifying an aircraft, if there are part malfunctions, man malfunctions, or it is in maintenance, list the aircraft number, the class of the aircraft, and the number of critical malfunctions.
11	CLMTC	I N CLSSP(L) K	After maintenance has been started or attempted on malfunctions discovered during preflight or during a ground alert, list the aircraft number, the part, a flag showing if the malfunction is waiting for the part (CLSSP(L)=1)*, and a flag showing if this attempt is merely a retry at starting maintenance (K=1).
1	CREPT	M NMENA(M) NRIP(M) NQREP(M)	After the start of every bench repair, list the shop used, the men left available in these shops, the number of reparables in this shop, and the reparables in queue in this shop.
39	CREPT	M NRIP(M) NQREP(M)	When doing a pre-emption from bench repair, list the shop, the decreased number of reparables in process, and the increased number of reparables in queue.
38	ENDSM	--	When the end of simulation time arrives, routine 38 shows zero, which is the signal that simulation is over.
13	FCRDM	M NMALM(M) FLAG	After a malfunction is filed in each required shop to wait for men, list the shop, the number of malfunctions waiting men of that shop, and a flag showing if this filing in queue is happening at a shift change (FLAG=1).
14	FCRDW	M NWIP(M)	When work begins, a card is filed in each shop in use, the shop and number of jobs in process is listed.

*All flags are either 0 or 1. 0 indicates the no or not condition and 1 the can or yes condition.

#	Routine	Words	Explanation
37	LTFRE	I CLAS(I) CI	At the latest time to start a preflight on a new sortie, an attempt to start the new sortie is made. The aircraft number, the classification of the aircraft, and a flag showing if the preflight can be started is listed.
3	MTCE	M NMENA(M) SUB(B) NP	At the start of maintenance, if both men and parts are found available, list the shop number, the new number of men available in that shop, the number of men substituted to that shop (e.g. − for a skilled shop, + for an unskilled shop), and a flag showing if a preemption has taken place.
7	MTCE	M EXTRA	When extra men are brought from home to work when there are not enough men ever -- list the shop and number of extra men.
4	MTCE	I NOMEM(I) NOMNM(I) NOPTM(I)	After the start of maintenance is attempted, whether both men and parts were available to start or not, list the aircraft that is to be worked on, the number of maintenance malfunctions, man malfunctions and part malfunctions.
4	MTCE	N NC NPRTA(N) NMALP(N)	Also list the part required (if any), NC=1 if this is a cannibalization, the number of parts available for this part, and the number of malfunctions waiting for that part.
4	MTCE	NCANB(N) MI KK NREDX(I)	And list the number of cannibalizations of this part, MI=1 if men were found available, the type of the malfunction; and the number of critical malfunction on this aircraft.
5	MTN	MM NMENA(MM) SUB(X)	At the end of maintenance, when men are returned to their shops, list the shop, the new number of men available for this shop, and the number of men substituted.
39	MTN	M OVTMH	At the end of maintenance, if men worked overtime, list the shop and the overtime hours worked.
6	MTN	I NOMNM(I) NOMEM(I) NOPTM(I)	At the end of maintenance, list the aircraft number, the number of man malfunctions, maintenance malfunctions, and part malfunctions left on the aircraft.

#	Routine	Words	Explanation
6	MTN	CLAS(I) NREDX(I) K KT	At the end of maintenance, list the classification of the aircraft, the number of critical malfunctions remaining on the aircraft, the type of this malfunction, and the criticality of this malfunction.
15	PDLAY	N CLSSP(L)	At the end of postflight delay when maintenance is attempted on each postflight malfunction, list the part required and a flag showing if the malfunction is waiting for the part (CLSSP(L)=1).
16	POSFL	I NOOSM(I) NREDX(I) CLAS(I)	At the end of postflight when malfunctions are discovered and before a delay or a download, list the aircraft number, the number of outstanding malfunctions, how many critical, and the classification of the A/C.
17	PREFL	N CLSSP(L)	At the end of preflight, for each malfunction discovered, list the part required and the same flag as in #15.
18	PREFL	IX NOOSM(IX) CLAS(IX) NREDX(IX)	At the end of preflight when either maintenance or wait for sortie starts, list the aircraft, the number of outstanding malfunctions, the class of the aircraft, and the number of critical malfunctions in the aircraft.
24	PREFT	I CLAS(I) NACST	After the attempt to start a preflight, list the aircraft, its classification, and the number of A/C standing.
19	PTREP	M NMENA(M) NRIP(M) N	At the end of bench repair, after the man has been returned and the reparables in process decreased, list the shop, the men available, the number of reparables in process and the part which was just repaired.
2	RCRDM	M NMALM(M) I NOMNM(I)	When a malfunction is removed from queue, list the shop, the new number of malfunctions waiting for men of the shop, the aircraft with this malfunction, and the number of man malfunctions left on that aircraft.
20	RCRDW	M NWIP(M)	After removing a card from work in process, list the shop and the new number of work in process.

#	Routine	Words	Explanation
21	REPAR	M NQREP(M) NMENA(M)	After an attempt has been made to start bench repair on a reparable, list the shop, number of reparables in queue, and the number of men available in the shop.
10	RUSH	KJ R	When a preflight or postflight malfunction is to be completed in less time than required so that a sortie will not be cancelled, list the type of the malfunction and the new repair time.
31	SHIFT	SFTNO	At the end of a shift, list the shift number.
36	SHIFT	M NMENA(M)	At the beginning of a new shift, after assigning those men who start a job immediately, list each shop and the number of men available.
23	SORTE	I NACST CLAS(I) TCURS(I)+2	At the end of each sortie, list the aircraft number, the number of aircraft standing, the classification of the aircraft that has just finished the sortie, and the type of sortie.
25	SORTI	I NTYNX	When a new sortie is read in, if the sortie is cancelled immediately, list the aircraft number and the type of the sortie.
26	SPOFL	I	When starting each postflight, list the aircraft number.
27	START	FSAT NSHOP	At the start of simulation, the first Saturday and the number of shops is listed.
28	START	NMASD(M,1) NMASD(M,2) NMASD(M,3) M	At the start of simulation, the week day manning for all three shifts is listed along with the shop number.
28	START	NMASE(M,1) NMASE(M,2) NMASE(M,3) M	At the start of simulation, the weekend manning for the three shifts is listed for each shop, plus the shop number.
29	STEAM	I CLAS(I) NACWW NACST	When the start of team action is attempted, list the aircraft number, the classification of the aircraft, the number of aircraft with weapons and the number of aircraft standing.

#	Routine	Words	Explanation
30	STNXS	I CLAS(I) NACST	When the start of a new sortie is attempted, list the aircraft, it's classification, and the number of aircraft standing.
33	STOMT	N NMALP(N)	When the next sortie must start preflight, stopping maintenance is attempted by checking if there are any critical malfunctions. For each malfunction terminated, list the part, and the number of malfunctions waiting for the part.
33	STOMT	I 999	This message appears if a successful attempt has been made to stop maintenance and start the next sortie.
39	TERM	M OVTMH	When terminating maintenance, if men were working overtime, list the shop and the overtime hours used for this shop.
32	TERM	M NMENA(M) J TLNO(L)	When maintenance is terminated for each shop required, list the shop that was working on the malfunction, the number of men available in that shop now, J to show if termination was called by STOMT, DOPRE, or SHIFT, and the aircraft number on which maintenance is being terminated.
22	USEMN	NRIP(M) NQREP(M) M NMALM(M)	When men have been made available and an attempt to reassign them has been made, list the number of reparables in process for the shop with the men, the number of reparables in queue waiting those men, the shop number, and the number of malfunctions waiting for men from that shop.
34	USEPT	N NMALP(N)	When a part becomes available and there was an outstanding cannibalization on that part, list the part and the number of malfunctions waiting for this part.
34	USEPT	N NMALP(N) NOPTM(I) I	After attempting to use a newly arrived part on a regular malfunction, list the part, the number of malfunctions waiting that part, the number of part malfunctions on the aircraft on which the part is used, if any, and the aircraft number.

#	Routine	Words	Explanation
35	WTSOR	I IJ Y JJ	At the end of a wait for sortie, the aircraft either sorties or is cancelled. List the aircraft number, IJ (an indicator to note if sortie is cancelled (IJ=1)), & (the lateness, if any), and the type of the sortie.
38	ERR	9999	When an error has been called, 9999 indicates that the program stopped due to the error as compared to the normal program exit.

Appendix D

PROGRAM LISTING

```
+                                  1AC     E1/1 I                                  X
+                                  2PRT    E1/1 I                                  X
+                                  3SHOP   E /  I                                  X
+                                  7RSHP        F*                                 X
+                                  8ENDSE  1    F                                  X
+                                  9TCURS  1    I                                  X
+                                 10TMNXS  11 1 F                                  X
+                                 11TYFLS  12/4*I                                  X
+                                 11TYNXS  11/4*I                                  X
+                                 11PFLAG  13/4 I                                  X
+                                 12NPREM  2    I                                  X
+                                 13SELEN  2    F                                  X
+                                 14NOOSM  11/2 I                                  X
+                                 14NREDX  12/2 I                                  X
+                                 15CLAS   11/2 I                                  X
+                                 15PREFN  12/2 I                                  X
+                                 16NOPTM  1    I                                  X
+                                 17NOWEP       I*                                 X
+                                 18SENOO  11/2 I                                  X
+                                 18SENON  12/2 I                                  X
+                                 19MAXMN       I*                                 X
+                                 20TMPOT       F*                                 X
+                                 21DELAG       F*                                 X
+                                 22PODLA       F*                                 X
+              T CRIT   12/4 I    23NWIP  1 /  I                                   X
+                                 24FMLFN 2    I                                   X
+                                 25CLSEE 1    I                                   X
+                                 26SACST 11/2 I                                   X
+                                 26PACST 12/2 I                                   X
+              T REPTM 21/1 F     27FWIP  11/2 I    WIP 1   *PCARD L               X
+T MALFN84    4                   27LWIP  12/2 I                                   X
+              T LREQS 52/2 I     28PREDY       F*                                 X
+                                 29FMALP 11/2 I    MALP1   *PTYP   L              X
+                                 29LMALP 12/2 I                                   X
+                                 30NPRTA 11/2 I                                   X
+                                 30NCANB 13/4 I                                   X
+                                 30NMALP 14/4 I                                   X
+              T NRTS   62/4 I    31SHPDY       F*                                 X
+              T MREPP  31/4 I    32NQREP 1    I                                   X
+              T SHOPN  13/4 I    33DTCAN       F*                                 X
+N CANAB4                                                                          X
+                                 34NTEAM 1    I                                   X
+N REPAR8      T NOREP  1 /  F    35SFTNO       I                                  X
+                                 36FSAT        I                                  X
+                                 37FACST 01/1  I                                  X
+              T PQREP  6 /  I    38NMASD 2 /  I                                   X
+              T SQREP  5 /  I                                                     X
+                                 40FLAG        I                                  X
+                                 42NACST       I                                  X
+                                 43NAOCP       I                                  X
+                                 44NAOCM       I                                  X
+                                 45NACMN       I                                  X
```

```
                    46LTP    1     I                                        X
                    47KORE         I*                                       X
                    48TACTM        F*                                       X
                    49NGAMN  2     I                                        X
                    50WHERE        I                                        X
                    51ENDSH        F                                        X
                    52NOMNM  1     I                                        X
                    53NOMEM  1     I                                        X
T PTYR   2 /   F    55OVLAP        F*                                       X
                    56FQREP  11/2  I                                        X
                    56LQREP  12/2  I      RIP 1   *PTYR   H                 X
                    57FRIP   11/2  I                                        X
                    57LRIP   12/2  I                                        X
                    61NMASE  2 /   I                                        X
                    62MISSD  1     I                                        X
                    63FMALM  11/2  I                                        X
                    63LMALM  12/2  I                                        X
                    64NMENA  1     I                                        X
                    65MAXLT  1 /   F                                        X
                    66ISECL  1     I                                        X
                    67NMALM  1 /   I                                        X
                    68NRIP   1 /   I                                        X
                    69LMLFN  2     I                                        X
                    70LACST        I                                        X
                    71FSUN         I                                        X
                    72TMPRT        F*                                       X
                    73NPOSM  2     I                                        X
                    74TMFLS  1 /   F                                        X
                    75WEPST  1     I                                        X
                    76SHPNO  2     I                                        X
                    77NOMN   2     I                                        X
                    78SKLL   2     I                                        X
                    79TIMET  1 /   F                                        X
                    80NACWW        I                                        X
                    81RUN          I                                        X
                    82TNS          I                                        X
                    83BIG    1     I                                        X
                    84BIGTM  1     F                                        X
                                          ACST0                             X
T DISCV  11/4  I                          REQS1   *ZERO   L                 X
T PART   32/2  I                          MALM1   *PCARD  LPCARDF           X
T TLNO   32/4  I                                                            X
T TREPP  81/1  F                                                            X
T FREQS  51/2  I                                                            X
T CLSSP  61/4  I                                                            X
T TDISC  22/2  I                                                            X
T FQUES  31/2  I                                                            X
T LQUES  32/2  I                          QUES1   *ZERO   LZERO  I          X
T FINTM  4 /   F                                                            X
T PTYP   11 /  F                                                            X
T PTYM   12 /  F                                                            X
T PMLFN  71/2  I                                                            X
```

```
+                   T SMLFN 72/2 I                                          X
+                   T PMALP141/2 I                                          X    C
+                   T SMALP142/2 I                                          X    C
+                   T OTFLG613/4 I                                          X    C
+                   T MTNR 621/2 I                                          X
+T CARD 4                                                                   X
+                   T MLFTN 11/2 I                                          X
+                   T PMALM 21/2 I                                          X
+                   T SMALM 22/2 I                                          X
+                   T SQUES 31/2 I                                          X
+                   T PQUES 32/2 I                                          X
+                   T SWIP  41/2 I                                          X
+                   T PWIP  42/2 I                                          X
+T MREQ 2                                                                   X
+                   T NOMEN 11/4 I                                          X
+                   T PREQS 21/2 I                                          X
+                   T SREQS 22/2 I                                          X
+                   T SUB   14/4*I                                          X
+                   T SKILL 12/4 I                                          X
+                   N SHFLG 32/4 I                                          X    C
+                   N PRIP  71/2 I                                          X
+                   N SRIP  72/2 I                                          X    C
+                   N REPLT 4 /  F                                          X    C
+                   N PCANB 31/2 I                  QREP1  *PTYR  L         X
+                                                   MLFN2  *DISCV L         X
+N MTN  4                                                                   X
+N WTSOR4                                                                   X
+N PREFL4                                                                   X
+N POSFL4                                                                   X
+N CLSE 4                                                                   X
+N PDLAY4                                                                   X
+N LTPRE4                                                                   X
+N SHIFT4                                                                   X
+N CLMTC4                                                                   X
+N SORTE4                                                                   X
+N CALLM4                                                                   X    C
+N PTARR4                                                                   X
+                   N MFN   42/2 I                                          X    C
+                   N MAN   3    I                                          X
+                   T STOVT63    F                                          X
+                                                                MAXV FX    X    C
+                   T FG   614/4 I                                          X
+                   T CANAR641/2 I                                          X
+                   T CANAD642/2 I                                          X    X
```

```
      SUBROUTINE BENCH(M)
                  SUBROUTINE TO DETERMINE WHICH BENCH REPAIRS SHOULD
                  START AT SHOP M, CALLS  ON CREPT TO CREATE AND
