AFPEA TECHNICAL REPORT NO. 88-R-03

SIMULATION TECHNIQUE

FOR

EVALUATING CONTAINERS (SIMTEC)
Version 2.2

USER'S GUIDE

26 April 1988
(Supersedes Issue of 1 February 1983)

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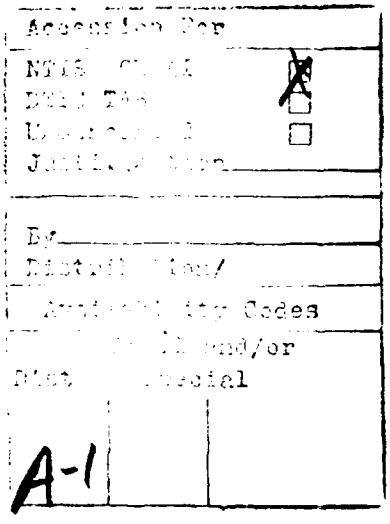
Special credit should be given to Mr Al Bodnar who developed this model while performing his functions as an operations research analyst in the Directorate of Concepts Analysis, Air Force Acquisition Logistics Division, Wright-Patterson Air Force Base.



EXECUTIVE SUMMARY

Problem. Few transportation models existed which permitted a program office to evaluate different types of packaging in terms of life cycle cost and sensitivities.

Procedure. The Simulation Technique for Evaluating Containers (SIMTEC), a computer simulation model, was developed to compare different types of packaging and shipping modes and to display the resultant life cycle cost (LCC). SIMTEC data such as engineering parameters for the containers, shipping rates, basing information, and scenario data are input into the model. Based on this data, failures, shipping schedules, spare requirements, and life cycle costs are generated as outputs. Additionally, sensitivity runs are available to enable the decision maker to "make the best decision."

Conclusion. SIMTEC is a model for evaluating different types of packaging and providing the decision maker with the most realistic data/cost available at the time. Additionally, SIMTEC can be used to aid the engineer in container design and to estimate the spare requirement needed to satisfy a particular network. Through simulating the "real world," SIMTEC predicts failures, generates a shipping schedule, and evaluates engineering tradeoffs to lower transportation costs. As with all simulation models, SIMTEC does not give the decision maker a decision, but rather provides increased information so a more intelligent decision may result.

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INTRODUCTION

Problem. In the past, very few transportation models existed which permitted a program to evaluate different types of packaging in terms of life cycle cost. Models that did exist had few sensitivities available or did not model the real packaging world via simulation.

Simulation Technique for Evaluating Containers (SIMTEC) is a computer program (model) developed to compare different types of packaging in terms of life cycle cost (LCC). Since discussions of computers/modeling can be very technical and intimidating to those unfamiliar with their use, the terms will first be defined before the technical aspects are discussed in the next section.

Terms. A model is a simplified representation of some real world situation. Models are used in the place of the real world situation for many reasons--economy and range of experimentation being the more important ones. A model provides the user the means and time to explore the environment solution alternatives, and objectives of the problem in greater detail. For example, this model allows the user to evaluate the LCC of competitive container candidates and shipping modes (aircraft, truck, etc,) by considering unit cost, life, weight, distance of shipment, mode of shipment, basing information, scenario data, etc. The computer program is used to make the modeling procedure more efficient and cost effective.

In general, a model may be used for the following five purposes:

(1) To study a system for improvement or comparison to another system,

(2) To design a system for the best outcome,

(3) To clarify objectives, goals, or plans,

(4) To train personnel,

(5) To predict the results of changes to a system.

SIMTEC, as a specialized model, may be used as a tool to do all of these things.