                  CAUSE REPAIR
   10 IF (NMEN A(M)) EQ(0),GO TO 100
      IF QREP(M) IS EMPTY,GO TO 100
      REMOVE FIRST X FROM QREP(M)
      LET NQREP(M) = NQREP(M) - 1
      CALL CREPT(X)
      GO TO 10
  100 RETURN
      END




      ENDOG EVENT CALLM
                  ATTEMPTS TO START MAINT USING MEN MADE AVAILABLE
                  DURING PRE-EMPTION
      LET M = MAN(CALLM)
      CALL USEMN(M)
  100 DESTROY CALLM
      RETURN
      END




:
      ENDOG EVENT CANAB
:                 STARTS REMOVE ACTION ON FICTITIOUS AIRCRAFT
      LET L = MFN(CANAB)
      LET CANAR(L) = 0
:                 IF MALFUNCTION IS NO LONGER AWAITING PARTS, RETURN
      IF (CLSSP(L)) EQ (0), GO TO 100
      LET I = TLNO(L)
K     SENSE LIGHT 1
      LET CANAD(L) = 1
      LET REPTM(L) =0.6*REPTM(L)
      CALL MTCE(L, NN)
  100 DESTROY CANAB
      RETURN
      END
```

```
C
      SUBROUTINE CANCL(I)                                                1
C                     CANCELS SORTIE AND DESTROYS MALFUNCTIONS
      LET PFLAG(I) = 0                                                   1
      LET KK = PREFN(I)                                                  1
      LET J = SENON(I)
   10 DO TO 20, FOR EACH L OF MLFN(J,I), WITH (DISCV(L)) EQ(1),
     COR (DISCV(L)) EQ(KK)
      CALL RDM(I,J,L)
   20 REPEAT 10                                                          1
      CALL OUT( 8,I,TYNXS(I)+2,TMNXS(I),0)
      LET TMNXS(I)=TMFLS(I)
      LET TYNXS(I) = TYFLS(I)                                            1
      LET PREFN(I) = 0
      RETURN                                                             1
      END                                                                1
C
      SUBROUTINE CLASS(I)
C                     IF AIRCRAFT IS CURRENTLY AOCP,AOCM OR ACMN REDUCE
C                     NAOCP, NAOCM OR NACMN BEFORE RECLASSIFYING A/C
      LET J = 0
      IF (CLAS(I)) EQ(4), LET J = 1
      IF (CLAS(I)) GR (3), GO TO 25
   10 GO TO (21,22,23),CLAS(I)
   21 LET NAOCP = NAOCP - 1
      GO TO 25
   22 LET NAOCM = NAOCM - 1
      GO TO 25
   23 LET NACMN = NACMN - 1
C                     SET CLASS=3 IF THERE ARE 'MAINTENANCE MALFUNCTIONS'
   25 IF (NOMEM(I)) EQ(0), GO TO 60
      LET NACMN = NACMN + 1
      LET CLAS(I) = 3
      GO TO 100
C                     SET CLASS=2 IF THERE ARE 'MAN MALFUNCTIONS'
   60 IF (NOMNM(I)) EQ(0), GO TO 70
      LET NAOCM = NAOCM + 1
      LET CLAS(I) = 2
      GO TO 100
C                     SET CLASS=1 IF THERE ARE 'PARTS MISSING'
   70 IF (NOP1M(I)) EQ(0), GO TO 100
      LET NAOCP = NAOCP + 1
      LET CLAS(I) = 1
  100 CALL OUT(9,I,CLAS(I),NREDX(I),0)
      RETURN
      END
```

```
      ENDOG EVENT CLMTC
C                     CALL MAINTENANCE (MTCE) WHEN MALFUNCTIONS L IS DISCV
C                     DURING PREFLIGHT OR DURING GROUND ALERT
      LET L = MFN(CLMTC)
      LET N = PART(L)
      LET I = TLNO(L)
      LET K = MAN(CLMTC)
      IF (K) EQ (1), GO TO 20
   10 LET NOOSM(I) = NOOSM(I) + 1
      IF(CRIT(L)) EQ(1), LET NREDX(I)=NREDX(I)+1
   20 IF (MTNR(L)) NE (0), GO TO 100
      CALL MTCE(L,NN)
      DESTROY CLMTC
  100 CALL OUT(11,I,N,CLSSP(L),K)
      RETURN
      END




C
      ENDOG EVENT CLSE                                                    1
C                     TIME TO CANCEL SORTIE IF NOT READY
      LET I = TLNO(CLSE)                                                  1
C                     IF PREFLIGHT COMPLETED-ATTEMPT TO STOP MAINT.,
C                     OTHERWISE GO TO CANCEL
   10 IF (PREFN(I)) EQ(1), GO TO 30
C                     IF CRITICAL MALFUNCTIONS EXIST CALL CANCEL ROUTINE
   40 LET ISECL(I) = 1
      CALL CANCL(I)
      GO TO 100
   30 CALL STOMT(I,0,*CI)
C                     IF NOTHING CRITICAL, SCHEDULE A 'WAIT FOR SORTIE'
C                     AT TIME = NOW
      IF (CI) EQ (1),GO TO 40
      CREATE WTSOR
      LET TLNO(WTSOR) = I
      LET MFN(WTSOR) = 1
      CAUSE WTSOR AT TIME
  100 DESTROY CLSE
      LET CLSEE(I) = 0
      RETURN
      END




C
      SUBROUTINE CREPT(REPAR)
C                     SUBROUTINE TO CAUSE PART REPAIR EVENT
      LET T=TIME + TREPP(REPAR)
      LET M = MREPP(REPAR)
      CALL PTYRR(REPAR)
      FILE REPAR IN RIP(M)
```

```
      LET NRIP(M) =NRIP(M)  + 1
      LET NMENA(M) = NMENA(M) - 1
C                  IFREPAIR COMPLETED BEFORE END OF SHIFT PLUS OVERLAP,
C                  CAUSE END OF PART REPAIR, OTHERWISE NOTE CURRENT TIME
C                  PLUS REMAINING REPAIR TIME.(C.F. DOPRE AND SHIFT)
      IF (T) GR (ENDSH + OVLAP), GO TO 20
      CAUSE PTREP CALLED REPAR AT T
      LET SHFLG(REPAR)=0
      IF (T - ENDSH) LE (0), GO TO 100
      LET OVTMH = T - ENDSH
      CALL OUT(39,M,OVTMH,0,0)
      GO TO 100
   20 LET SHFLG(REPAR)=1
      LET REPTM(REPAR)=T                                                  C
  100 CALL OUT(1,M,NMENA(M),NRIP(M),NQREP(M))
      RETURN
      END




C
      SUBROUTINE DELAY(X)                                                 C
C                  SET DELAY AFTER POSTFLIGHT
      LET X  = PODLA                                                      C
      RETURN                                                              C
      END

                                                                          C
                                                                          C


C
      SUBROUTINE DOPRE(L,M,B)
C                  SUBROUTINE TO DO THE PRE-EMPTION
C                  FIRST STOP ALL NECESSARY BENCH REPAIR                  C
   10 DO TO 20, FOR EACH K OF RIP(M)    ,WITH (SHFLG(K)) NE(2)             C
      REMOVE K FROM RIP(M)
      LET NRIP(M) = NRIP(M) - 1
      LET TREPP(K)=REPTM(K) - TIME                                        C
      FILE K IN QREP(M)                                                   C
      IF(SHFLG(K)) EQ(0), CANCEL PTREP CALLED K
      LET NQREP(M) = NQREP(M) + 1
      CALL OUT(12,M,NRIP(M),NQREP(M),0)
      LET NMENA(M) = NMENA(M) + 1
C                  IF ENOUGH MEN, RETURN
      IF (NMENA(M)) EQ (NOMEN(B)), GO TO 100
   20 REPEAT 10
C                  STOP ALL NECESSARY FLIGHT LINE MAINTENANCE
      LET I = LWIP(M)                                                     C
   25 IF(NMENA(M))GE (NOMEN(B)), GO TO 100
      IF(I) EQ(0), CALL ERR(3)                                            T
      IF (PCARD(I)) LE (PTYM(L)), CALL ERR( 2)                            T
      LET LL = MLFTN(I)
```

```
      LET I = PWIP(I)
      IF (DISCV(LL)) GE(2), GO TO 25
      IF (STOVT(LL)) GR (0.), GO TO 25
      IF(CANAD(LL)) GR(0), GO TO 25
      CALL TERM(LL,M,2)
      GO TO 25
  100 RETURN
      END




C
      EXOG EVENT DUMPP
      CALL CORE(KXX, KXX(8))
      RETURN
      END




C
      SUBROUTINE ENDAT(I)
C                   IF NEXT SORTIE IS A GROUND ALERT OR AN AIR ALERT,
C                   CURRENT SORTIE IS FINISHED
   20 IF (TYNXS(I)) LS (0) ,GO TO 25
      LET SENOO(I) = SENON(I)
C                   IF NEXT SORTIE IS NOT READ IN, FILE AIRCRAFT IN
C                   STANDING AND RETURN
      IF (PFLAG(I))EQ(1), GO TO 28
      FILE I IN ACST
      LET NACST = NACST + 1
      LET CLAS(I) = 5
      GO TO 100
C                   NOW ON GROUND ALERT, GOING ON AIR ALERT--
C                   START PREFLIGHT FOR NEXT SORTIE
   28 CALL PREFT(I)
      GO TO 100
C             NOW ON GROUND ALERT, GOING ON TRAINING MISSION
C                   START SERVICE ACTION
   25 CALL STEAM(I,3)
  100 RETURN
      END




C
      EXOG EVENT ENDSM
      CALL OUT(38,0,0,0.0)
      RETURN
      END
```

```
C
       SUBROUTINE ERR(N)
      CALL ERRR(N)
      CALL CORE(KXX,KXX(KORE))
      CALL OUT(38,9999,0,0,0)
X     END FILE 10
      STOP
      RETURN
      END
```

```
C
                    REPORT ERRR (N)
X                                                                ERROR
 X
X                ERROR
X                NUMBER
X                  **
 X                 N
                          END
                                                                      X
NUMBER                                                  PAGE **   3
PAGE
                                                                      X
                                                                      X
                                                                      X
                                                                      X

                      END
```

```
C
      SUBROUTINE FCRDM(L,M)
C               SUBROUTINE TO CREATE CARD AND FILE IT IN
C               MALFUNCTIONS WAITING MEN OF M AND QUES OF L.
      CREATE CARD
      STORE L IN MLFTN(CARD)
      LET SHOPN(CARD) = M
      CALL PTYMR(L,M)
      FILE CARD IN QUES(L)
      FILE CARD IN MALM(M)
      LET NMALM(M) =NMALM(M) + 1
      CALL OUT(13,M,NMALM(M),FLAG,0)
      RETURN
      END
```

```
C
      SUBROUTINE FCRDW(L,M)
C                  SUBROUTINE TO CREATE CARD AND FILE IT IN WORK IN PRC
      CREATE CARD
      LET MLFTN(CARD) = L
      LET SHOPN(CARD) = M
      LET NWIP(M) = NWIP(M) + 1
      FILE CARD IN WIP(M)
      CALL OUT(14,M,NWIP(M),0,0)
      RETURN
      END
```

```
C
      REPORT  INTLZ
X                                                    INITIALIZATION  VARIA
 X
X           ZERO  SUBSCRIPTED  VARIABLES
X                 1  AC              *                  22 PODLA    .******
 X                                  NAC                                PODLA
X                 2  PRT             *                  28 PREDY    .******
 X                                  NPRT                               PREDY
X                 3  SHOP            *                  31 SHPDY    .******
 X                                 NSHOP                               SHPDY
X                 17 NOWEP           *                  33 DTCAN    .******
 X                                 NOWEP                               DTCAN
X                 19 MAXMN           *                  36 FSAT           *
 X                                 MAXMN                                FSAT
X                 20 TMPOT    .******                   37 FACST          *
 X                                TMPOT                                FACST
X                 21 DELAG       *.*                   42 NACST          *
 X                                DELAG                                NACST
X           SINGLE  SUBSCRIPTED  VARIABLES
X                                        ATTRIBUTES  OF  AIRCRAFT
X                 AC                 15 CLAS      26 SACST     26 PACST     7
X                  *                   *            *            *
 X                 I                  CLAS(I)      SACST(I)     PACST(I)
  X                             FOR EACH AC I
X                               ATTRIBUTES  OF  PART
X                 30 NPRTA  FOR  THOSE  PARTS  NOT  SHOWN  EQUALS  ONE
X                                 PART     30 NPRTA
X                                   *         *
 X                                 N       NPRTA(N)
  X               FOR EACH PRT N, WITH (NPRTA(N)) GR(1)
X
X
X
X                                      ATTRIBUTES  OF  DUMMY  ENTITY
X                               UPLOAD              DOWNLOAD            SERVICE
X                 34 NTEAM         *                   *                   *
```

```
                                NTEAM(1)          NTEAM(2)          NTEAM(
              79 TIMET          .******           .******           .******
                                TIMET(1)          TIMET(2)          TIMET(
                               AIR ALERT         GND.ALERT          TRAININ
              65 MAXLT          .******           .******           .******
                             MAXLT(1)          MAXLT(2)          MAXLT(3)
        DOUBLE  SUBSCRIPTED  VARIABLES
                                                    ATTRIBUTES  OF  SHOP
                                                  38 NMASD
              SHOP                SHIFT1          SHIFT2          SHIFT3
                *                   *               *               *
                M                 NMASD(M,1)      NMASD(M,2)      NMASD(M,3)
              FOR EACH SHOP M
        DOUBLE  SUBSCRIPTED  ATTRIBUTES  OF  DUMMY  ENTITY
                                        76 SHPNO
              UPLOAD        *     *     *     *     *           *
SHPNO(1,1) SHPNO(1,2) SHPNO(1,3) SHPNO(1,4) SHPNO(1,5) NOMN(1,1) N
                                                          SKLL(1,3
              DOWNLOAD      *     *     *     *     *           *
SHPNO(2,1) SHPNO(2,2) SHPNO(2,3) SHPNO(2,4) SHPNO(2,5) NOMN(2,1) N
                                                          SKLL(2,3
              SERVICE       *     *                           *
                       SHPNO(3,1) SHPNO(3,2)             NOMN(3,1) NO
                                              INITIALIZATION  VARIABLES  -
        ZERO  SUBSCRIPTED  VARIABLES
              4  --- 2
              5  --- 3
              35 SFTNO
              40 FLAG
              43 NAOCP
              44 NAOCM
              45 NACMN
              50 WHERE
              51 ENDSH
              71 FSUN
                                              SINGLE  SUBSCRIPTED  VAR
           ATTRIBUTES  OF  AIRCRAFT                ATTRIBUTES  OF  SH
              8  ENDSE                              23 NWIP
              9  TCURS                             27 FWIP
              10 TMNXS                             27 LWIP
              11 TYFLS                             32 NREQ
              11 TYNXS                             39 OVTMH
              11 PFLAG                             56 FQREP
              14 NOOSM                             56 LQREP
              14 NREDX                             57 FRIP
              15 PREFN                             57 LRIP
              16 NOPTM                             63 FMALM
              18 SENOO                             63 LMALM
              18 SENON                             64 NMENA
              46 LTP                               67 NMALM
              52 NOMNM                             68 NRIP
              53 NOMEM
              66 IDYCL
              66 ISECL
              74 TMFLS
```

```
X            DOUBLE  SUBSCRIPTED  VARIABLES
X              ATTRIBUTES  OF  AIRCR FT  AND  OF  SORTIE  NUMBER  NEW  O
X                  12 NPREM
X                  13 SELEN
X                  24 FMLFN
X                  49 NGAMN
X                  69 LMLFN
X                  73 NOPSM
                              END
                                                                        X
BLES  -  RUN NO.  *                                                    13
         RUN
                                                                        2
                  47 KORE          *
                                  KORE
                  48 TACTM         *
                                  TACTM
                  55 OVLAP        .******
                                  OVLAP
                  70 LACST         *
                                  LACST
                  72 TMPRT        .******
                                  TMPRT
                  80 NACWW         *
                                  NACWW
                  81 RUN           *                                     5
                                    RUN
                                                                        2
                                                                        1

5 WEPST
  *
WEPST(I)                                                                X
                                                                       1X
                                                                        X
                                                                        X
                                                                        X
                                                                        X
                                                                        X
                                                                        X
                                                                        X
                                                                        X
                                                                       1
                                                                       1
                                                                       1

3)                                                                     1

3)
G
                                                                        X
                                                                        X
                                                                       2X
 AND  SHIFT  NUMBER                                                    2
                  61 NMASE
       SHIFT1      SHIFT2       SHIFT3                                 1
```

```
        *             *             *
      NMASE(M,1)  NMASE(M,2)  NMASE(M,3)

 77 NOMN                                  78 SKLL
*     *     *     *             *     *     *     *     *
OMN(1,2) NOMN(1,3) NOMN(1,4) NOMN(1,5) SKLL(1,1) SKLL(1,2)
) SKLL(1,4) SKLL(1,5)
*     *     *     *             *     *     *     *     *
OMN(2,2) NOMN(2,3) NOMN(2,4) NOMN(2,5) SKLL(2,1) SKLL(2,2)
) SKLL(2,4) SKLL(2,3)
*                               *     *
MN(3,2)                     SKLL(3,1) SKLL(3,2)
INITIALLY  SET  TO ZERO
```

```
IABLES
OP                ATTRIBUTES  OF  PART
                     29 FMALP
                     29 LMALP
                     30 NCANB
                     30 NMALP

                  ATTRIBUTE  OF  DUMMY  ENTITY
                     62 MISSD
```

```
R  OLD
```

END

```
C
      ENDOG EVENT LTPRE
C                     LATEST TIME TO   -FLIGHT
      LET JJ = 0
      LET I = TLNO(LTPRE)
      LET LTP(I) = 0
C                     NO ACTION IF A/C NOT IN POSTFLT MAINT FROM PREV-
C                     IOUS SORTIE
      IF (CLAS(I)) NE(8), GO TO 10
      LET JJ = 1
      GO TO 20
   10 IF (CLAS(I)) LE (3), GO TO 20
      LET CI = 1
      GO TO 100
   20 IF (TYMXS(I)) NE (0), GO TO 30
      LET CI = 1
      GO TO 100
C                     STOP MAINT.IF THERE ARE NO CRITICAL MALFUNCTIONS
   30 CALL STOMT(I,1,*CI)
C                     IF NO CRITICAL MALFUNCTIONS 'START NEXT SORTIE'
      IF(CI)EQ(1),GO TO 100
      CALL STMXS(I)
      IF(JJ) NE(1), GO TO 100
      LET LTP(I) = 99
      LET JJ = 0
  100 DESTROY LTPRE
      CALL OUT(37,I,CLAS(I),CI,0)
  101 RETURN
      END
```

```
C
      SUBROUTINE MTCE(L,NN)
C                     MAINTENANCE SUBROUTINE.  CHECKS TO SEE IF PARTS AND
C                     MEN ARE AVAILABLE FOR ALL THE REQUIREMENTS
C                     OF THE MALFUNCTION L. IF SO IT ALLOCATES THE
C                     PARTS AND MEN TO L AND SHIPS THE REPARABLE,
C                     IF APPROPRIATE, TO THE SHOP
      LET NC = 0
      LET NN = 0
      LET N = PART(L)
      LET I = TLNO(L)
      LET KK = DISCV(L)
      LET PI = 1.0
      LET MI = 1
      LET NPR  = 0
      LET IDELY = 0
      CALL PTYMR(L,M)
C                           1. ANALYSIS OF PART AVAILABILITY
C                     TEST 'NO PART NEEDED' (N=0) OR 'CALLED BY CANAB'
C                     (SL2 IS ON) OR  PART AVAILABLE.
```

```
      IF (N) EQ (0), GO TO 50
   11 IF (NPRTA(N)) GR (0), GO TO 45                                    C
      IF (CANAD(L)) EQ(1), GO TO 50
C                    PART NOT AVAILABLE, SET P= 0.0                    C
C                    UPDATE PART STATISTICS. CANABALIZE IF CRITICAL    C
   12 LET PI = 0.0
      IF (CLSSP(L)) EQ (1),GO TO 50
      CALL PTYPR (L,N)
      FILE L IN MALP(N)
      LET CLSSP(L) = 1
      LET NMALP(N) = NMALP(N) + 1
      LET NOPTM(I) = NOPTM(I) + 1
      IF (CRIT(L)) EQ (0), GO TO 50
      CREATE CANAB
      STORE CANAB IN CANAR(L)
      LET MFN(CANAB)  = L
      CAUSE CANAB AT MAXIF(TIME,TMNXS(I)-2.0*REPTM(L) - .25)
   45 IF (CANAD(L)) EQ(0), GO TO 50                                     C
      LET REPTM(L) = REPTM(L) / 0.6
      LET CANAD(L) = 0
C                          II. ANALYSIS OF MANPOWER AVAILABILITY
   50 DO TO 90,FOR EACH X OF REQS(L)
      LET SUB(X) = 0
      IF (SKILL(X)) EQ (0),LET Q  = X                                   C
      LET M=SHOPN(X)
      IF(M) EQ(0), GO TO 109
C                    IF LABOR A AILABLE DESTROY CARD (IN MALM) IF ANY
      IF(NMENA(M)) LS (NOMEN(X)),    GO TO 73
      CALL RCRDM(L,M)                                                   C
      GO TO 90                                                          C
C                    IF LABOR NOT AVAILABLE TRY TO SUBSTITUTE
C                    SKILLED FOR UNSKILLED
   73 IF(SKILL(X)    EQ (0), GO TO 78
      IF (NMENA(M) - NOMEN(X)+NMENA(M-1) -NOMEN(Q)) LS(0), GO TO 78     C
      LET SUB(X) = NOMEN(X) - NMENA(M)
      FIND FIRST,FOR EACH K OF REQS(L),WITH(SHOPN(K))EQ(M-1),IF NONE,
     CCALL ERR( 4)
      LET SUB(K) = -SUB(X)
      CALL RCRDM(L,M)
      GO TO 90
C                    IF SKILL SUBSTITUTION IMPOSSIBLE, TRY PRE-EMPTION
C    IF MALFN IS CRITICAL
   78 IF (CRIT(L)) EQ (0), GO TO 79
      CALL PREMP(L,M,X)
      IF(SUB(X)) LS (98) , GO TO 79
      CALL RCRDM(L,M)
      GO TO 90
   79 LET MI = 0
C                    NO LABOR AVAILABLE--NO HOW.
C                    CREATE AND FILE WAITING CARD(S)
   80 DO TO 81,FOR EACH Z OF QUES(L), WITH (SHOPN(Z)) EQ (M)
      GO TO 90
   81 REPEAT 80
      CALL FCRDM(L,M)
```

```
   90 REPEAT 50
C                          III.  IF MEN AND PARTS WERE FOUND TO BE
                           AVAILABLE FOR ALL REQUIREMENTS OF L  THEN
C                          DO THE ACTUAL ALLOCATION OF MEN
C                     FOR EACH REQUIREMENT OF L
      IF (MI) EQ (0), GO TO 135
  109 IF (PI) EQ (0), GO TO 100
      LET NN = 1
      LET LK = CANAR(L)
      IF (LK) EQ (0), GO TO 110
      CANCEL CANAB CALLED LK
      DESTROY CANAB CALLED LK
      LET CANAR(L) = 0
  110 DO TO 115,FOR EACH B OF REQS(L)
      LET M = SHOPN(B)
      IF(M) EQ(0), GO TO 116
      CALL FCRDW(L,M)
C                     DO PRE-EMPTION IF THIS CALLED FOR (SUB=98)
      IF (SUB(B)) LS(98) ,  GO TO  112
      CALL DOPRE(L,M,B)
      LET SUB(B) = 0
      LET IDELY = 1
      LET NP = 1
C                     REDUCE NUMBER OF MEN AVAILABLE IN SHOP M
  112 LET NMENA(M) = NMENA(M) - NOMEN(B) + SUB(B)
      CALL OUT(3,M,NMENA(M),SUB(B),NP)
      LET NP = 0
  115 REPEAT 110
C                     CALCULATE 'FINISH TIME' (INCLUDE PREEMPT DELAY,
C                     PREDY, IF ANY PREEMPTIONS, IDELY=1
  116 LET REPTI = REPTM(L)
      IF(IDELY) EQ (1), LET REPTI  =  REPTM(L) + PREDY
      CALL RUSH(L,REPTI)
      LET FINTM(L) = TIME + REPTI
C                     CREATE AND CAUSE END OF MAINTENANCE (MTN)
      CREATE MTN
      LET MFN(MTN) = L
      IF(KK) GR(1), GO TO 117
      LET NOMEM(I) = NOMEM(I) + 1
  117 IF(KK) EQ(6), LET NOMEM(I) = NOMEM(I) + 1
      LET PCANB(MTN) = 0
      STORE MTN IN MTNR(L)
      CAUSE MTN AT FINTM(L)
C                     NOTE IF THIS IS CANABALIZATION (START OF A 'REMOVE
C                     ONLY' ACTION, AND RETURN
      IF (CANAD(L)) EQ(0), GO TO 119
  118 LET PCANB(MTN) =  1
      LET NCANB(N) = NCANB(N) + 1
      LET NC = 1
      LET NOMEM(I) = NOMEM(I) - 1
      GO TO 1000
C                     IF PART NOT REQUIRED, RETURN
  119 IF (N) EQ(0), GO TO 100
C                     PART REQUIRED REDUCE PART AVAILABILITY BY ONE
```

```
      LET PART(L) = 0                                                    C
  120 LET NPRTA(N) = NPRTA(N) - 1                                        C
      IF(KK) EQ(2), GO TO 1000
C                   IF REPAIRABLE THIS STATION SHIP TO SHOP (CAUSE REPAR)
      IF (NRTS(L)) EQ (1), GO TO 130
      LET NPR  = 1
      CREATE REPAR CALLED R
      LET PART(R) = N                                                    C
      LET MREPP(R) = MREPP(L)
      LET TREPP(R) = TREPP(L)
      LET REPLT(R) = 0.6 * REPTM(L)
      CAUSE REPAR CALLED R AT TIME + REPTI + SHPDY
      GO TO 100
C                   IF NOT REP. THIS STATION CAUSE PART ARIVAL FROM DEPOT  C
  130 CREATE PTARR                                                       C
      LET PART(PTARR) = N
      LET REPLT(PTARR) = 0.6*REPTM(L)                                    C
      CAUSE PTARR AT TIME + DELAC
      GO TO 100
C                   MEN NOT AVAILABLE (MI=0),IF NOT A REPLACE ACTION
C                   (DISCV NOT 2) INCREASE 'NO.MALFUNCTION AWAITING MEN'
  135 IF(KK)       NE(2),LET NOMNM(I)= NOMNM(I) + 1
C     CHECK IF ENOUGH MEN AVAILABLE TO DO JOB SOMETIME
      LET IJK = 0                                                        C
  137 DO TO 140, FOR EACH MM OF REQS(L)
      LET M = SHOPN(MM)
      LET MEN = NOMEN (MM)
      LET MAX = XMAXOF(NMASD(M,1), NMASD(M,2), NMASD(M,3))
      IF (MEN) LE (MAX), GO TO 140
      IF (SKILL(MM)) EQ (0), GO TO 138
C     NOT ENOUGH UNSKILLED - CHECK IF SUM IS EXECEEDED                   C
      FIND MXSUM = MAX OF (NMASD(M,MI) + NMASD(M-1,MI)), FOR MI=(1)(3)
      IF (MEN + NOMEN(PREQS(MM))) LE (MXSUM), GO TO 140
      LET MAX = MXSUM - NOMEN(PREQS(MM))                                 C
C     NOT ENOUGH MEN EVER
  138 LET EXTRA = FLOATF(NOMEN(MM) - MAX)*REPTM(L)
      CALL OUT(7, M, EXTRA, 0,0)
      LET NOMEN(MM) = MAX
      IF (IJK) EQ (1), GO TO 140
      CREATE CLMTC
      LET MEN(CLMTC) = L
      LET MAN(CLMTC) = 1
      CAUSE CLMTC AT TIME                                                C
      LET IJK = 1                                                        C
  140 REPEAT 137
C                   IF NOT A REPLACE ACTION, CLASSIFY AIRCRAFT
  100 IF (KK) NE(2),   CALL CLASS(I)
X1000 IF (SENSE LIGHT 1) 1001,1001
 1001 CALL OUT(4,I,NOMEM(I),NOMNM(I),NOPTM(I))
      CALL OUT(4,N,NC,NPRTA(N),NMALP(N))
      CALL OUT(4,NCANB(N),MI,KK,NREDX(I))
      RETURN
      END
```

```
C
      ENDOG EVENT MTN
C                     END OF MAINTENANCE
      LET L = MFN(MTN)
      LET I = TLNO(L)
      LET K = DISCV(L)
      LET KT = CRIT(L)
      LET OVTF = STOVT(L)
C                     REMOVE MALFN FROM WIP
    6 DO TO 7, FOR EACH Y OF REQS (L)
      LET M = SHOPN(Y)
      IF(M) EQ(0), GO TO 15
      CALL RCRDW(L,M)
    7 REPEAT 6
C     IF MALFN WAS COMPLETED ON OVERTIME,
C                     DON'T RETURN MEN TO SHOP
    8 IF (OVTF) GR (0.), GO TO 28
C                     RETURN MEN TO SHOP
   10 DO TO 12,FOR EACH X OF REQS(L)
      LET MM = SHOPN(X)
      LET NMENA(MM) = NMENA(MM) + NOMEN(X)-SUB(X)
      CALL OUT(5,MM,NMENA(MM),SUB(X),0)
   12 REPEAT 10
      GO TO 15
C                     ACCUMULATE OVERTIME
   28 DO TO 29,FOR EACH X OF REQS(L)
      LET M = SHOPN(X)
      LET OVTMH = (TIME-STOVT(L))*(FLOATF(NOMEN(X)-SUB(X)))
      CALL OUT(39,M,OVTMH,0,0)
   29 REPEAT 28
      LET STOVT(L) = 0.
C                     IF CANABALIZATION OR OVERTIME, DO NOT REASIGN MEN
   15 IF (PCANB(MTN)) EQ(1), GO TO 27
      IF (OVTF) GR (0.), GO TO 30
C                     ATTEMPT TO USE AVAILABLE MEN
   16 DO TO 26, FOR EACH Y OF REQS(L)
      LET M = SHOPN(Y)
      IF(M) EQ(0), GO TO 30
      CALL USEMN(M)
      IF(SKILL(Y)) EQ(1), GO TO 26
      IF(SHOPN(SREQS(Y)) - 1) EQ(M), GO TO 26
      CALL USEMN(M+1)
   26 REPEAT 16
C                     IF REGULAR MALFN,REMOVE FROM MLFN,DESTROY MALFN AND
C                     DECREASE OUTSTANDING MALFNS OF A/C
   30 IF (K) EQ(6), GO TO 35
      IF (K) GR (1), GO TO 310
   35 IF(CRIT(L)) EQ(1), LET NREDX(I) = NREDX(I) -1
      IF(NREDX(I)) LS(0), CALL ERR(6)                                    T
      CALL RDM(I,SENOO(I),L)
      LET NOOSM(I) = NOOSM(I) - 1
      LET NOMEM(I) = NOMEM(I) - 1
      IF (NOOSM(I)) LS(0), CALL ERR( 6)                                  T
      IF (PREFN(I)) EQ (10), GO TO 45
      IF (NOOSM(I)) EQ(0), GO TO 40
```

```
C                   IF STILL OUTSTANDING MALS-CLASSIFY A/C AND RETURN
   41 CALL CLASS(I)
      GO TO 100                                                          C
C                   STILL IN PREFLIGHT
   45 IF(NOOSM(I)) EQ(0), GO TO 46
      CALL CLASS(I)
      GO TO 100                                                          C
   46 LET CLAS(I) = 10                                                   C
      GO TO 100
C                   TAKE APPROPRIATE ACTION DEPENDING ON 'WHERE
C                   MALFN DISC'
   40 LET NACMN = NACMN - 1
      IF (K) EQ(0), GO TO 52
      GO TO (70,97,97,97,97,42),K
   42 IF (ENDSE(I)) GR (TIME), GO TO 43
C        GROUND ALERT ALREADY FINISHED
      CALL ENDAT(I)
      GO TO 100
   43 LET CLAS(I) = 6
      GO TO 100
C             END OF PREFLIGHT MALFN. IF NEW SORTIE READ IN (PFLAG(I)=1)
C             START NEW SORTIE, OTHERWISE CAUSE WAIT FOR SORTIE
   52 IF (PFLAG(I)) EQ (1), CALL ERR(21)
      CREATE WTSOR
      LET TLNO(WTSOR) = I
      IF (ISECL(I)) EQ (0), GO TO 67
      CAUSE WTSOR AT TIME
      GO TO 100
   67 CAUSE WTSOR AT MAX1F(TIME,TMNXS(I))
      LET CLAS(I) = 9
      LET KL = CLSEE(I)
      IF (KL) EQ (0), CALL ERR(33)
      CANCEL CLSE CALLED KL
      DESTROY CLSE CALLED KL
      LET CLSEE(I) = 0
      GO TO 100
C                   END OF POSTFLT MAINT-ATTEMPT TO START NEXT SORTIE
   70 CALL STNXS(I)
      GO TO 100
C                   NOT REGULAR MALFUNCTION
X 310 SENSE LIGHT 1
      CALL RDM(1,SENOO(I),L)
      GO TO(97,100,330,340,350),K
C                   2=REPLACE, 3=UPLOAD, 4=DOWNLOAD, 5=SERVICE
C                   END OF UPLOAD, START PREFLIGHT
  330 CALL PREFT(I)
      GO TO 100
C                   END OF DOWNLOAD, START NEXT SORTIE
X 340 SENSE LIGHT 1
      GO TO 70
C                   END  OF SERVICE -IF CURRENT SORTIE IS AIR ALERT OR
C                   TRAINING, START A POSTFLIGHT
  350 IF (TCURS(I)) EQ (0), GO TO 352
      CALL SPOFL(I)
```

```
      GO TO 100
  352 IF (TYNXS(I)) GE(0), CALL ERR( 7)                                  T
C                   GROUND ALERT TO TRAINING-START DOWNLOAD
      IF(I) GE(NOWEP), GO TO 340
      CALL STEAM(I,2)
      GO TO 100
C                   END OF A 'REMOVE CANABALIZATION'-START A REMOVE
C                   AND REPLACE AND RETURN
   27 LET REPTM(L) = REPTM(L)/0.6
      LET N = PART(L)
      LET NPRTA(N) = NPRTA(N) + 1
      LET NOPTM(I) = NOPTM(I) - 1
      REMOVE L FROM MALP(N)
      LET CLSSP(L) = 0
      CALL MTCE(L, NN)
  100 DESTROY MTN
      CALL OUT(6,I,NOMNM(I),NOMEM(I),NOPTM(I))
      CALL OUT(6,CLAS(I),NREDX(I),K,KT)
      RETURN
   97 CALL ERR(52)
      END
C
      SUBROUTINE OUT(A,B,C,D,E)
      DIMENSION X(1002), J(1)
X     EQUIVALENCE(X,J)
      LET N= WHERE
      LET X(N+1) = A
      LET X(N+2) = B
      LET X(N+3) = C
      LET X(N+4) = D
      LET X(N+5) = E
      LET X(N+6) = TIME
      LET WHERE = N + 6
      IF (J(N+1)) EQ (38), GO TO 10
      IF (WHERE) NE (1002), GO TO 20
      LET WHERE = 0
X     WRITE TAPE 10,(X(I),I=1,1002)
      GO TO 20
   10 LET J(997) = 38
X     WRITE TAPE 10,(X(I), I = 1,1002)
      IF (J(N+2)) EQ (9999), GO TO 15
X     END FILE 10
      REWIND TAPE 10
   15 CALL EXIT
20    RETURN
      END
```

```
C
      FUNCTION PCARD(CARD)
C                  SETS PRIORITY OF CARD EQUAL TO PRIORITY OF
C                  CORRESPONDING MALFN.
      LET PCARD = PTYM(MLFTN(CARD))
      RETURN
      END




C
      ENDOG EVENT PDLAY                                                    1
C                  END OF POSTFLIGHT DELAY
      LET I = TLNO(PDLAY)                                                  1
      IF(LTP(I)) NE(99), GO TO 10
      LET LTP(I) = 0
      GO TO 100
   10 LET NOMEM(I) =0                                                      1
      LET NOMNM(I) =0                                                      1
      LET NOPTM(I) =0                                                      1
C                  FIND LONGEST MALFUNCTION
      LET JJ = SENOO(I)
      FIND BIGTM(I) = MAX OF REPTM(L), FOR EACH L OF MLFN(JJ,I),
     CWHERE BIG(I) IS THE LONGEST MALFN
      LET BIGTM(I) = BIGTM(I) + TIME
C                  ATTEMPT TO START MAINT ON ALL POSTFLIGHT MALFNS
      LET FG(J) = 0, FOR EACH J OF MLFN(JJ,I)
   20 FIND BIGK = MAX OF REPTM(K), FOR EACH K OF MLFN(JJ,I), WITH
     C(FG(K)) EQ (0), WHERE L, IF NONE, GO TO 100
      LET FG(L) = 1
      IF(DISCV(L))EQ(0),CALL ERR( 8)
      LET N = PART(L)
      CALL MTCE(L,NN)
      CALL OUT(15,N,CLSSP(L),0,0)
   30 GO TO 20
  100 DESTROY PDLAY                                                        1
      RETURN                                                               1
      END                                                                  1




C
      ENDOG EVENT POSFL
C                  END OF POSTFLIGHT-DISCOVER MALFUNCTIONS
      LET I = TLNO(POSFL)
      LET J = SENOO(I)
      LET NOOSM(I) = NPOSM(J,I)
      IF (NREDX(I)) NE(0), CALL ERR(20)                                    1
   20 DO TO 30, FOR EACH L OF MLFN(J,I)
      IF(CRIT(L)) EQ(1), LET NREDX(I) = NREDX(I) + 1
   30 REPEAT 20
```

```
C                   START POSTFLT DELAY PRIOR TO MAINT.IF ANY MALFNS
      IF (NOOSM(I)) EQ(0), GO TO 355
      CALL DELAY(*X)
      CREATE PDLAY
      LET TLNO(PDLAY) = I
      CAUSE PDLAY AT TIME + X
      LET CLAS(I) = 8
      GO TO 100
C                   NO MALS-DOWNLOAD IF NECESSARY,OTHERWISE ATTEMPT TO
C                   START NEXT SORTIE
  355 IF(I) GE(NOWEP), GO TO 70
      IF (TCURS(I))EQ (-1), GO TO 70
      IF (TYNXS(I))GE (0), GO TO 70
      CALL STEAM(I,2)
      GO TO 100
X  70 SENSE LIGHT 1
      CALL STNXS(I)
  100 DESTROY POSFL
      CALL OUT(16,I,NOOSM(I),NREDX(I),CLAS(I))
      RETURN
      END




C
      ENDOG EVENT PREFL
C                   END OF PREFLIGHT
      LET IX= TLNO(PREFL)
      LET PREFN(IX) = 1
      DESTROY PREFL
C                   ATTEMPT TO START MAINT ON ALL PREFLIGHT MALFUNCTIONS
   50 DO TO 55,FOR EACH L OF MLFN(SENOO(IX),IX),WITH(DISCV(L))EQ(0),
     C AND (TDISC(L))EQ(0)
      LET NOOSM(IX) = NOOSM(IX) + 1
      IF(CRIT(L)) EQ(1), LET NREDX(IX) = NREDX(IX) + 1
      LET N = PART(L)
      CALL MTCE(L,NN)
      CALL OUT(17,N,CLSSP(L),0,0)
   55 REPEAT 50
      IF(NOOSM(IX))GR(0), GO TO 100
C                   IF NO OUTSTANDING MALFNS,CAUSE WTSOR AND RETURN
      CREATE WTSOR
      LET TLNO(WTSOR) = IX
      CAUSE WTSOR AT MAXIF(TIME,TMNXS(IX))
      LET KL = CLSEE(IX)
      IF (KL) EQ (0), CALL ERR(34)
      CANCEL CLSE CALLED KL
      DESTROY CLSE CALLED KL
      LET CLSEE(IX) = 0
      LET CLAS(IX) = 9
  100 CALL OUT(18,IX,NOOSM(IX),CLAS(IX),NREDX(IX))
      RETURN
      END
```

```
C                                                                       C
C                                                                       C
      SUBROUTINE PREFT(I)                                               C
C                     SUBROUTINE TO START A PREFLIGHT                   C
      LET PFLAG(I)=0                                                    1
C                     IF SORTIE HAS BEEN CANCELLED, FILE A/C IN STANDING
C                     AND RETURN
      IF(ISECL(I))  EQ(0), GO TO 30
      LET ISECL(I)=0
      FILE I IN ACST                                                    C
      LET NACST = NACST + 1                                             C
      LET CLAS(I)=5
      GO TO 100                                                         1
C                     IF NOT TOO LATE TO START SORTIE,CAUSE END OF PREFLITE
C                     AND CANCEL LTPRE EVENT                            C
   30 LET X = TIME - TMNXS(I) - MAXLT(TYNXS(I) +2) + TMPRT              C
      IF (X) GR (0 ), GO TO 80
      CREATE PREFL                                                      1
      LET TLNO(PREFL) = I                                               1
      CAUSE PREFL AT TIME + TMPRT                                       1
      LET PREFN(I) = 10
      LET CLAS(I) = 10                                                  1
      IF (LTP(I)) EQ(0), GO TO 72
      CANCEL LTPRE CALLED LTP(I)
      DESTROY LTPRE CALLED LTP(I)
      LET LTP(I) = 0
C                     CAUSE 'CALL MAINT' FOR ALL MALFNS DISCOVERED DURING
C                     PREFLIGHT
   72 DO TO 77,FOR EACH L OF MLFN(SENOC(I),I),WITH (DISCV(L)) EQ (0),AND
     C(TDISC(L)) GR (0)
      CREATE CLMTC                                                      C
      LET MFN(CLMTC) = L
      CAUSE CLMTC AT TIME +(FLOATF(TDISC(L))/3.0)*TMPRT