A simulation model is a model which gives the simplified picture of the "real system." This system can be defined as a set of components (machine, resources, people, etc.) having attributes (output rates, capacities, costs, skills, etc.) which interact. Simulation is the process of observing the model in action for the purpose of designing or modifying the system. For example, solar energy thermal collection systems for homes

have been tested by simulation, prior to being built, in order to help solve particular application problems or to indicate problems in design not known to exist. Other applications include: production, inventory, and distribution systems; queuing and traffic flow systems; operating and information systems for airports, hospitals, and industrial organizations; environments involving conflict, such as military strategies and competitive market strategies.

Simulation provides a means of studying a system, but does not direct one to an optimum solution. Such a solution may be found only after a series of attempts at juggling the variables.

A model, including SIMTEC, never makes a decision. A model provides information to be used in making a decision. Since a model is of necessity a simplified version of the "real world," it never includes all factors really necessary to make a decision.

Of course, the more confidence one has in a model, the more important its information is in making a decision. High confidence is obtained in a model by using real world values as inputs. Lesser confidence is obtained as you move through estimates towards guesses for your input values. Often real world values are not available and reasonable estimates are the next best thing. Anyone with even minimal exposure to data processing has heard of the expression, "garbage in, garbage out." Nowhere is this truer than in simulation modeling. The best estimates are probably obtained through interpretation of historical data or analogies to similar systems. Other sources are formulas, such as those in MIL-STD-794, for determining sizes and weights. The programs for use with Packaging Service Contracts are another source of cost estimates.

The balance of this user handbook provides the technical details of using the SIMTEC computer model. We hope this brief non-technical discussion will clarify the terms/ideas discussed in the technical portion of the user's handbook.

MODEL DESCRIPTION

Background

Simulation Technique for Evaluating Containers (SIMTEC) is a computer program developed to display the lowest life cycle cost and to evaluate competitive container candidates and shipping modes (aircraft, truck, etc.) which satisfy all mission requirements. While Packaging, Handling, and Transportation (PH&T) is often ignored since the dollars involved are relatively small when compared to major program acquisitions, PH&T is an area where real savings do exist.

This model was originally developed for the Air Launched Cruise Missile (ALCM) engine program to evaluate alternative containers to ship the ALCM engine. (Reference Appendix A for an example use of the model and the results of the original ALCM program). SIMTEC is a generalized extension of this original study. The major addition to the original model is the method of generating shipments. The ALCM program was based solely upon scheduled maintenance since a missile does not fail due to flying hours like aircraft. SIMTEC predicts failures and generates a shipping schedule based upon engineering and logistics data. (The method of estimating failures is discussed later in this guide). SIMTEC is not only for new acquisition programs but can be used for evaluating replacement containers for existing systems.

Overview

SIMTEC uses data from several sources to make its evaluation. The data can either be actual engineering and logistics inputs or estimates. If only estimates are available, SIMTEC can do sensitivity runs to give the decision-maker a better feel for the environment so a better decision may result.

The first of four sets of data includes program control information, engineering data, basing information, scenario data, plus other information as discussed in this manual. Based upon this data file SIMTEC will predict failures and a subsequent shipping schedule. A random seed number is used to begin these calculations. This random seed number generates different random numbers from a uniform distribution. (Using different seed numbers will generate different sequences of random numbers, and therefore, different failure predictions). Unless the analyst desires to evaluate the effects of another profile of failures, the shipping schedule needs only to be predicted once. This results in a shortened run time for SIMTEC.

The second set of data are the engineering parameters for the container candidates. Four elements were chosen that were deemed appropriate to evaluate container differences: cost, life, weight, and packing/unpacking labor expense. Container size was excluded since this element would be

similar among the candidates while cost, life, weight, and packaging time would all relate to the particular materials and design of each alternative. Note: If a new container is going to be designed to satisfy a particular shipping network, SIMTEC can also be used to find the best mix of these four elements.

The third set of data are the shipping rates to estimate the life cycle shipping expense. These rates are based upon cost per hundred pounds and can vary due to the size of shipment, the distance of shipment, and the mode of transportation.

The fourth, or final, set of data includes the production and spares delivery schedules. This is an unformatted or "Random Access" file and therefore cannot be typed out. Simtec will display this data and provide opportunity for revision.

Figure 1 is a tree diagram illustrating the trade-offs available to lower transportation costs. Collecting shipping rates for all feasible modes of transportation and collecting data for all feasible containers provides the data to evaluate all options and select an option based upon lowest life cycle cost. The purpose of this model is to provide a means of evaluating life cycle cost differences among feasible PH&T options.

SHIPPING COST

DECISION TREE

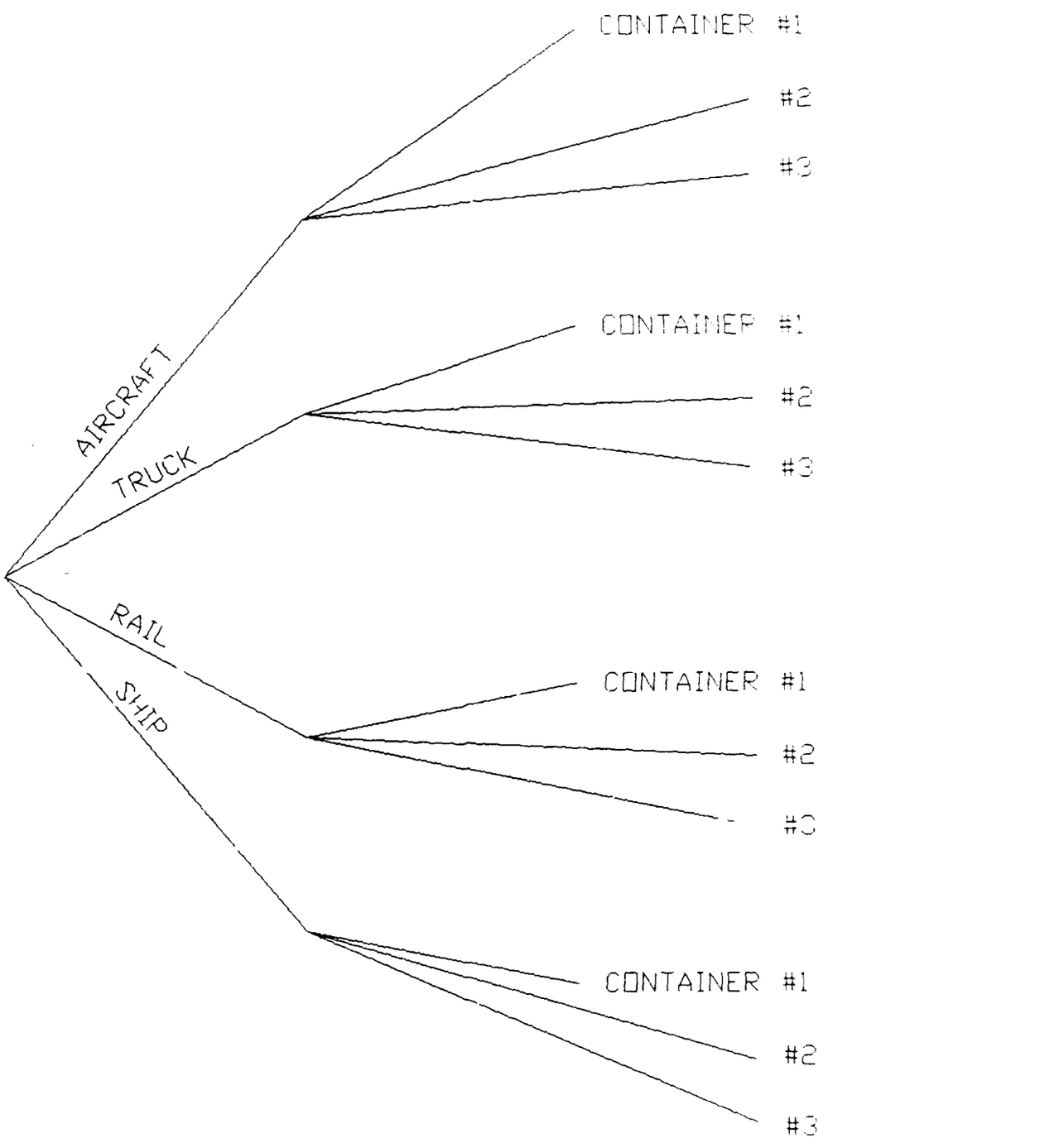

FIGURE 1

As a last note, SIMTEC has uses other than as a container evaluation technique. SIMTEC can help a container engineer design a container or can estimate the spares requirements (by inputing zero spares into the schedule) that will be necessary to satisfy a particular network. This spares value could change based upon the mode of transportation (for example, truck versus airlift) if shortened pipeline time results. The number of shipments per month could also affect the spares requirement.

As with all simulation models, SIMTEC does not give the decision maker a decision, but only increases information so a better decision can be made. There may be other factors that will also influence a decision. For example, this model assumes each container alternative provides adequate protection from damage (i.e., SIMTEC assumes all containers are equal). If the equipment is extremely expensive and fragile, an increase in shipping expense by not choosing the lowest life cycle cost container may be warranted. (Lowest life cycle cost is desirable, but item protection is a necessity). These types of contingencies can be evaluated outside of SIMTEC. The cost difference between competing containers will aid in making this type of decision.

FILE DESCRIPTION

Input Files

Four input data files (A/C Data, Container Data, Shipping Rates, Delivery Schedule) are needed to provide the necessary information to run SIMTEC. This input can be provided either by the use of previously existing files or by an interactive routine at the beginning of the program. This input routine asks for the necessary data and creates files on disk to run the program later without re-entering the data.

A/C Data File

The "A/C Data" file provides program control information plus engineering and operational data to generate failures and the subsequent shipping schedule. Figures 1 and 3 illustrate an example A/C data file.