   77 REPEAT 72
      GO TO 100                                                         1
C                     TOO LATE - FILE AIRCRAFT IN STANDING AND CANCL SORTIE
   80 FILE I IN ACST                                                    1
      LET NACST = NACST + 1
      LET KL = CLSEE(I)
      IF (KL) EQ (0), CALL ERR(35)                                      C
      CANCEL CLSE CALLED KL
      DESTROY CLSE CALLED KL                                            C
      LET CLSEE(I) = 0
      LET CLAS(I) = 5                                                   1 C
      CALL CANCL(I)                                                     1
  100 CALL OUT(24,I,CLAS(I),NACST,0)                                    C
      RETURN                                                            1
      END                                                               1
```

```
C
      SUBROUTINE PREMP(L,M,X)
C                     SUBROUTINE TO SEE IF PRE-EMPTION IS POSSIBLE
C                     IF STOPPING BENCH REPAIRS IS ENOUGH, NOTE PRE-EMPT
C                     FROM BENCH ONLY O.K.(SUB=98) AND RETURN
      LET K = NMENA(M)
      LET K = K + 1, FOR EACH Y OF RIP(M), WITH(SHFLG(Y)) NE(2)
      IF (K) LS (NOMEN(X)), GO TO 10
      LET SUB(X) = 98
      GO TO 100
C                     IF NO FLIGHT LINE MALFNS IN PROCESS, NOTE PRE-EMPT
C                     NOT O.K. AND RETURN
   10 IF (NWIP(M)) GR (0), GO TO 20
   11 LET SUB(X) = 0
      GO TO 100
C                     TRY PRE-EMPTION FROM FLIGHT LINE MALFUNCTIONS
C                UNLESS MALFUNCTION IS ON OVERTIME OR IS A CANABALIZATION
   20 LET I = LWIP(M)
   22 IF (PCARD(I)) LE (PTYM(L)), GO TO 11
      LET LL = MLFTN(I)
      IF (DISCV(LL)) GE(2), GO TO 30
      IF (STOVT(LL)) GR (0.), GO TO 30
      IF (CANAD(LL)) GR(0), GO TO 30
      FIND FIRST , FOR EACH Y OF REQS(LL),WITH (SHOPN(Y)) EQ(M), IF
     CNONE, CALL ERR(16)
      LET K = NOMEN(Y) - SUB(Y) + K
      IF (NOMEN(X)) LE (K),GO TO 40
   30 LET J = PWIP(I)
      IF (J) EQ (0), GO TO 11
      LET I = J
      GO TO 22
C                     NOTE PRE-EMPT FROM BENCH AND FLIGHT LINE O.K.(SUB=99)
   40 LET SUB(X) = 99
  100 RETURN
      END




C
      ENDOG EVENT PTARR                                                    1
C                     END OF PART ARRIVAL FROM DEPOT
      LET N=PART(PTARR)                                                    1
C                     INCREASE BASE STOCK BY ONE
      LET NPRTA(N)=NPRTA(N)+1
C                     ATTEMPT TO USE PART ON ANY WAITING MALFUNCTIONS
   20 CALL USEPT(N,PTARR)
  100 DESTROY PTARR
      RETURN                                                               1
      END                                                                  1
```

```
      ENDOG EVENT PTREP
C                     END OF BENCH REPAIR                                    C
C                     REMOVE REPARABLE FROM IN PROCESS AND INCREASE 'NMENA'  C
      LET M = MREPP(PTREP)
      REMOVE PTREP FROM RIP(M)
      LET N = PART(PTREP)
      IF(SHFLG(PTREP)) EQ(0), LET NMENA(M)=NMENA(M) + 1
      LET NRIP(M)  = NRIP(M) -1
      LET NPRTA(N) = NPRTA(N) + 1
   10 CALL USEPT(N,PTREP)
C                     ATTEMPT TO USE NEWLY FREED MAN ON FLIGHT LINE
      CALL USEMN(M)
  100 DESTROY REPAR CALLED PTREP
      CALL OUT(19,M,NMENA(M),NRIP(M),N)
      RETURN
      END
```

```
C                                                                            C
C                                                                            C
C
      SUBROUTINE PTYMR(L,M)
C                     SETS PRIORITY OF MALFUNCTION IN MALM
      IF (DISCV(L)) NE (6), GO TO 10
      LET PTYM(L) = 0
      GO TO 100
   10 LET PTYM(L) =TMNXS(TLNO(L))
  100 RETURN
      END
```

```
C                                                                            C
      SUBROUTINE PTYPR(L,N)                                                  1
C                     SETS PRIORITY OF MALFUNCTION IN MALP                   C
      IF (DISCV(L)) NE (6), GO TO 10                                         C
      LET PTYP(L) = 0                                                        C
      GO TO 100
   10 LET PTYP(L) = TMNXS(TLNO(L));
  100 RETURN                                                                 1
      END                                                                    1
```

```
C
      SUBROUTINE PTYRR(REPAR)                                                X
C                     SETS PRIORITY OF REPARABLE IN RIP
      LET PTYR(REPAR) = TIME
      RETURN
      END
```

```
      SUBROUTINE RCRDM(L,M)
C                     SUBROUTINE TO REMOVE AND DESTROY CARD FROM MALM AND
C                     QUES, IF ANY
      FIND FIRST, FOR EACH Y OF QUES(L), WITH (SHOPN(Y)) EQ (M),
     XIF NONE,  RETURN
      REMOVE Y FROM QUES(L)
      REMOVE Y FROM MALM(M)
      LET I = TLNO(L)
      DESTROY CARD CALLED Y
      LET NMALM(M) = NMALM(M)- 1
      CALL OUT(2,M,NMALM(M),I,NOMNM(I))
      RETURN
      END




C
      SUBROUTINE RCRDW(L,M)
C                     SUBROUTINE TO REMOVE AND DESTROY CARD IN WIP
C                     (ASSUMES CARD IS IN WIP)
      FIND FIRST, FOR EACH CARD OF WIP(M), WITH (MLFTN(CARD)) EQ(L), IF
     CNONE, CALL ERR(17)
      REMOVE CARD FROM WIP(M)
      DESTROY CARD
      LET NWIP(M)=NWIP(M)-1
      CALL OUT(20,M,NWIP(M),0,0)
      RETURN
      END




C
      SUBROUTINE RDM(I,J,L)
C                     SUBROUTINE TO REMOVE AND DESTROY THE MALFUNCTION L
C                     AND ITS MREQS
C                     I=AIRCRAFT,  J=SENOO(I) OR SENON(I)
      LET LK = CANAR(L)
      IF (LK) EQ (0), GO TO 5
      CANCEL CANAB CALLED LK
      DESTROY CANAB CALLED LK
    5 IF QUES(L) IS NOT EMPTY, RETURN
      IF (CLSSP(L)) NE (0), RETURN
    8 IF REQS(L) IS EMPTY, GO TO 10
      REMOVE FIRST MREQ FROM REQS(L)
      DESTROY MREQ
      GO TO 8
X   10 IF (SENSE LIGHT 1) 30,20
    20 REMOVE L FROM MLFN(J,I)
    30 DESTROY MALFN CALLED L
      RETURN
      END
```

```
C                                                                       C
      ENDOG EVENT REPAR
C                     END OF SHIPMENT TO SHOP
      LET M = MREPP(REPAR)
C                     MEN AVAILABLE, START AND CAUSE END OF BENCH REPAIR
      IF (NMENA(M)) EQ (0), GO TO 40
      IF QREP(M) IS NOT EMPTY, CALL ERR( 9)                             T
   30 CALL CREPT(REPAR)
      GO TO 100
C                     NO MEN AVAILABLE FILE REPARABLE IN QUE
   40 CALL PTYRR(REPAR)
      FILE REPAR IN QREP(M)                                             C
      LET NQREP(M) = NQREP(M) + 1
  100 CALL OUT(21,M,NQREP(M),NMENA(M),0)
      RETURN                                                            C
      END

                                                                        1(

                                                                        C

C
      FUNCTION RMAXV(J)                                                 C
      LET I = TLNO(J)                                                   C
      FIND RMAXV = MAX OF REPTM(K), FOR EACH K OF MLFN(SENOO(I),I),      1(
     CWITH (DISCV(K)) EQ (DISCV(J)), IF NONE, LET RMAXV= REPTM(J)
      LET RMAXV = RMAXV - REPTM(J) + ENDSE(I)
      RETURN
      END

C
      SUBROUTINE RUSH(L,R)
      LET T = 0
      LET KJ = DISCV(L)                                                 C
      IF (KJ) GR (1), GO TO 100
      IF (KJ) EQ (1), LET T = TMPRT
      IF (TIME + R + T) LS (TMNXS(TLNO(L))), GO TO 100
      LET R = RSHP*R
      CALL OUT(10,KJ,R,0,0)
  100 RETURN
      END                                                               C
                                                                        C

                                                                        C
                                                                        C
                                                                        C
```

```
      ENDOG EVENT SHIFT
                     END OF SHIFT.  UPDATE SHIFT NUMBER
      LET FLAG = 1
      CALL OUT(31,SFTNO,0,0,0)
      IF (SFTNO) EQ (3), LET SFTNO =0
      LET SFTNO = SFTNO + 1
      LET IWKE = 0
      IF(XMODF(DPART(TIME),7)) EQ (FSAT), LET IWKE = 1
      IF(XMODF(DPART(TIME),7)) EQ (FSUN), LET IWKE = 1
      IF(SFTNO) EQ(3), GO TO 5
      LET ENDSH = TIME + 1./3.
      GO TO 102
    5 LET ENDSH = FLOATF(DPART(TIME)) + 1.0
                     DETERMINE IF WEEKEND OR WEEKDAY
  102 IF (XMODF(DPART(TIME),7)) EQ (FSAT), GO TO 103
      IF (XMODF(DPART(TIME),7)) NE (FSUN), GO TO 8
                     MAN ALL SHOPS WITH WEEKEND MANNING
  103 DO TO 1030, FOR EACH SHOP M
      LET NMENA(M) =NMASE(M,SFTNO)
 1030 LOOP
      GO TO 1031
                     MAN SHOPS WITH WEEKDAY MANNING
    8 DO TO 9,FOR EACH SHOP M
      LET NMENA(M) =NMASD(M,SFTNO)
    9 LOOP
                     STOP ALL WORK ON BENCH REPAIR UNLESS ITEM FLAGGED TO
                     CONTINUE PAST END OF SHIFT(SHFLG=0)
 1031 DO TO 107, FOR EACH SHOP M
      IF RIP(M) IS EMPTY, GO TO 107
      LET L1 = FRIP(M)
  104 LET L2 = SRIP(L1)
      IF (SHFLG(L1)) EQ(0), GO TO 105
      REMOVE L1 FROM RIP(M)
      LET NRIP(M) = NRIP(M) - 1
      FILE L1 IN GREP(M)
      LET NGREP(M) = NGREP(M) + 1
      LET TREPP(L1) = REPTM(L1) - TIME
  105 LET SHFLG(L1) = 2
      IF (L2) EQ(0), GO TO 107
      LET L1 = L2
      GO TO 104
  107 LOOP
C                    LOOK AT EACH MALFN IN PROCESS
   10 DO TO 50,FOR EACH SHOP M
      STORE FWIP(M) IN J1
   11 IF (J1) EQ (0), GO TO 50
      STORE SWIP(J1) IN J2
      LET L = MLFTN(J1)
C                    IF UPLOAD,DOWNLOAD,SERVICE,OR GROUND ALERT, GO TO
C                    CONTINUE ON OVERTIME
      IF(DISCV(L)) GR (2), GO TO 30
C                    OTHERWISE CHECK PREFLT OR POSTFLT MALFUNCTION
C                    IF WORK DOES NOT EXTEND TOO FAR INTO NEXT SHIFT,
C                    CONTINUE ON OVERTIME
      IF (FINTM(L) - TIME) LS (OVLAP), GO TO 30
```

```
C                   OTHERWISE, IF OTFLG=1, ATTEMPT TO RESTART MALFN WITH
C                   NEW MEN, IF NOT CRITICAL(OTFLG=0) TERMINATE MAINT.
      IF(OTFLG(L)) EQ (0),GO TO 20
C                   IF ENOUGH NEW MEN AVAILABLE, ASSIGN THEM, OTHERWISE
C                   CONTINUE ON OVERTIME
   12 DO TO 14,FOR EACH   X   OF REQS(L)
      IF (NMENA(SHOPN(X))) LS (NOMEN(X)),GO TO 30
   14 REPEAT 12
   17 DO TO 18,FOR EACH Y OF REQS(L)
      LET M = SHOPN(Y)
      LET NMENA(M) = NMENA(M) - NOMEN(Y)
      CALL OUT(36,M,NMENA(M),0,0)
      LET SUB(Y) =0
   18 REPEAT 17
      GO TO 40
C                   TERMINATE MAINTENANCE
   20 CALL TERM(L,0,3)
      GO TO 40
C                   CONTINUE ON OVERTIME
   30 IF (STOVT(L)) GR (0), GO TO 40
      LET STOVT(L) = TIME
   40 LET J1 = J2
      GO TO 11
   50 LOOP
C                   ATTEMPT TO ASSIGN REMAINING NEW MEN TO WAITING MALFNS
      DO TO 60, FOR EACH SHOP M
      CALL USEMN(M)
   60 LOOP
C                   CAUSE NEXT END OF SHIFT
      CAUSE SHIFT AT ENDSH
      LET FLAG = 0
      RETURN
      END
C
      ENDOG EVENT SORTE
C                   END OF SORTIE
      LET I = TLNO(SORTE)
C                   IF CURRENT SORTIE IS A TRAINING SORTIE OR AN AIR
C                   ALERT(-1 OR +1),START A SERVICE    AND RETURN
      IF (TCURS(I)) EQ (0),GO TO 20
      CALL STEAM(I,3)
      GO TO 100
C                   NOW ON GROUND ALERT--
   20 IF (NOOSM(I)) NE (0), GO TO 100
C          NO OUTSTANDING MALFNS - CALL END  ALERT
      CALL ENDAT(I)
  100 DESTROY SORTE
      CALL OUT(23,I,NACST,CLAS(I),TCURS(I),2)
      RETURN
      END
```

```
C
      EXOG EVENT SORTI
      SAVE
C                     READ TAIL NO. AND TYPE OF NEXT SORTI
      READ I,NTYNX
      FORMAT(I4,I2)
      IF (TNS) EQ (1), GO TO 2
C           NON-TAIL NUMBER SCHEDULING
      LET NT1 = 1
      IF (I) GE (NOWEP), LET NT1 = 2
      LET IX = 0
      LET IRWS = 0
      IF (NT1) EQ(2), GO TO 81
      IF (NTYNX) LS(0), GO TO 81
      LET IRWS = 1
   81 DO TO 83, FOR EACH II OF ACST
      LET NT2 = 1
      IF (II) GE (NOWEP), LET NT2 = 2
      IF (NT1) NE (NT2), GO TO 83
      IF (WEPST(II)) EQ(IRWS), GO TO 85
   83 REPEAT 81
C           NO A/C AVAILABLE WITH PROPER WEAPON STATUS -TRY OTHERS
      IF (NTYNX) LS (C), GO TO 84
      IF (IX) EQ(1), GO TO 84
      LET IX = 1
      IF (IRWS) EQ(1), LET IRWS = -1
      LET IRWS = IRWS + 1
      GO TO 81
C                NO A/C IN STANDING - ASSIGN SORTIC TO A/C MOST NEAR READY
   84 LET SLJ = 999.
      LET I = 99
      LET IRWS = 0
      LET IX = 0
      IF(NT1) EQ(2), GO TO 91
      IF(NTYNX) LS(0), GO TO 91
      LET IRWS = 1
   91 DO TO 98, FOR EACH AC II
      LET NT2 = 1
      IF(II) GE (NOWEP), LET NT2 = 2
      IF(NT1) NE (NT2), GO TO 98
      GO TO (93,93,93,98,98,98,98,98,98,98,98,93,98),CLAS(II)
   93 IF MLEN(1,II) IS NOT EMPTY, IF MLEN(2, II) IS NOT EMPTY, GO TO 98
      IF (CLAS(II)) GR (3), GO TO 85
      IF (TCURS(II)) EQ(0), GO TO 98
      IF(DISCV(FMLEN(SENOO(II),II))) NE(1), GO TO 98
      IF(WEPST(II)) NE(IRWS), GO TO 98
      FIND SLOJ = MAX OF REPTM(L), FOR EACH L OF MLEN(SENOO(II),II),
     CIF NONE, CALL ERR(69)
      IF (SLOJ) GR (SLJ), GO TO 98
      LET SLJ = SLOJ
      LET I = II
   98 LOOP
      IF(I) LE (NAC), GO TO 7
      IF(IX) EQ(1), GO TO 1
```

```
      LET IX = 1
      IF(IRWS) EQ(1), LET IRWS = -1                                          C
      LET IRWS = IRWS + 1                                                    C
      GO TO 91
C        PROPER A/C IS AVAILABLE
   85 LET I = II
      GO TO 7
C       CANCEL SORTIE IF CLASS OF I-TH TAIL NO. = 4,6,9 OR 10
    2 GO TO (7,5,5,3,7,3,7,7,3,3,7,7,7,7),CLAS(I)
C                  READ OVER DATA NOT USED. PROCEDURE ASSUMES NUMBER OF
C                  MREQS LE 14,THEREFORE EXACTLY 2 CARDS PER MALFUNCTION
    3 READ N1,N2,N3
      FORMAT (S29,3I3)
      LET NM = N1+N2+N3
      IF(NM) EQ(0), GO TO 8
      DO TO 6,FOR II = (1)(2*NM)
      READ I1
      FORMAT (I1)                                                            C
    6 LOOP
    8 CALL OUT(25,I,NTYNX,0,0)
      GO TO 100
    5 FIND FIRST,FOR EACH L OF MLFN(SENOO(I),I),WITH (DISCV(L)) EQ(0),
     CIF NONE,GO TO 7
      GO TO 3                                                                C
C                  UPDATE SORTIE NO.,NEW,(SENON)=1 OR 2
    7 LET NSN = SENON(I)
      IF (NSN) EQ (2), LET NSN = 0
      LET NSN = NSN + 1
      IF MLFN(NSN,I) IS EMPTY, GO TO 9
      IF MLFN(SENON(I),I) IS NOT EMPTY, GO TO 3
      GO TO 11
    9 LET SENON(I) = NSN
   11 LET J = SENON(I)
C                  READ SORTI INFORMATION
      READ SELEN(J,I), TMNXS(I), TMFLS(I), TYFLS(I),NPREM(J,I),NPOSM(J,I     C
     C),NGAMN(J,I)                                                           C
      FORMAT(H3.2,2H4.2,2,4I3)
      IF (I) GE (NOWEP), IF (NTYNX) = J (-1), LET SELEN(J,I) = SELEN(J,
     CI)*.643
      LET TYNXS(I) = NTYNX
      LET NM = NPREM(J,I)+NPOSM(J,I)+NGAMN(J,I)
C                  NOTE IF A/C NOT READY FOR SORTIE(CLAS NE5),OTHERWISE
C                  LET OLD SORTIE NO.=NEW SORTIE NO.
      IF (CLAS(I)) EQ (5), GO TO 10
      LET PFLAG(I) = 1
      LET ISECL(I) = 0
      GO TO 12
   10 LET SENOO(I) = J
C                  SCHEDULE CANCEL SORTIE (CLSE) AT LATEST OK SORTI TIME
   12 CREATE CLSE
      LET TLNO(CLSE) = I
      STORE CLSE IN CLSEE(I)
      CAUSE CLSE AT TMNXS(I) + MAXLT(NTYNX + 2)
```

```
C                   IF MALFUNCTIONS EXIST CREATE, F LE, READ
C                   ATTRIBUTES OF MALFUNCTILNS
      IF (NM) EQ (0),GO TO 50
      DO TO 40,FOR KK = (1)(NM)
      CREATE MALFN CALLED Q
      FILE Q IN MLFN(J,I)
      LET TLNO(Q) = I
      READ  RFPTM(Q),DISCV(Q),CRIT(Q),OTFLG(Q),NRTS(Q),TDISC(Q),PART(Q),
     CMREPP(Q),TREPP(Q),NREQS
      FORMAT(M2.2,5I2,I4,I3,M2.2,I2)
      DO TO 30,FOR KKK= (1)(NREQS)
      CREATE MREQ
      FILE MREQ IN REQS(Q)
   30 LOOP
      READ SHOPN(M),NOMEN(M),SKILL(M)   ,FOR EACH M OF REQS(Q)
      FORMAT 14(2I2,I1)
C                   CONVERT MANHOURS TO ELAPSED TIME
      LET NOM = 0
      LET NOM = NOM + NOMEN(MM), FOR EACH MM OF REQS(Q)
      IF(NOM) EQ(0), GO TO 40
      LET REPTM(Q) = REPTM(Q)/FLOATF(NOM)
   40 LOOP
C                   'F A/C READY, START EITHER A PREFLT OR AN UPLOAD
   50 IF(CLAS(I)) NE (5), GO TO 70
      REMOVE I FROM ACST                                              1
      LET NACST = NACST - 1
      IF(I) GE(NOWEP), GO TO 80
      IF (TYNXS(I)) EQ (-1), GO TO 80
      IF (WEPST(I)) EQ (1,, GO TO 80
      CALL STEAM(I,1)
      GO TO 100
   80 CALL PREFT(I)
      GO TO 100                                                       1
C                   OTHERWISE SCHEDULE LTPRE TO ALLOW FOR UPLOAD OR
C                   DOWNLOAD,IF NECESSARY,AND A PREFLIGHT
   70 CREATE LTPRE
      LET TLNO(LTPRE) = I
      LET LTP(I) = LTPRE
      LET B = 0.
      IF (TCURS(I))GE (0),GO TO 75
      IF (TYNXS(I))EQ (-1), GO TO 78
      LET B = B + TIMET(1)
      GO TO 78
   75 IF (TYNXS(I)) GE (0), GO TO 78
      LET B = TIMET(2)
   78 CAUSE LTPRE AT TMNXS(I) - TMPRT - B
  100 RETURN
      END
```

```
C
      SUBROUTINE SPOFL(I)
C                     START POSTFLIGHT ACTION
      CREATE POSFL
      LET TLNO(POSFL) = I
      CAUSE POSFL AT TIME + TMPOT
      LET CLAS(I) = 11
      CALL OUT(26,I,0,0,0)
      RETURN
      END
C
      EXOG EVENT START
C                     START OF SIMULATION, CHANGES FIRST SAT.AND FIRST SUN.
C                     TO MOD 7 AND CAUSES FIRST SHIFT
C     USED WHEN READING DAILY MANNING FROM TAPE 13
      READ FROM TAPE 13,I,J
      FORMAT(I3,I4)
      IF (I)  EQ (888), GO TO 30
X     PRINT 1
X    1 FORMAT(///37H MANNING TAPE NOT PROPERLY POSITIONED)
      CALL EXIT
X   30 PRINT 2,J
X    2 FORMAT(I4)
      READ FROM TAPE 13,A
      FORMAT(A1)
      CALL INTLZ
      LET FSAT = XMODF(FSAT-1,7)
      LET FSUN = XMODF(FSAT+1,7)
      CREATE SHIFT
      CAUSE SHIFT AT TIME
      CALL OUT(27,FSAT,NSHOP,0,0)
   10 DO TO 20, FOR EACH SHOP M
      CALL OUT(28,NMASD(M,1),NMASD(M,2),NMASD(M,3),M)
      CALL OUT(28,NMASE(M,1),NMASE(M,2),NMASE(M,3),M)
   20 LOOP
      RETURN
      END
```

```
      REPORT STATUS(II)
X     CANCELLED SORTIE  ON  TAIL NO.  *  AT    * DAYS,  * HOURS,  * MINS
 X                                    II      DPART(TIME) HPART(TIME) M
X                                                        FIRST MALFU
X       TAIL NO.     CLASS   NO. OF OUTSTANDING MALFNS        OLD
X            *          *                *                     *
 X           I       CLAS(I)          NOOSM(I)      FMLFN(1 , I)
  X    FOR EACH AC I
                                    END
                                                                    X
                                                                  2
PART(TIME)
NCTION  IN
  NEW   WEAPON STATUS    TYPE OF NEXT SORTIE                        1
    *         *                *
FMLFN(2 , I)   WEPST(I)  TYNXS(I)
                                                                    X
    END




C
      SUBROUTINE STEAM(I,J)
C                  START TEAM ACTION,J=1=UPLOAD,J=2=DOWNLOAD,J=3=SERVICE
      CREATE MALFN CALLED L
      LET DISCV(L) = J + 2
      LET CRIT(L) = 1
      LET CTFLG(L) = 1
      LET TLNO(L) = I
      LET REPTM(L) = TIMET(J)
      LET NN = NTEAM(J)
      DO TO 10,FOR K=(1)(NN)
      CREATE MREC CALLED X
      LET SMOPN(X) = SMPN(J,K)
      LET NOMEN(X) = NOMN(J,K)
      LET SKILL(X) = SKLL(J,K)
      FILE X IN RCDS(L)
   10 LOOP
   15 CALL MTCE(L,NN)
      LET CLAS(I) = I,J
      IF(J)E.(1),GO TO 20
      IF(J)E.(2),GO TO 30
      GO TO 1
C                  SET WEAPON STATUS =1=WEAPONS AMOANO,0=NO WEAPONS AVAIL
   20 LET WEPST(I) =1
      LET NA(WW) = NA(WW) + 1
      GO TO 1
   30 LET WEPST(I) =
      LET NA(WW) = NA(WW) - 1
    1 CALL SCHED(2,I,CLAS(I),NA(WW),WEPST)
      RETURN
      END
```

```
C
      SUBROUTINE  STNXS(I)
C                 START NEXT SORTIE
C                 CALLED AT END OF A DOWNLOAD (SENSE LIGHT 1 ON)
X     IF(SENSE LIGHT 1)10,2
C                 START DOWNLOAD IF NECESSARY
    2 IF (TCURS(I)) EQ(-1),GO TO 10
      IF(I) GE(NOWEP), GO TO 10
      IF (TYNXS(I)) GE (0),GO TO 10
      CALL STEAM(I,2)
      GO TO 100
   10 LET SENOO(I) = SENON(I)
C                 IF NO NEW SORTIE READ IN, FILE A/C IN STANDING
C                 AND RETURN
      IF (PFLAG(I)) EQ (1), GO TO 20
      LET ISECL(I) = 0
      FILE I IN ACST
      LET NACST = NACST + 1
      LET CLAS(I) = 5
      GO TO 100
C                 IF NEXT SORTIE IS TRAINING, START PREFLIGHT AND RETRN
   20 IF (LTP(I)) EQ (0), GO TO 22
      CANCEL LTPRE CALLED LTP(I)
      DESTROY LTPRE CALLED LTP(I)
      LET LTP(I) = 0
   22 IF (I) GE (NOWEP), GO TO 21
      IF (TYNXS(I)) GE (0), GO TO 25
   21 CALL PREFT(I)
      GO TO 100
C                 IF WEAPONS ABOARD, START PREFLIGHT, OTHERWISE
C                 START UPLOAD
   25 IF(WEPST(I)) EQ (0), GO TO 30
      GO TO 21
   30 CALL STEAM(I,1)
  100 CALL OUT(30,I,CLAS(I),NACST,0)
      RETURN
      END
C
      SUBROUTINE STOMT(I,K,CI)
C                 STOP MAINT IF ALL OUTSTANDING MALFNS ARE NOT CRITICAL
C                 IF ANY CRITICAL, RETURN
      LET CI = 1
      LET NSO = SENOO(I)
      LET NSN = SENON(I)
      IF (K) EQ (0), GO TO 31
C     CALLED FROM LTPRE
C     STOP MAINT IF ALL OUTSTANDING MALFNS ARE NOT CRITICAL, OTHERWISE
```

```
C       RETURN
   10   DO TO 15, FOR EACH L OF MLFN(NSO,I)
        IF (CRIT(L)) EQ (1), GO TO 100
   15   REPEAT 10
        GO TO 34
   31   DO TO 32, FOR EACH L OF MLFN(NSO,I), WITH (DISCV(L)) EQ (0)
        IF (CRIT(L)) EQ (1), GO TO 100
   32   REPEAT 31
C                    STOP WORK ON ALL MALFNS AND RESCHEDULE WORK FOR END
C                    OF NEXT POSTFLIGHT
   34   LET CI = 0
        LET L1 = FMLFN(NSO,I)
   35   IF (L1) EQ (0), GO TO 60
        LET L2 = SMLFN(L1)
        IF (K) EQ (1), GO TO 38
        IF (DISCV(L1))NE (0), GO TO 50
   38   LET DISCV(L1) = 1
        IF (K) EQ (0), GO TO 39
        REMOVE L1 FROM MLFN(NSO,I)
        FILE L1 IN MLFN(NSN,I)
   39   LET NPOSM(NSN,I) = NPOSM(NSN,I) + 1
C                    MALFN EITHER IN PROCESS OR IN QUEUE
C                    IF MALFN IN PROCESS,TERMINATE MAINT.
   40   STORE FREQS(L1) IN X
        IF (SHOPN(X)) EQ (0),GO TO 46
        FIND FIRST,FOR EACH CARD OF WIP(SHOPN(X)),WITH (MLFTN(CARD))
      CEQ (L1), IF NONE, GO TO 45
        CALL TERM(L1,0,1)
        GO TO 48
C                    IF NOT IN PROCESS REMOVE MALFN FROM ALL QUEUES
   45   DO TO 47, FOR EACH J OF REQS(L1)
        LET M = SHOPN(J)
        CALL RCRDM(L1,M)
   46   IF(CLSSP(L1)) EQ(0), GO TO 47
        LET N = PART(L1)
        REMOVE L1 FROM MALP(N)
        LET NMALP(N) = NMALP(N) - 1
        LET CLSSP(L1) = 0
        CALL OUT(33,N,NMALP(N),NSEWM,0)
   47   REPEAT 45
   48   LET NOOSM(I) = NOOSM(I) - 1
   50   LET L1 = L2
        GO TO 35
   60   IF (NOOSM(I)) NE (0), CALL ERR(13)
C                    SET MALFN COUNTS TO ZERO
        LET NOMEM(I) = 0
        LET NOMNM(I) = 0
        LET NOPTM(I) = 0
        CALL OUT(33,I,999,0,0)
  100   RETURN
        END
```

```
C
      SUBROUTINE TERM(L,MM,J)
C                     TERMINATE MAINTENANCE ON L. UPDATE REMAINING REPAIR
C                     TIME AND CANCEL END OF MAINT
      LET REPTM(L) = FINTM(L) - TIME
      CANCEL MTN CALLED MTNR(L)
      DESTROY MTN CALLED MTNR(L)
      LET MTNR(L) = 0
C                     REMOVE EACH CARD OF L FROM WIP. FILE IN MALM UNLESS
C                     CALLED BY STOMT(J=1)
   10 DO TO 40,FOR EACH K OF REQS(L)
      LET M = SHOPN(K)
      CALL RCRDW(L,M)
C    IF MALFN ON OVERTIME, DO NOT REASSIGN MEN
      IF (STOVT(L))EQ (0.), GO TO 12
      LET OVTMH = (TIME STOVT(L))*(FLOATF(NOMEN(K)-SUB(K)))
      CALL OUT(39,M,OVTMH,0,0)
      LET STOVT(L) = 0.
      GO TO (30,14,14),J
   14 CALL FCRDM(L,M)
      GO TO 30
   12 GO TO (20,13,13),J
   13 CALL FCRDM(L,M)
C                     IF CALLED BY DOPRE(J=2),CAUSE 'CALL MAINT',OTHER-
C                     WISE CALLED BY SHIFT(J=3) REMOVE NEXT CARD FROM WIP
      GO TO (100,20,30),J
C                     IF CALLED BY DOPRE OR STOMT, RETURN MEN TO SHOP AND
C                     TRY TO START MTCE AT THIS SHOP
C                     CALLED BY DOPRE OR STOMT
   20 LET NMENA(M) = NMENA(M) + NOMEN(K) - SUB(K)
      IF MALM(M) IS EMPTY, GO TO 30
      CREATE CALLM
      LET MAN(CALLM) = M
      CAUSE CALLM AT TIME
   30 CALL OUT(32,M,NMENA(M),J,TLNO(L))
   40 REPEAT 10
C                     UPDATES AIRCRAFT STATISTICS
      LET I = TLNO(L)
      LET NOMEM(I) = NOMEM(I) - 1
      LET NOMNM(I) = NOMNM(I) + 1
      CALL CLASS(I)
  100 RETURN
      END
C
      SUBROUTINE USEMN(M)
      IF MALM(M) IS EMPTY, IF QREP (M) IS EMPTY, GO TO 100
      STORE FMALM(M) IN Q
   17 IF(Q) EQ(0), GO TO 18
```

```
    STORE SMALM(Q) IN QQ
    LET J = MLFTN(Q)
    LET II = TLNO(J)
    LET NOMNM(II) = NOMNM(II) - 1
    LET JJ = DISCV(J)
    CALL MTCE (J,NN)
    IF (JJ) LE (2), GO TO 20
    IF (JJ) EQ (6), GO TO 20
    LET CLAS(II) = JJ + 9
 20 IF (NMENA(M)) LS (0), CALL ERR(5)
    IF (NMENA(M)) EQ(0), GO TO 26
    LET Q = QQ
    GO TO 17
 18 CALL BENCH(M)
 26 CALL OUT(22,NRIP(M),NQREP(M),M,NMALM(M))
100 RETURN
    END
```

```
    SUBROUTINE USEPT(N,J)
                SUBROUTINE TO ATTEMPT TO USE PART ON ANY WAITING MALS
                IF OUTSTANDING CANNIBALIZATIONS(NCANB GR 0),
                PUT PART BACK ON A/C.
     IF(NCANB(N)) EQ(0), GO TO 10
                START A REPLACE ACTION TO PUT BACK A CANABALIZED PART
    LET I= 0
    LET NCANB(N) = NCANB(N) - 1
    LET NMALP(N) = NMALP(N) - 1
    LET NPRTA(N) = NPRTA(N) - 1
    CALL OUT(34,N,NMALP(N),0,0)
     GO TO 100
                ATTEMPT TO USE PART
 10 DO TO 20, FOR EACH L OF MALP(N)
    REMOVE L FROM MALP(N)
    LET NMALP(N) = NMALP(N) - 1
    LET CLSSP(L) = 0
    LET I = TLNO(L)
    LET NOPTM(I) = NOPTM(I) -1
    IF QUES(L) IS NOT EMPTY, LET NOMNM(I) = NOMNM(I) - 1
    IF(CANAR(L)) EQ(0), GO TO 15
    LET K = CANAR(L)
    CANCEL CANAB CALLED K
    DESTROY CANAB CALLED K
    LET CANAR(L) = 0
 15 CALL MTCE(L,*NN)
    CALL OUT(34,N,NMALP(N),NOPTM(I),I)
    IF (NN) EQ(1),GO TO 100
 20 REPEAT 10
100 RETURN
    END
```

```
C
      ENDOG EVENT WTSOR                                                    1
C                     END OF WAIT FOR SORTIE
      LET I = TLNO(WTSOR)                                                  1
      LET J = TYNXS(I)                                                     1
C                     IF SORTIE CANCELLED (ISECL=1),FILE A/C IN STANDING
C                     AND RETURN
      LET IJ = ISECL(I)
      IF(ISECL(I)) EQ(0),GO TO 5                                           1
      LET ISECL(I) = 0                                                     1
      FILE I IN ACST                                                       1
      LET NACST = NACST + 1
      LET CLAS(I) = 5                                                      1
      GO TO 80
C                     SORTIE NOT CANCELLED - NOTE IF SORTIE IS LATE
    5 LET Y = TIME - TMNXS(I)
      LET JJ = TYNXS(I) + 2
      IF (Y-MAXLT(JJ)) GR(0), CALL ERR(14)                                 T
C                     NOTE TO IGNORE CANCEL SORTIE(IDYCL=1) AND CAUSE
C                     SORTIE
   50 LET KL = CLSEE(I)
      IF (KL) EQ (0), GO TO 55
      CANCEL CLSE CALLED KL
      DESTROY CLSE CALLED KL
      LET CLSEE(I) = 0
   55 CREATE SORTE
      LET TLNO(SORTE) = I                                                  1
      LET T = TIME + SELEN(SENOO(I),I)                                     1
      CAUSE SORTE AT T                                                     1
      LET ENDSE(I) = T                                                     1
      LET TCURS(I) = TYNXS(I)                                              1
      LET CLAS(I) = 4                                                      1
      IF (TYNXS(I)) EQ(0), LET CLAS(I) = 6
      LET TMNXS(I) = TMFLS(I)                                              1
      IF (TNS) EQ (0) , LET TMNXS(I) = 999.9
      LET TYNXS(I) = TYFLS(I)                                              1
C                     IF ANY GROUND ALERT MALFNS, CAUSE MAINT START
C                     ON PROPER DAY
      IF (NGAMN(SENOO(I),I))EQ (0),GO TO 80
   60 DO TO 70,FOR EACH L OF MLFN(SENOO(I),I), WITH(DISCV(L)) EQ (6),AND
     C(TDISC(L)) GR (0)
      CREATE CLMTC
      LET MFN(CLMTC) = L
      CAUSE CLMTC AT TIME + (FLOATF(TDISC(L)))
   70 REPEAT 60
C                     NOTE A/C HAS NO GOOD PREFLIGHT ON IT
   80 LET PREFN(I) = 0                                                     1
  100 DESTROY WTSOR                                                        1
      CALL OUT(35,I,IJ,Y JJ)
      RETURN                                                               1
      END                                                                  1
```

```
C
      FUNCTION ZERO(CARD)
C                    MAKES A RANKED SET A FIFO SET
      LET ZERO = 0
      RETURN
      END
```

ANALYSIS

1AC	E	
2PART	E	
3SHOP	E	
8RINT		F*
9FSAT		I
10NBNCH		I
11CNACW		F
12CSACW		F
13MXACW		I
14NACWW		F
15LAST		F
16GTSUB		I
17GOVTM		F
18GNPRE		I
19GXMLM		I
20GXREP		I
21GXMLP		I
22GCANB		I
23FMSDS		I
24LMSDS		I
25GSORT		I
26NUML		F
27LTPSE		F
28LTTHR		F
29LTHPS		F
30NMISS		F
31NMSPS		F
32TMANH		F
33OVPTH		F
34CANPS		F
35LTPA		I
36LTPS		I
37OFILR		F
38AVAIL		F
39CATOT		F
40TAVAL		F
41NTURN	2	I
42CTRNA	1	F
43CTRNX	1	F
44MAXTA	1	F
45MAXTX	1	F
46AVTAA	1	F
47AVTAX	1	F
48NA		I
49NFL		I
50GRNDU		F
51GNSRT		I
52GMNPS		F
53MINTA	1	F
54MINTX	1	F
55KORE		I*
56CNMNM	1	F

```
56MEMNM  1      F
57CSMNM  1      F
57SDMNM  1      F
58TNMNM  1      F
59CNPTM  1      F
59MEPTM  1      F
60CSPTM  1      F
60SDPTM  1      F
61TNPTM  1      F
62TCLAS  1      F
63CNMEM  1      F
63MEMEM  1      F
64CSMEM  1      F
64SDMEM  1      F
65TNMEM  1      F
66CLS    11/2   I
66NOMNM  12/2   F
67XTURN  1      F
68NOMEM  11/2   F
68NOPTM  12/2   F
69NRUSH  1      I
70ATOTL  1      F
71ATURN  1      F
72NASKS  13/4   I
72NFILS  14/4   I
72MXMLP  12/4   I
72NCANB  11/4   I
73CNMLP  1      F
73MEMLP  11/2   F
73SDMLP  12/2   F
74CSMLP  1      F
75TNMLP  1      F
76TA            F
76FILLR  11/2   F
77EXHRS  1      F
78NMALP  12/2   F
79CMENA  1      F
80CSMEN  1      F
81TMENA  1      F
82CQREP  1      F
82MEREP  1      F
83CSREP  1      F
83SDREP  1      F
84TQREP  1      F
85MXREP  11/2   I
85NPREE  12/2   I
86CNMLM  1      F
86CMALM  1      F
87CSMLM  1      F
88TMALM  1      F
88TNMLM  1      F
89MXWIP  12/3   I
```

```
 89MXMLM 11/3 I
 89MAXLM 13/3 I
 90CNWIP 1     F
 90MEWIP 1     F
 91CSWIP 1     F
 91SDWIP 1     F
 92TNWIP 1     F
 93NMENA 11/2  F
 94GEXHR       F
 93NQREP 12/2  F
 95NMALM 11/2  F
 95NWIP  12/2  F
 97FSUN        I
 98GSWIP       F
 99OVTMH 1     F
100GMWIP       F
101GSPTM       F
102MEMEN 1     F
103SDMEN 1     F
104UTIL  1     F
105MEMLM 1     F
106SDMLM 1     F
107MANPS 1     F
108MNMEN 11/2  I
108TSUB  12/2*I
109NMSSD 11/3  I
109NTSRT 12/3  I
109NUMLS 13/3  I
111LATEH 1     F
112NSORT 1     I
113NMHPS 1     F
114GHUSE 1     F
115GUTIL 1     F
116CLSS  1     F
117PLSS  1     F
119GMMLM       F
120GSMLM       F
121GMREP       F
122GSREP       F
123GMMLP       F
124GSMLP       F
125CLAS  2     F
126CUTIL 2     F
127CSUTL 2     F
128UTILZ 2     F
129SDUTZ 2     F
130NMASH 2 /2  I
131HUSED 2     F
132OCMLM 1     F
133OSMLM 1     F
134MNO   1     F
135SOG   1     F
```

```
                          136URPRT        I*
                          137WHERE        I
                          138TNACW        F
                          139MEACW        F
                          140SDACW        F
                          141GMPTM        F
                          142NSHFT  1      I
                          143GSMNM        F
                          144GMMNM        F
                          145GSMEM        F
                          146GMMEM        F
I MSDSE4
                                                  MSDS    *ZERO   L
               I TME    4      F
               I TALNO  2      I
               I TYPE   3      I
               I PMSDS  12/2   I
               I SMSDS  11/2   I
                          147BORR         F
                          148KCORR        F
                          149NOWEP        I*
                          150MAXME        I
                          151CSTRA  1     F
                          151SDTRA  1     F
                          152CSTRX  1     F
                          152SDTRX  1     F
                          153CHNGE        I
```

```
C
      SUBROUTINE ANLYZ
      LET DIV=1.0/(TIME - LAST)
      COMPUTE GSORT = SUM OF NSORT(I),FOR EACH AC I
C     SHOP STATISTICS
      DO TO 10,FOR EACH SHOP M
      LET SQMLM = NMALM(M)**2
      ACC NMALM(M),SQMLM INTO CMALM(M),CSMLM(M) ALL SINCE TMALM(M)
      LET MEMLM(M) = CMALM(M)*DIV
      LET SDMLM(M) = SQRTF(DIV*CSMLM(M)-MEMLM(M)** )
      IF(MXMLM(M))GR (GXMLM). LET GXMLM = MXMLM(M)
      LET SQREP = NQREP(M)**2
      ACC NQREP(M),SQREP INTO CQREP(M),CSREP(M) ALL SINCE TQREP(M)
      LET MEREP(M) = CQREP(M)*DIV
      LET SDREP(M) = SQRTF(DIV*CSREP(M) - MEREP(M)**2 + .000001)
      IF (MXREP(M)) GR (GXREP), LET GXREP = MXREP(M)
      LET SQWIP = NWIP(M)**2
      ACC NWIP(M),SQWIP INTO CNWIP(M),CSWIP(M) ALL SINCE TNWIP(M)
      LET MEWIP(M) = CNWIP(M)*DIV
      LET SDWIP(M) = SQRTF(DIV*CSWIP(M) - MEWIP(M)**2)
      LET GOVTM = GOVTM + OVTMH(M)
      LET GTSUB = GTSUB + XABSF(TSUB(M))/2
      LET GNPRE = GNPRE + NPREE(M)
      LET HOURU = 0.