This example shows data for an item, i.e., a radio used on the BI program. Note that data is needed for both the aircraft and the item being evaluated. Aircraft data describes the environment within which the item will be operated. The required data describes how often each item on each aircraft will actually be operating. Item level data also describes how reliable, how many items on each aircraft, and how often shipments must be made (maintenance concept) for each item failure. Note that these parameters may differ for the same item on different aircraft due to operating locations and applications. Figure 2 shows the aircraft data, number of flying hours, item failure rate, and related information required.

Figure 3 shows the detailed information for this aircraft at each operating location. All the information contained in these two Figures is stored in the "A/C Data" file. (Reference file B1-1).

```
R
1.  NUMBER OF YEARS IN LIFE CYCLE =  1
2.  NUMBER OF OPERATING LOCATIONS =  4
3.  NUMBER OF CTNRS, EVALUATED... =  3
4.  PRINT OPTION.................. =  1
    0 = RESULTS ONLY
    1 = FILES & RESULTS
5.  HELP OPTION................... =  0
    0 = SUPPRESSES PRINTING
    1 = PRINTS ARRAYS
6   LAST MONTH DELIVERY.......... = 10
        NUMBER FROM 1 TO 13
7.  SCHEDULE PRINT OPTION..... . =  2
    0 = NO SCHEDULE
    1 = SCHEDULE
    2 = SCHEDULE & A/C FILES ONCE
    3 = SCHEDULE & A/C FILES EACH MONTH
8.  INPUT SEED.................... = -26.00
9.  ITEM WEIGHT................... = 140.0
99
1.  A/C TYPE.......................... = B-1
2.  AVG. # FLYING HRS. PER YEAR....... =  900.00
3.  STD. DEVIATION INN FLYING HRS..... =  180.00
        USUALLY = 20% OF #2
4.  ACCUMULATED FLYING HRS............ =     .00
5.  STD. DEVIATION IN ACCUM FLYING HRS =     .00
        USUALLY = 20% OF #4
6.  AVG HRS BETWEEN PRGM DEPOT MAINT.. = 2000.00
7.  STD DEVIATION IN PRGM DEPOT MAIN.. =   40.00
        USUALLY = 20% OF #6
8.  NRTS: % OF ITEMS SENT TO DEPOT.... =    1.00
9.  MTBF FOR ITEM..................... =  500.00
10.  STD DEVIATION FOR MTBF........... =  100.00
        USUALLY = 20% OF #9
11.  TOTAL # A/C IN SIMULATION........ =   35
12.  PRESENT # OF A/C AT BASES........ =    0
13.  NUMBER OF ITEMS ON EACH A/C...... =    1
14.  NUMBER OF MONTHS THE A/C WILL BE
        DOWN FOR MAINTENANCE.......... =    4.00
15.  STD DEVIATION OF DOWNTIME........ =     .80
        USUALLY = 20% OF #14
     INPUT # TO CHANGE, 99 TO CONTINUE
99
```