      DO TO  8,FOR I = (1)(6)
      LET HOURU = HOURU        + HUSED(M,I)
      LET SN = FLOATF(NSHFT(I))
      IF (CHNGE) EQ (0), GO TO 7
      LET UTILZ(M,I) = HUSED(M,I)/CUTIL(M,I)
      GO TO 8
    7 LET UTILZ(M,I) = CUTIL(M,I)/SN
      LET SDUTZ(M,I) = SQRTF(CSUTL(M,I)/SN - UTILZ(M,I)**2 + .000001)
    8 LOOP
      LET MANPS(M) = HOURU/FLOATF(GSORT)
   10 LOOP
      LET NA =0
      LET NFL=0
      DO TO 20, FOR EACH PART N,WITH(NASKS(N)) GR (0)
      LET SQMLP = NMALP(N)**2
      ACC NMALP(N),SQMLP INTO CNMLP(N),CSMLP(N) ALL SINCE TNMLP(N)          C
      LET MEMLP(N) = CNMLP(N)*DIV
      LET SDMLP(N) =       DIV*CSMLP(N)-MEMLP(N)**2                         C
      IF (SDMLP(N)) GE (0), GO TO 15
      CALL CORE(KXX,KXX(28000))
      CALL EXIT
   15 LET SDMLP(N) = SQRTF(SDMLP(N))
      IF (MXMLP(N)) GR (GXMLP) ,LET GXMLP = MXMLP(N)
      LET FILLR(N) = FLOATF(NFILS(N))/FLOATF(NASKS(N))
      LET NA = NA + NASKS(N)
      LET NFL= NFL +NFILS(N)
      LET GCANB = GCANB + NCANB(N)
   20 LOOP
C     AIRCRAFT STATISTICS
      DO TO 30,FOR EACH AC I
```

```
      LET SQMEM     = NOMEM(I)**2
      ACC NOMEM(I),SQMEM INTO CNMEM(I),CSMEM(I) ALL SINCE TNMEM(I)
      LET MEMEM(I) = CNMEM(I)* DIV
      LET SDMEM(I) = SQRTF(DIV*CSMEM(I) - MEMEM(I)**2)
      LET SQMNM     = NOMNM(I)**2
      ACC NOMNM(I),SQMNM INTO CNMNM(I),CSMNM(I) ALL SINCE TNMNM(I)
      LET MEMNM(I) = CNMNM(I)*DIV
      LET SDMNM(I) = SQRTF(DIV*CSMNM(I) - MEMNM(I)**2)
      LET SQPTM = NOPTM(I)**2
      ACC NOPTM(I),SQPTM INTO CNPTM(I),CSPTM(I) ALL SINCE TNPTM(I)
      LET MEPTM(I) = CNPTM(I)*DIV
      LET SDPTM(I) = SQRTF(DIV*CSPTM(I) - MEPTM(I)**2)
   30 LOOP
      COMPUTE GMMLM,GSMLM = MEAN,STD-DEV OF MEMLM(M),FOR EACH SHOP M
      COMPUTE GMREP,GSREP = MEAN,STD-DEV OF MEREP(M),FOR EACH SHOP M
      COMPUTE GMWIP,GSWIP = MEAN,STD-DEV OF MEWIP(M),FOR EACH SHOP M
      COMPUTE GMMLP,GSMLP = MEAN,STD-DEV OF MEMLP(N),FOR EACH PART N
      COMPUTE GMMEM,CSMEM = MEAN,STD-DEV OF MEMEM(I),FOR EACH AC I
     C, WITH (NSORT(I)) GR (0)
      COMPUTE GMMNM,GSMNM = MEAN,STD-DEV OF MEMNM(I),FOR EACH AC I
     C, WITH (NSORT(I)) GR (0)
      COMPUTE GMPTM,GSPTM = MEAN,STD-DEV OF MEPTM(I),FOR EACH AC I
     C, WITH (NSORT(I)) GR (0)
      DO TO 33, FOR EACH AC I
      ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
   33 LOOP
      LET GNSRT = 0
      DO TO 35,FOR I = (1)(3)
      LET GNSRT = GNSRT + NTSRT(I)
   35 LOOP
      CALL ANAZ1
  100 RETURN
      END




C
      SUBROUTINE ANAZ1
C     SYSTEM STATISTICS
      LET DIV = 1.0/(TIME-LAST)
      LET NUML = NUMLS(1)+NUMLS(2)+NUMLS(3)
      LET GS = FLOATF(GSORT)
      LET LTPSE = 100.*NUML/GS
      LET LTTHR = LATEM(1)+LATEM(2)+LATEM(3)
      LET LTHPS = LTTHR/GS
      LET NMISS = NMSSD(1)+NMSSD(2)+NMSSD(3)
      LET NMSPS = 100.*NMISS/(GS+NMISS)
      COMPUTE TM  = SUM OF NMASH(M,I),FOR EACH SHOP M, FOR I =(1)(6)
      LET TMANH = TM*8.*(TIME - LAST)
      LET OVPTH = 100.*GOVTM/TMANH
      LET CANPS = 100.*FLOATF(CLANB)/GS
```

```
   LET OFILR = FLOATF(NFL)/FLOATF(NA)
   LET CATOT = 0.
   DO TO 40,FOR J = (1)(14)
   COMPUTE CLSS(J) = SUM OF DECHR(CLAS(I,J)), FOR EACH AC I
   LET CATOT = CATOT + CLSS(J)
40 LOOP
   DO TO 50,FOR EACH AC I
   LET ATOTL(I) = 0.
   DO TO 45,FOR K = (1)(14)
   LET ATOTL(I) = ATOTL(I) + CLAS(I,K)
45 LOOP
50 LOOP
   LET AVAIL = 24.*(TIME - LAST)
   LET TAVAL = FLOATF(NAC)*AVAIL
   DO TO 55,FOR J = (1)(14)
   LET PLSS(J) = 100.*CLSS(J)/CATOT
55 LOOP
   DO TO 56, FOR I = (1)(2)
   LET Q = NTURN(I,1)
   LET R = NTURN(I,2)
   LET AVTAA(I) = CTRNA(I) / Q
   LET AVTAX(I) = CTRNX(I) / R
   LET SDTRA(I) = SQRTF(CSTRA(I)/Q - AVTAA(I)**2)
   LET SDTRX(I) = SQRTF(CSTRX(I)/R - AVTAX(I)**2)
56 LOOP
   DO TO 60,FOR I = (1)(6)
   DIMENSION HSS(6)
   IF (CHNGE) EQ (0), GO TO 58
   COMPUTE HSS(I) = SUM OF CUTIL(M,I), FOR EACH SHOP M
58 COMPUTE GHUSE(I)   = SUM OF HUSED(M,I),FOR EACH SHOP M
60 LOOP
   COMPUTE GMNPS = SUM OF MANPS(M),FOR EACH SHOP M
   COMPUTE GEXHR = SUM OF EXHRS(M), FOR EACH SHOP M
   LET HU = 0.
   LET HA = 0.
   DO TO 65,FOR I = (1)(6)
   IF (CHNGE) EQ (0), GO TO 61
   LET GUTIL(I) = GHUSE(I)/HSS(I)
   LET HA = HA + HSS(I)
   GO TO 62
61 LET HS = FLOATF(NSHFT(I))*NMHPS(I)
   LET GUTIL(I) = GHUSE(I)/HS
   LET HA = HA + FLOATF(NSHFT(I))*NMHPS(I)
62 LET HU = HU + GHUSE(I)
65 LOOP
   LET GRNDU = 100.*HU/HA
   LET SQ = NACW.**2
   ACC NACWW, SQ INTO CNACW, CSACW ALL SINCE TNACW
   LET MEACW = DIV*CNACW
   LET SDACW = SQRTF(DIV*CSACW - MEACW**2 + .00001)
   LET BORR = BORR + CLAS(I,2) + CLAS(I,7) + CLAS(I,5) + CLAS(I,9)
  C+ CLAS(I,6)+ CLAS(I,4), FOR I = (1)(NOWEP-1)
   LET BORR = DECHR(BORR)
   LET KCORR = KCORR+CLAS(I,2)+CLAS(I,7)+CLAS(I,5)+CLAS(I,9)
```

```
  C+ CLAS(I,6)+ CLAS(I,4), FOR I = (NOWEP)(NAC)

    LET KCORR = DECHR(KCORR)
    LET AA = FLOATF(NOWEP-1)
    LET BB = FLOATF(NAC - NOWEP + 1)
    LET BORR = (100.*BORR) / (AA*AVAIL)
    LET KCORR = (100.*KCORR) / (BB*AVAIL)
     LET MAXME = 0
     DO TO 67, FOR EACH SHOP M, WITH (MNMEN(M)) NE (9999)
    LET MAXME = MAXME + XFIXF(NMENA(M)) - MNMEN(M)
67  LOOP
    CALL INTER
    CALL INTR1
    LET LAST = TIME
    DO TO 80,FOR EACH SHOP M
    LET CMALM(M) = 0.
    LET CSMLM(M) = 0.
    LET CQREP(M) = 0.
    LET CSREP(M) = 0.
    LET CNWIP(M) = 0.
    LET CSWIP(M) = 0.
    LET MXMLM(M) =0
    LET MXREP(M) =0
    LET OVTMH(M) = 0.
    LET TSUB(M) = 0
    LET NPREE(M) =0
    LET OCMLM(M) = 0.
    LET OSMLM(M) = 0.
    LET MNMEN(M) = NMENA(M)
    LET EXHRS(M) = 0
    DO TO 70,FOR I = (1)(6)
    LET CUTIL(M,I) = 0.
    LET CSUTL(M,I) = 0.
    LET HUSED(M,I) = 0.
70  LOOP
80  LOOP
    LET GXMLM = 0
    LET GXREP = 0
    DO TO 90,FOR EACH PART N,WITH (NASKS(N))GR (0)
    LET CNMLP(N) = 0.
    LET CSMLP(N) = 0.
    LET MXMLP(N) = 0
    LET NFILS(N) = 0
    LET NASKS(N) = 0
    LET NCANB(N) = 0
90  LOOP
    DO TO 110,FOR EACH AC I
    LET CNMEM(I) = 0.
    LET CSMEM(I) = 0.
    LET CNMNM(I) = 0.
    LET CSMNM(I) = 0.
    LET CNPTM(I) = 0.
    LET CSPTM(I) = 0.
    LET NSORT(I) = 0
```

```
    DO TO 105,FOR J = (1)(14)
    LET CLAS(I,J) = 0.
105 LOOP
110 LOOP
    DO TO 120,FOR I = (1)(6)
    LET NSHFT(I) = 0
120 LOOP
    DO TO 130,FOR I = (1)(3)
    LET NUMLS(I) = 0
    LET LATEH(I) = 0.
    LET NTSRT(I) = 0
    LET NMSSD(I) = 0
130 LOOP                                                        C
    LET LTPA = 0
    LET LTPS = 0
    LET LTTHR = 0.
    LET NUML = 0.
    LET NMISS = 0.
    LET CNACW = 0.
    LET CSACW = 0.
    LET MXACW = 0.                                              10
    LET NBNCH = 0                                               100
    LET GCANB = 0
    LET GOVTM = 0
    LET GTSUB = 0
    LET GEXHR = 0
    LET GMNPS = 0
    DO TO 135, FOR I = (1)(2)
    LET NTURN(I,1) = 0                                          C
    LET NTURN(I,2) = 0
    LET MAXTA(I) = 0
    LET MAXTX(I) = 0
    LET MINTA(I) = 999.
    LET MINTX(I) = 999.
    LET CTRNX(I) = 0                                            10C
    LET CTRNA(I) = 0
    LET CSTRA(I) = 0
    LET CSTRX(I) = 0
135 LOOP
    LET NRUSH(1) = 0
    LET NRUSH(2) = 0
    LET PORR = 0                                                C
    LET YCORR = 0
    STORE FMSDS IN J
140 IF (J) EQ (0),GO TO 150
    STORE SMSDS(J) IN K
    REMOVE J FROM MSDS
    DESTROY MSDSE CALLED J
    LET J = K
    GO TO 140
150 RETURN
    END
```

```
    SUBROUTINE CANCL (I,J,P,T)
    LET NMSSD(J) = NMSSD(J)+1
    CREATE MSDSE
    LET TALNO(MSDSE) = I
    LET TYPE(MSDSE) = J
    LET TME(MSDSE) = P
    FILE MSDSE IN MSDS
    RETURN
    END




    SUBROUTINE CLASS(I,J,K,T)
    IF (J) GR (3),GO TO 100
    LET TIME = T
    ACC 1.0 INTO CLAS(I,CLS(I))SINCE TCLAS(I)
    IF (K) EQ (0),GO TO 10
    LET CLS(I) = 1
    GO TO 100
 10 LET CLS(I) = 2
100 RETURN
    END




    SUBROUTINE CLMTC(I,J,K,L,T)
    IF (L) EQ (1), GO TO 100
    IF (J) EQ (0),GO TO 100
    LET NASKS(J) = NASKS(J) +1
    IF (K) EQ (0),LET NFILS(J) = NFILS(J) + 1
100 RETURN
    END




    SUBROUTINE CREPT(I,J,K,L,T)
    LET TIME =T
    LET SQMEN = NMENA(I)**2
    ACC NMENA(I),SQMEN INTO CMENA(I),CSMEN(I) ALL SINCE TMENA(I),ADD
   C-1.0
    IF (J) LS (MNMEN(I)),LET MNMEN(I) = J
    LET SQREP = NQREP (I)**2
    ACC NQREP(I),SQREP INTO CQREP(I),CSREP(I) ALL SINCE TQREP(I),POST
   CFLOATF(L)
    RETURN
    END
```

```
C
      SUBROUTINE DOPRE (I,J,K,T)                                        C
      LET SQREP = NQREP(I)**2
      LET TIME = T
      ACC NQREP(I), SQREP INTO CQREP(I),CSREP(I) ALL SINCE TQREP(I),ADD
     C1.0
      IF (K) GR (MXREP(I)),LET MXREP(I) =K
      RETURN
      END                                                                1


C
       SUBROUTINE ERR(N)                                                C
      CALL ERRR(N)
      CALL CORE(KXX,KXX(KORE))
      STOP
      RETURN
      END


C
                        REPORT ERRR (N)
X                                                                ERROR
 X
X                     ERROR                                              C
X                     NUMBER                                            X
X                       **                                              X
 X                      N                                               X
                                 END                                    X
                                                                      X   X
NUMBER                                                  PAGE **  3      X
PAGE                                                                    X
                                                                        X
                                                                      X   X
                                                                      X     X
                                                                      X   X
                                                                      X   X
                          END                                           X
                                                                          X
                                                                        X
                                                                        X
                                                                        X
                                                                          X
C
      SUBROUTINE EXTRA(I,A)                                             X
      LET EXHRS(I) = EXHRS(I) + A                                       X
      RETURN                                                            X
      END                                                               X
```

```
      SUBROUTINE FCRDM(I,J,K,T)
      LET SQM = NMALM(I)**2
      LET TIME = T
      ACC NMALM(I),SQM INTO CMALM(I),CSMLM(I) ALL SINCE TMALM(I),ADD 1.0
      IF(K) EQ(1), GO TO 100
      IF (J) GR (MXMLM(I)),LET MXMLM(I) = J
      IF(J) GR (MAXLM(I)), LET MAXLM(I) = J
  100 RETURN
      END




      SUBROUTINE FCRDW(I,J,T)
      LET SQW = NWIP(I)**2
      LET TIME = T
      ACC NWIP(I),  SQW INTO CNWIP(I),CSWIP(I) ALL SINCE TNWIP(I),ADD
     C1.0
      IF (J) GR (MXWIP(I)),LET MXWIP(I) = J
      RETURN
      END




      REPORT INTR1
                                                              SYSTEM  STAT
                              NUMBER OF LATE SORTIES
       TRAIN. GND.ALERT  AIR ALERT  TOTAL  PER-CENT OF SORTIES LATE
          *         *          *        *.              *.**
  X   NUMLS(1) NUMLS(2) NUMLS(3)    NUML            LTPSE
                            CANCELLATIONS
       TRAIN. GND.ALERT  AIR ALERT  TOTAL  PER-CENT OF SORTIES CANCELLED
          *         *          *        *.              *.**
  X    NMSSD(1) NMSSD(2) NMSSD(3)   NMISS           NMSPS
                          CANABALIZATION SUMMARY
                 TOTAL                    PER-CENT OF SORTIES
                    *                                *.**
  X                GCANB                            CANPS
                 SORTIE COUNT BY TYPE OF SORTIE
         TRAINING   GND. ALERT   AIR ALERT     TOTAL
             *           *           *           *
  X        NTSRT(1)  NTSRT(2)    NTSRT(3)      GNSRT
                                                          TURN - AROUN
        TOUCHDOWN TO COMPLETION OF ALL MAINTENANCE
      A/C   NO. OF      AVERAGE   MAXIMUM   MINIMUM   STD.
          TURNAROUNDS     TIME      TIME      TIME    DEVIATION
```

```
X     B-52      *          *.**      *.**      *.**      *.***
 X    NTURN(1,1) DECHR(AVTAA(1)) DECHR(MAXTA(1)) DECHR(MINTA(1))
 X    DECHR(MINTX(1)) DECHR(SDTRX(1))
X     KC-135    *          *.**      *.**      *.**      *.***
 X    NTURN(2,1) DECHR(AVTAA(2)) DECHR(MAXTA(2)) DECHR(MINTA(2))
 X    DECHR(MINTX(2)) DECHR(SDTRX(2))
X        NUMBER OF MALFUNCTIONS COMPLETED IN LESS THAN SPECIFIED TIME
X              PREFLIGHT MALFNS          POSTFLIGHT MALFNS
X                       *                        *
 X                    NRUSH(1)                 NRUSH(2)
X                                                    SHOP  UTILIZATION
 X
X              ------------MANHOURS  USED-----    -----          ------
X              WEEKDAY  SHIFTS          WEEKEND  SHIFTS                  WE
X             1       2       3       1       2       3            1
X     SHOP                                                      AVG.  S.D.
X      *     *.*     *.*     *.*     *.*     *.*     *.*    *.**  *.***
 X    M HUSED(M,1) HUSED(M,2) HUSED(M,3) HUSED(M,4) HUSED(M,5) HUSED(M,6
 X    SDUTZ(M,3) UTILZ(M,4) SDUTZ(M,4) UTILZ(M,5) SDUTZ(M,5) UTILZ(M,6)
  X   FOR EACH SHOP M
X
X     GRD    *.*     *.*     *.*     *.*     *.*     *.*    *.**
 X      GHUSE(1) GHUSE(2) GHUSE(3) GHUSE(4) GHUSE(5) GHUSE(6)  GUTIL(1)
X                NUMBER OF AIRCRAFT WITH WEAPONS
X             AVERAGE       STD. DEV.       MAXIMUM
X              *.**           *.**             *
 X            MEACW          SDACW           MXACW
X                          CANCELLED  SORTIES
X            TAIL NO.      TYPE  OF  SORTIE     TIME  OF  SORTIE
X               *                     *                  *.**
 X             TALNO(K)             TYPE(K)             TME(K)
  X    FOR EACH K OF MSDS
       END
```

```
                                                                      X
ISTICS                                                              2*
                          LATE TAKE-OFF HOURS
   TRAIN. GND.ALERT AIR ALERT   TOTAL  AVG.HOURS LATE PER SORTIE    1
    *.**     *.**       *.**      *.**            *.**             2
 LATEH(1)  LATEH(2) LATEH(3)   LTTHR            LTHPS
                        OVERTIME  SUMMARY
            TOTAL  HOURS          PER-CENT OF AVAILABLE HOURS      1
                *.**                        *.**                   2
                GOVTM                       OVPTH
                        OVERALL  FILL-RATE
      NUMBER OF DEMANDS   NUMBER OF FILLS   FILL-RATE              1
               *                   *           *.**               2
              NA                  NFL          OFILR
TOTAL NUMBER OF     STOPPING POSTFLT.MAINT.TO START NEW SORTIE
 BENCH REPAIRS            ATTEMPTS            SUCCESSES            1
       *                     *                   *                 2
    NBNCH                 LTPA                LTPS
D  DATA (HOURS)
 TOUCHDOWN TO COMPLETION OF ALL RED-X MAINTENANCE
```

```
A/C     NO. OF       AVERAGE    MAXIMUM    MINIMUM    STD.
      TURNAROUNDS      TIME       TIME       TIME   DEVIATION          1
B-52        *           *.**       *.**       *.**      *.***          1
DECHR(SDTRA(1)) NTURN(1,2) DECHR(AVTAX(1)) DECHR(MAXTX(1))
                                                                        X
KC-135      *           *.**       *.**       *.**      *.***          2
DECHR(SDTRA(2)) NTURN(2,2) DECHR(AVTAX(2)) DECHR(MAXTX(2))
                                                                        X
                OPERATIONAL  READY  RATE (PER-CENT)
             B-52                              KC-135                   1
              *.**                              *.**                    2
              BORR                              KCORR
  OVERALL  PER-CENT =  *.**                                             2*
          GRNDU
--+--+   SHIFT  UTILIZATION (FRACTION)--------    ---                   1
EKDAY  SHIFTS                          WEEKEND  SHIFTS
      2             3              1             2             3         1
 AVG.  S.D.   AVG.  S.D.   AVG.  S.D.   AVG.  S.D.   AVG.  S.D.
*.**  *.***  *.**  *.***  *.**  *.***  *.**  *.***  *.**  *.***
) UTILZ(M,1) SDUTZ(M,1) UTILZ(M,2) SDUTZ(M,2) UTILZ(M,3)
SDUTZ(M,6)
                                                                        X
                                                                        1
*.**          *.**          *.**          *.**          *.**
GUTIL(2) GUTIL(3) GUTIL(4) GUTIL(5)  GUTIL(6)                           2
                                                                         *
                                                                        1
                                                                        2
                                                                            X
                                                                        2*
                                                                            X
                                                                            X
                                                                            X
                                                                            X
      END
```

```
C
               REPORT INTER
X                                                    INTERIM  REPORT -
 X
X                                                                SHOP  ST
X          SHOP     MALFUNCTIONS WAITING  REPARABLES WAITING     OVERTIME
X           NO.       AVG.  STD.DEV. MAX    AVG.  STD.DEV. MAX  REG. EXTRA
X           **       **.**  ***.**    **   **.**  ***.**    *  ***.* ***.*
 X     M MEMLM(M)  SDMLM(M) MXMLM(M) MEREP(M) SDREP(M) MXREP(M) OVTMH(M)
 X      MANPS(M)
  X       FOR EACH SHOP M
X
X           GRAND     *.**     *.***     *     *.**     *.**     *  ***.* ***.*
```

```
 X                GMMLM      GSMLM  GXMLM    GMREP    GSREP   GXREP    GOVTM
X                                                                AIRCRAFT  ST
X          TAIL   NUMBER OF   NO.OF MAINT.MALFNS  NO.OF MAN MALFNS.  NO.OF
X           NO.     SORTIES     AVG.     STD.DEV.     AVG.    STD.DEV.    AVG.
X           **        **       *.**       *.**       *.**      *.**      *.**
 X           I       NSORT(I) MEMEM(I) SDMEM(I)  MEMNM(I) SDMNM(I)  MEPTM(
  X       FOR EACH AC I
X           GRAND       *       *.**       *.**      *.**      *.**      *.**
 X                    GSORT     GMMEM      GSMEM      GMMNM      GSMNM    GMPTM
X                                                                AIRCRAFT
X       TAIL     IN MAINT.     FLY-     GND.     G.A.MAINT.     STAND     AWAIT
X        NO.     RX  NO RX     ING     ALERT     RX  NO RX      -ING     SORTIE
X         *     *.**  *.**    *.**     *.**     *.**  *.**      *.**      *.**  X
 X      I DECHR(CLAS(I,1)) DECHR(CLAS(I,2)) DECHR(CLAS(I,4)) DECHR(CLAS(I,     X
 X      (I,9)) DECHR(CLAS(I,10)) DECHR(CLAS(I,11)) DECHR(CLAS(I,14)) DECHR
  X     FOR EACH AC I
X       TOT.    *.**  *.**    *.**     *.**     *.**  *.**      *.**      *.**
 X      CLSS(1) CLSS(2) CLSS(4)  CLSS(6)  CLSS(8) CLSS(7)  CLSS(5)  CLSS(9
X       O/O     *.**  *.**    *.**     *.**     *.**  *.**      *.**      *.**
 X      PLSS(1) PLSS(2) PLSS(4)  PLSS(6)  PLSS(8) PLSS(7)  PLSS(5)  PLSS(9
                                                  END

                                                                          X
DAY    *   HOUR    *                                                   13
    DPART(TIME)  HPART(TIME)
ATISTICS                                                               2
NO. OF MEN   NO. OF   MINIMUM NO.OF MALFNS-IN-PROCESS   MANHOURS
SUBSTITUTED PRE-EMPTS MEN AVAILABLE   AVG.    STD.DEV.  PER SORTIE   1
 ***          *           *          *.**     *.***       *.**       1
DECHR(EXHRS(M)) TSUB(M) NPREE(M) MNMEN(M) MEWIP(M) SDWIP(M)
                                                                        X
                                                                        X  C
                                                                       1
   *          *          *          *.**     *.***       *.**
DECHR(GEXHR) GTSUB GNPRE MAXME  GMWIP  GSWIP  GMNPS                        X
ATISTICS                                                              1*
PART MALFNS                                                                X
  STD.DEV.                                                            1
     *.**                                                             1
I) SDPTM(I)
                                                                        X
     *.**
    GSPTM
STATUS  (HOURS)                                                       1*
   PRE-    POST-   SERVICE   UP-    DOWN      TOTAL       AVAIL-
  FLIGHT  FLIGHT             LOAD    LOAD                  ABLE       1        X
   *.**    *.**      *.**    *.**    *.**      *.**       *.**       1        X
6)) DECHR(CLAS(I,8)) DECHR(CLAS(I,7)) DECHR(CLAS(I,5)) DECHR(CLAS             X
(CLAS(I,12)) DECHR(CLAS(I,13)) DECHR(ATOTL(I)) AVAIL                         X
                                                                        X    X
   *.**    *.**      *.**    *.**    *.**      *.**       *.**               X
) CLSS(10) CLSS(11) CLSS(14) CLSS(12) CLSS(13)       CATOT  TAVAL           X
   *.**    *.**      *.**    *.**    *.**                                    X
) PLSS(10) PLSS(11) PLSS(14) PLSS(12) PLSS(13)
             END
```

```
      SUBROUTINE LTPRE(I,J,G,T)
      LET TIME = T
      LET LTPA = LTPA + 1
      IF (G) EQ (1.), GO TO 100
      LET LTPS = LTPS + 1
      ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      LET CLS(I) = J
      IF (ATURN(I)) EQ(0), GO TO 100
      LET TA = TIME - ATURN(I)
      LET KK = 1
      IF (I) GE (NOWEP), LET KK = 2
       LET X = TA
C     PUNCH 1, X, KK
C   1 FORMAT (F6.2,I4)
      LET NTURN(KK,1) = NTURN(KK,1) + 1
      LET CTRNA(KK) = CTRNA(KK)+ TA
      LET CSTRA(KK) = CSTRA(KK) + TA**2
      IF (TA) GR (MAXTA(KK)), LET MAXTA(KK) = TA
      IF (TA) LS (MINTA(KK)), LET MINTA(KK) = TA
      LET ATURN(I) = 0.0
  100 RETURN
      END
C
      MAIN ROUTINE
      DIMENSION X(1002),J(1)
X     EQUIVALENCE(X,J)
      REWIND 10
X  95 READ TAPE 10, (X(I),I=1,1002)
      LET N=1
   99 LET I = J(N)
      LET TIME = X(N+5)
      IF (TIME-LAST) GE (RINT), CALL ANLYZ
      LET A = X(N+1)
      LET B = X(N+2)
      LET C = X(N+3)
      LET D = X(N+4)
X     GO TO(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,
X    C24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39),I
X   1 CALL CREPT(A,B,C,D,TIME)
X     GO TO 500
X   2 CALL RCRDM(A,B,C,D,TIME)
X     GO TO 500
X   3 CALL MTCE1(A,B,C,D,TIME)
X     GO TO 500
```

```
X    4 CALL MTCE2(A,B,C,D,TIME)                                          X   30
X      GO TO 500                                                         X
X    5 CALL MTN1(A,B,C,TIME)                                             X   31
X      GO TO 500                                                         X
X    6 CALL MTN2(A,B,C,D,TIME)                                           X   32
X      GO TO 500                                                         X
X    7 CALL EXTRA(A,B)                                                   X   33
X      GO TO 500
X    8 CALL CANCL(A,B,C,TIME)                                            X   34
X      GO TO 500                                                         X
X    9 CALL CLASS(A,B,C,TIME)                                            X   35
X      GO TO 500                                                         X
X   10 CALL RUSH(A,B,TIME)                                               X   36
X      GO TO 500                                                         X
X   11 CALL CLMTC(A,B,C,D,TIME)                                          X   37
X      GO TO 500                                                         X
X   12 CALL DOPRE(A,B,C,TIME)                                            X   39
X      GO TO 500                                                           500
X   13 CALL FCRDM(A,B,C,TIME)
X      GO TO 500
X   14 CALL FCRDW(A,B,TIME)                                                 38
X      GO TO 500
X   15 CALL PDLAY(A,B)
X      GO TO 500
X   16 CALL POSFL(A,B,C,D,TIME)
X      GO TO 500
X   17 CALL PREF1(A,B)                                                   X
X      GO TO 500                                                         X  200
X   18 CALL PREF2(A,B,C,TIME)                                              100
X      GO TO 500
X   19 CALL PTREP(A,B,C,D,TIME)
X      GO TO 500
X   20 CALL RCRDW(A,B,TIME)
X      GO TO 500
X   21 CALL REPAR(A,B,C,TIME)
X      GO TO 500
X   22 CALL USEMN(A,B,C,D,TIME)
X      GO TO 500
X   23 CALL SORTE(A,C,D,TIME)                                            X
X      GO TO 500
X   24 CALL PREFT(A,B,TIME)
X      GO TO 500
X   25 CALL SORT1(A,B,TIME)
X      GO TO 500
X   26 CALL SPOFL(A,TIME)
X      GO TO 500
X   27 CALL STRT1(A,B)
X      GO TO 500
X   28 CALL STRT2(A,B,C,D)
X      GO TO 500                                                           1
X   29 CALL STEAM(A,B,C,TIME)                                              1
X      GO TO 500
```

```
30 CALL STNXS(A,B,TIME)
   GO TO 500
31 CALL SHFT1(A,TIME)
   GO TO 500
32 CALL TERM(A,B,C,D,TIME)
   GO TO 500
33 CALL STOMT(A,B,TIME)
   GO TO 500
34 CALL USEP2(A,B,C,D,TIME)
   GO TO 500
35 CALL WTSOR(A,B,C,D,TIME)
   GO TO 500
36 CAL. SHFT2(A,B,TIME)
   GO TO 500
37 CALL LTPRE(A,B,C,TIME)
   GO TO 500
39 CALL OVTM(A,B)
00 LET N= N+6
   IF (N) GR (1002), GO TO 95
   GO TO 99
38 CALL CORE(KXX,KXX(KORE))
   IF (CHNGE) EQ(0), GO TO 100
   BACKSPACE TAPE 13, 1 RECORD
   READ FROM TAPE 13,I
   FORMAT(I3)
   IF (I) EQ (777), GO TO 100
   PRINT 200
00 FORMAT(///42H MANNING TAPE NOT POSITIONED AT END OF ANZ)
00 REWIND TAPE 10
   CALL EXIT
   END
```

```
   SUBROUTINE MTCE1(I,J,K,L,T)
   LET TIME = T
   LET SUM = NMENA(I)**2
   ADD NMENA(I), SUM INTO CMENA(I),CSMEN(I)  ALL SINCE TMENA(I),POST
  CALCATE(J)
   IF(J) LS (MNMEN(I)),LET MNMEN(I) = J
   IF(L) EQ(1), GO TO 10
   LET NPRES(I) = NPRES(I) + 1
   GO TO 100
1  LET TSUB(I) = TSUB(I) + K
   RETURN
   END
```

```
C
      SUBROUTINE MTCE2(I,J,K,L,T)                                        X
X     IF (SENSE LIGHT 1)20,10
   10 LET TIME = T
      LET II = I
      LET SQMEM     = NOMEM(I)**2
      LET SQMNM     = NOMNM(I)**2
      LET SQPTM     = NOPTM(I)**2
      ACC NOMEM(I), SQMEM INTO CNMEM(I),CSMEM(I) ALL SINCE TNMEM(I),POST
     C FLOATF(J)
      ACC NOMNM(I), SQMNM INTO CNMNM(I),CSMNM(I) ALL SINCE TNMNM(I),POST
     C FLOATF(K)
      ACC NOPTM(I), SQPTM INTO CNPTM(I),CSPTM(I) ALL SINCE TNPTM(I),POST
     C FLOATF(L)                                                         X
X     SENSE LIGHT 1
      GO TO 100
X  20 IF (SENSE LIGHT 2)30,25
   25 IF (J) EQ (1),LET NCANB(I) = NCANB(I) + 1
      LET SQMLP = NMALP(I)**2
      ACC NMALP(I), SQMLP INTO CNMLP(I),CSMLP(I) ALL SINCE TNMLP(I),POST
     C FLOATF(L)
      IF (L) GR (MXMLP(I)),LET MXMLP(I) = L
X     SENSE LIGHT 1
X     SENSE LIGHT 2
      GO TO 100
   30 IF (K) LE (2),GO TO 100
      ACC 1.0 INTO CLAS(II,CLS(II)) SINCE TCLAS(II)
      GO TO(100,100,50,50,50,35,35),K
   35 IF (L) EQ (0),GO TO  40
      LET CLS(II) = 8
      GO TO 100
   40 LET CLS(II) = 7
      GO TO 100
   50 LET CLS(II) = K + 5
  100 RETURN
      END



C
      SUBROUTINE MTN1(I,J,K,T)
      LET TIME = T
      LET SQMEN = NMENA(I)**2
      ACC NMENA(I), SQMEN INTO CMENA(I),CSMEN(I) ALL SINCE TMENA(I),POST
     C FLOATF(J)
      RETURN
      END

                                                                         C


C
```

```
      SUBROUTINE MTN2(I,J,K,L,T)
      IF (SENSE LIGHT 1)20,10
   10 LET TIME = T
      LET II =I
      LET SQMNM = NOMNM(I)**2
      LET SQMEM = NOMEM(I)**2
      LET SQPTM = NOPTM(I)**2
      ACC NOMNM(I), SQMNM INTO CNMNM(I),CSMNM(I) ALL SINCE TNMNM(I),POST
     C FLOATF(J)
      ACC NOMEM(I), SQMEM INTO CNMEM(I),CSMEM(I) ALL SINCE TNMEM(I),POST
     C FLOATF(K)
      ACC NOPTM(I), SQPTM INTO CNPTM(I),CSPTM(I) ALL SINCE TNPTM(I),POST
     C FLOATF(L)
      SENSE LIGHT 1
      GO TO 100
   20 ACC 1.0 INTO CLAS(II,CLS(II)) SINCE TCLAS(II)
      IF (I) GR (3), GO TO 30
      IF (K) EQ (5), GO TO 40
      IF (J) EQ (0),GO TO 27
      LET CLS(II) = 1
      GO TO 100
   27 LET CLS(II) = 2
      IF(K) NE(1), GO TO 100
   28 IF (J) NE(0), GO TO 100
      IF(XTURN(II)) EQ(0), GO TO 100
      LET TX = TIME - XTURN(II)
      LET KK = 1
      IF (II) GE (NOWEP), LET KK = 2
      LET NTURN(KK,2) = NTURN(KK,2) + 1
      LET CTRNX(KK) = CTRNX(KK)+ TX
      LET CSTRX(KK) = CSTRX(KK) + TX**2
      IF (TX) GR (MAXTX(KK)), LET MAXTX(KK) = TX
      IF (TX) LS (MINTX(KK)), LET MINTX(KK) = TX
      LET XTURN(II) = 0.
      GO TO 100
   30 LET CLS(II) = I
      IF (K) NE (1), GO TO 100
      IF(L) EQ(0), GO TO 100
      GO TO 28
   40 IF (J) EQ (0), GO TO 45
      LET CLS(II) = 6
      GO TO 100
   45 LET CLS(II) = 7
  100 RETURN
      END



C
      SUBROUTINE OVTM(I,A)
      LET OVTMH(I) = OVTMH(I) +A
      RETURN
      END
```

```
      SUBROUTINE PDLAY(I,J)
      IF (I) EQ (0),GO TO 100
      LET NASKS(I) = NASKS(I) + 1
      IF (J) EQ 1),LET NFILS(I) = NFILS(I) + 1
  100 RETURN
      END


C
      SUBROUTINE POSFL(I,J,K,L,T)
      LET TIME = T
      IF (J) EQ (0),GO TO 30
      ACC 1,0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      IF (K) EQ (0), LET CLS(I) = 2
      IF (K) EQ (0), GO TO 40
      LET CLS(I) = 1
      GO TO 100
   30 LET KK = 1
      IF (I) GE (NOWEP), LET KK = 2
      IF(ATURN(I)) EQ(0), GO TO 100
      LET TA = TIME - ATURN(I)
       LET X = TA
X     PUNCH 1, X, KK
X    1 FORMAT (F6.2,I74)
      LET NTURN(KK,1) = NTURN(KK,1) + 1
      LET CTRNA(KK) = CTRNA(KK) + TA
      LET CSTRA(KK) = CSTRA(KK) + TA**2
      IF (TA) GR (MAXTA(KK)), LET MAXTA(KK) = TA
      IF (TA) LS (MINTA(KK)), LET MINTA(KK) = TA
      LET ATURN(I) = 0.
   40 IF(XTURN(I)) EQ(0), GO TO 100
      LET TX = TIME - XTURN(I)
      LET KK = 1
      IF (I) GE (NOWEP), LET KK = 2
      LET NTURN(KK,2) = NTURN(KK,2) + 1
      LET CTRNX(KK) = CTRNX(KK)+ TX
      LET CSTRX(KK) = CSTRX(KK) + TX**2
      IF (TX) GR (MAXTX(KK)), LET MAXTX(KK) = TX
      IF (TX) LS (MINTX(KK)), LET MINTX(KK) = TX
      LET XTURN(I) = 0.
  100 RETURN
      END


C
      SUBROUTINE PREF1(I,J)
      IF (I) EQ (0),GO TO 100
      LET NASKS(I) = NASKS(I) + 1
      IF (J) EQ (0),LET NFILS(I) = NFILS(I) + 1
  100 RETURN
      END
```

```
      SUBROUTINE PREF2(I,J,K,T)
      IF (J) NE (0),GO TO 100
      LET TIME = T
      ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      LET CLS(I) = 9
  100 RETURN
      END



      SUBROUTINE PREFT(I,J,T)
      LET TIME = T
      ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      LET CLS(I) = J
      RETURN
      END



      SUBROUTINE PYREP(I,J,K,L,T)
      LET TIME = T
      LET SQMEN = NMENA(I)**2
      ACC NMENA(I), SQMEN INTO CMENA(I),CSMEN(I) ALL SINCE TMENA(I),POST
    C FLOATF(J)
      LET NBNCH = NBNCH +1
  100 RETURN
      END



      SUBROUTINE RCRDM(I,J,K,L,T)
      LET TIME = T
      LET SQMLM = NMALM(I)**2
      LET SQMNM = NOMNM(K)**2
      ACC  NMALM(I),SQMLM INTO CMALM(I),CSMLM(I) ALL SINCE TMALM(I),ADD
    C-1.0
      ACC  NOMNM(K),SQMNM INTO CNMNM(K),CSMNM(K) ALL SINCE TNMNM(K),POST
    C FLOATF(L)
  100 RETURN
      END
```

```
      SUBROUTINE RCRDW (I,J,T)
      LET TIME = T
      LET SQWIP = NWIP(I) **2
      ACC   NWIP(I),SQWIP INTO CNWIP(I),CSWIP(I) ALL SINCE TNWIP(I),ADD
     C-1.0
      RETURN
      END



C
      SUBROUTINE REPAR(I,J,K,T)
      IF (K) NE (0), GO TO 100
      LET TIME = T
      LET SQREP = NQREP(I)**2
      ACC  NQREP(I),SQREP INTO CQREP(I),CSPEP(I) ALL SINCE TQREP(I),POST
     C FLOATF(J)
      IF (J) GR (MXREP(I)), LET MXREP(I) = J
  100 RETURN
      END



C
      SUBROUTINE RUSH(I,R,T)
      LET NRUSH(I+1) = NRUSH(I+1) + 1
      RETURN
      END



C
      SUBROUTINE SHFT1(I,T)
      DIMENSION MEN(24)
      LET TIME = T
      LET N = XMODF(DPART(TIME),7)
      IF (N) EQ (FSAT), GO TO 1
      IF (N) EQ (FSUN), GO TO 2
      IF (N) EQ (0), GO TO 3
      IF (I) EQ (3), GO TO 4
   54 LET NDT = DPART(TIME)
      LET K = I + 1
      GO TO 5
    4 LET NDT = DPART(TIME) - 1
      LET K = 1
      GO TO 5
    1 IF (I) NE (3), GO TO 2
   52 LET NDT = DPART(TIME) - 1
      LET K = 4
      GO TO 5
    2 IF (I) EQ (3), GO TO 51
      LET NDT = DPART(TIME)
```

```
    LET I = I + 3
    LET K = I + 1
    GO TO 5
 51 LET I = I + 3
    GO TO 52
  3 IF (I) EQ (0), GO TO 56
    IF (I) NE (3), GO TO 54
    LET I = 6
    LET K= 1
    GO TO 5
 56 LET K = 1
    GO TO 20
  5 LET NSHFT(I) = NSHFT(I) + 1
    DO TO 10, FOR EACH SHOP M
    LET SQMEN = NMENA(M)**2
    ACC NMENA(M),SQMEN INTO CMENA(M),CSMEN(M) ALL SINCE TMENA(M)
    LET  MEMEN(M) = CMENA(M)*3.0
    LET  SDMEN(M) =       3.0*(CSMEN(M)) - MEMEN(M)**2
    IF(SDMEN(M)) LS(0), GO TO 40
    LET SDMEN(M)  = SQRTF(SDMEN(M))
    IF(NMASH(M,I)) NE(0), GO TO 8
    LET UTIL(M) = 0.
    GO TO 10
  8 LET UTIL(M) = 1.0 - MEMEN(M)/FLOATF(NMASH(M,I))
    LET HUSED(M,I) = 8.0*(FLOATF(NMASH(M,I))-MEMEN(M)) + HUSED(M,I)
    IF (CHNGE) EQ (0), GO TO 9
    LET CUTIL(M,I) = CUTIL(M,I) + 8.0*(FLOATF(NMASH(M,I)))
    GO TO 10
  9 LET CUTIL(M,I) = CUTIL(M,I) + UTIL(M)
    LET CSUTL(M,I) = CSUTL(M,I) + UTIL(M)**2
    GO TO 10
 40 IF (SDMEN(M)) LS (.000001), GO TO 50
    CALL CORE(KXX,KXX(32000))
    CALL EXIT
 50 LET SDMEN(M) = 0.0
    GO TO 8
 10 LOOP
 20 IF (CHNGE) EQ (0), GO TO 230
    READ FROM TAPE 13, MEN(J), FOR J = (1)(24)
    FORMAT 24(I3)
    IF (MEN(1)) EQ (999), GO TO 230
    IF (MEN(1)) EQ (777), RETURN
    LET NMASH(J,K) = MEN(J), FOR J = (1)(24)
    DO TO 220, FOR L = (25)(NSHOP-24)(24)
    READ FROM TAPE 13, NMASH(M,K), FOR M = (L)(XMINOF(L+23,NSHOP))
    FORMAT 24(I3)
220 LOOP
230 DO TO 30, FOR EACH SHOP M
    LET CMENA(M) = 0.
    LET CSMEN(M) = 0.
    LET MAXLM(M) = 0
    LET NMENA(M) = FLOATF(NMASH(M,K))
 30 LOOP
100 RETURN
    END
```

```
C
      SUBROUTINE SHFT2(I,J,T)
      LET TIME = T
      LET SQMEN = NMENA(I)**2
      ACC NMENA(I),SQMEN INTO CMENA(I),CSMEN(I) ALL SINCE TMENA(I), POST
     C FLOATF(J)
      IF(J) LS(MNMEN(I)), LET MNMEN(I) = J
  100 RETURN
      END


C
      SUBROUTINE SORTE(I,K,L,T)
      LET TIME = T
      LET NSORT(I) = NSORT(I) +1
      LET NTSRT(L) = NTSRT(L) +1
      IF (K) EQ (5), GO TO 20
      IF (L) EQ (2),GO TO 10
      LET ATURN(I) = TIME
      LET XTURN(I) = TIME
      GO TO 100
   10 LET ATURN(I) = 0.0
      LET XTURN(I) = 0.0
      GO TO 100
   20 ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      LET CLS(I) = 5
  100 RETURN
      END


C
      SUBROUTINE SORTI(I,J,T)
      LET NMSSD(J+2) = NMSSD(J+2) + 1
      CREATE MSDSE
      LET TALNO(MSDSE) = I
      LET TYPE(MSDSE) = J + 2
      LET TME(MSDSE) = T
      FILE MSDSE IN MSDS
      RETURN
      END


C
      SUBROUTINE SPOFL (I,T)
      LET TIME = T
      ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      LET CLS(I) = 11
      RETURN
      END
```

```
      SUBROUTINE STFAM(I,J,K,T)
      LET TIME= T
      LET SQACW = NACWW**2
      ACC NACWW, SQACW INTO CNACW, CSACW ALL SINCE TNACW, POST FLOATF(K)
      IF (K) GR (MXACW), LET MXACW = K
      RETURN
      END



C
      SUBROUTINE STNXS(I,J,T)
      LET TIME = T
      LET KK = 1
      IF (I) GE (NOWEP), LET KK = 2
      IF (ATURN(I)) EQ (0),GO TO 10
      LET TA = TIME - ATURN(I)
       LET X = TA
X     PUNCH 1, X, KK
X    1 FORMAT (F6.2,I74)
      LET NTURN(KK,1) = NTURN(KK,1) + 1
      LET CTRNA(KK) = CTRNA(KK)+ TA
      LET CSTRA(KK) = CSTRA(KK) + TA**2
      IF (TA) GR (MAXTA(KK)), LET MAXTA(KK) = TA
      IF (TA) LS (MINTA(KK)), LET MINTA(KK) = TA
      LET ATURN(I) = 0.0
      IF (XTURN(I)) EQ (0), GO TO 10
      LET TX = TIME - XTURN(I)
      LET NTURN(KK,2) = NTURN(KK,2) + 1
      LET CTRNX(KK) = CTRNX(KK) + TX
      LET CSTRX(KK) = CSTRX(KK) + TX**2
      IF(TX) GR (MAXTX(KK)), LET MAXTX(KK) = TX
      IF (TX) LS (MINTX(KK)), LET MINTX(KK) = TX
      LET XTURN(I) = 0.0
   10 IF(J) NE(5), GO TO 100
      ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      LET CLS(I) = 5
  100 RETURN
      END



C
      SUBROUTINE STOMT(I,J,T)
      LET TIME = T
      IF (J) EQ (999), GO TO 10
      LET SQ = NMALP(I)**2
      ACC NMALP(I), SQ INTO CNMLP(I), CSMLP(I) ALL SINCE TNMLP(I), ADD
     C-1.0
      GO TO 100
   10 LET SQMEM = NOMEM(I)**2
      LET SQMNM = NOMNM(I)**2
      LET SQPTM = NOPTM(I)**2
      ACC NOMEM(I), SQMEM INTO CNMEM(I), CSMEM(I) ALL SINCE TNMEM(I)
```

```
      ACC NOMNM(I),SQMNM INTO CNMNM(I),CSMNM(I) ALL SINCE TNMNM(I)
      ACC NOPTM(I),SQPTM INTO CNPTM(I),CSPTM(I) ALL SINCE TNPTM(I)
      LET NOMEM(I) = 0.                                                  1
      LET NOMNM(I) = 0.
      LET NOPTM(I) = 0.
  100 RETURN
      END
                                                                         C


C
      SUBROUTINE STRT1(I,J)
      LET FSAT = I
      LET FSUN =XMODF(I+1,7)
      RETURN
      END


C
      SUBROUTINE STRT2(I,J,K,L)
X     IF(SENSE LIGHT 1)20,10                                             C
   10 LET NMASH(L,1) = I
      LET NMASH(L,2) = J
      LET NMASH(L,3) = K
X     SENSE LIGHT 1
      GO TO 100
   20 LET NMASH(L,4) = I
      LET NMASH(L,5) = J
      LET NMASH(L,6) = K
      IF (L) LS (NSHOP),GO TO 100
      DO TO 30,FOR I = (1)(6)
      COMPUTE NMHPS(I)=  SUM OF NMASH(M,I),FOR EACH SHOP M
      LET NMHPS(I) = NMHPS(I)*8.0
   30 LOOP                                                               C
  100 RETURN                                                             X
      END                                                                )
                                                                         X
                                                                         X
                                                                         X
                                                                         )
C
      SUBROUTINE TERM(I,J,K,L,T)
      LET TIME = T
      LET SQMEN= NMENA(I)**2
      ACC  NMENA(I),SQMEN INTO CMENA(I),CSMEN(I) ALL SINCE TMENA(I),POST
     C FLOATF(J)
      IF (J) LS (MNMEN(I)), LET MNMEN(I) = J                             E
      IF (K) EQ (1), GO TO 100
      LET SQMEM = NOMEM(L)**2                                            *
      LET SQMNM = NOMNM(L)**2
      ACC NOMEM(L), SQMEM INTO CNMEM(L), CSMEM(L) ALL SINCE TNMEM(L),
     CADD -1.0                                                           E
```

```
      ACC NOMNM(L), SQMNM INTO CNMNM(L), CSMNM(L) ALL SINCE TNMNM(L),
     CADD 1.0
  100 RETURN
      END




      SUBROUTINE USEMN(I,J,K,L,T)
      LET TIME = T
      LET SQREP = NQREP(K)**2
      ACC  NQREP(K),SQREP INTO CQREP(K),CSREP(K) ALL SINCE TQREP(K),POST
     C FLOATF(J)
      IF (J) GR (MXREP(K)), LET MXREP(K) = J
   10 IF(L) GR(MXMLM(K)), LET MXMLM(K) = L
      IF (L) GR(MAXLM(K)), LET MAXLM(K) = L
      RETURN
      END




      SUBROUTINE USEP2(I,J,K,L,T)
      IF (L) NE (0), GO TO 100
      LET SQMLP = NMALP(I)**2
      ACC NMALP(I), SQMLP INTO CNMLP(I),CSMLP(I) ALL SINCE TNMLP(I),ADD
     C-1.0
      IF (J) GR (MXMLP(I)), LET MXMLP(I) = J
  100 RETURN
      END




C
            REPORT UTIZR(I, N)
X                                                  UTILIZATION  AND  QUEUE
 X
X             SHOP  NUMBER     UTILIZATION     AVG. MEN AVAILABLE     STD. D
X
X                   *              **.**              **.**
 X                 M             UTIL(M)            MEMEN(M)
  X       FOR EACH SHOP M
                                  END
                                                                          X
  REPORT - DAY    *  SHIFT  *                                          13
         N         I
EVIATION     NUMBER OF MALFUNCTIONS WAITING                             1
               MEAN           STD.DEV.     MAXIMUM                     1
*.***          *.**             *.**         **
 SDMEN(M)      MNQ(M)            SDQ(M)     MAXLM(M)
                                                                          X
END
```

```
C
      SUBROUTINE WTSOR(I,J,P,L,T)
      LET TIME = T
      IF (J) EQ (I),GO TO 10
      ACC 1.0 INTO CLAS(I ,CLS(I)) SINCE TCLAS(I)
      IF(L) NE(2), GO TO 5
      LET CLS(I) = 6
      GO TO 8
    5 LET CLS(I) = 4
    8 IF (P) EQ (0),GO TO 100
      LET NUMLS(L) = NUMLS(L) + 1
      LET LATEH(L) = LATEH(L) + DECHR(P)
      GO TO 100
   10 ACC 1.0 INTO CLAS(I,CLS(I)) SINCE TCLAS(I)
      LET CLS(I) = 5
  100 RETURN
      END




C
      FUNCTION ZERO(CARD)
C                     MAKES A RANKED SET A FIFO SET
      LET ZERO = 0
      RETURN
      END
```