FIGURE 2

```
THE NUMBER OF OPERATING LOCATIONS = 4
INFO FOR LOCATION 1
    1.  NUMBER OF A/C..................... = 16
    2.  MONTH THE A/C ARRIVE.......... =  2

ENTER THE # TO CHANGE, 99 TO CONTINUE
99

THE NUMBER OF OPERATING LOCATIONS = 4
INFO FOR LOCATION 2

    1.  NUMBER OF A/C..................... = 5
    2.  MONTH THE A/C ARRIVE......... = 5

ENTER THE # TO CHANGE, 99 TO CONTINUE
99

THE NUMBER OF OPERATING LOCATIONS = 4
INFO FOR LOCATION 3

    1.  NUMBER OF A/C..................... = 10
    2.  MONTH THE A/C ARRIVE......... =  7

ENTER THE # TO CHANGE, 99 TO CONTINUE
99

THE NUMBER OF OPERATING LOCATIONS = 4
INFO FOR LOCATION 4

    1.  NUMBER OF A/C..................... = 4
    2.  MONTH THE A/C ARRIVE......... = 8

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
```

FIGURE 3

NOTE: This 13 months/year is typically used in the business world. It is determined by dividing 52 weeks by 4 weeks for a month. This alleviates any problems of how to handle the extra days in the months). B-1 (2,5,7,8).

In this example all aircraft are new. If the aircraft are already in the inventory, then the "Month the A/C Arrive" data element would not be needed (no value would be entered) and the record would be entered before any new deliveries. The delivery schedule needs to be input in order. The order of bases is not important, i.e., deliveries to base 4 can be before base 3 because the timing of the deliveries control the program not the basing itself.

Container Data File

The "Container Data" file contains all pertinent container data and is the basis for the evaluation. Information includes container weight, life, cost, and pack/unpack time. Figure 4 is an example "Container Data" file.

The information contained in figure 4 is stored in file B1-2.

```
THE NUMBER OF CONTAINERS = 3
INFORMATION FOR CONTAINER # 1

1.  CONTAINER WEIGHT..................... =    190.00
2.  CONTAINER LIFE (# OF TRIPS)......... =      2.00
3.  CONTAINER COST...................... =    200.00
4.  LABOR IN MINUTES TO PACK/UNPK....... =     65.00
5.  CONTAINER MTBF (# OF TRIPS)......... =    100.00
6.  MAINTENANCE COST PER TRIP........... =    200.00
7.  CONTAINER NAME...................... =    NON-REUSAB

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
THE NUMBER OF CONTAINERS = 3
INFORMATION FOR CONTAINER # 2

1.  CONTAINER WEIGHT..................... =    204.00
2.  CONTAINER LIFE (# OF TRIPS)......... =     10.00
3.  CONTAINER COST...................... =    100.00
4.  LABOR IN MINUTES TO PACK/UNPACK..... =     65.00
5.  CONTAINER MTBF (# OF TRIPS)......... =      5.00
6.  MAINTENANCE COST PER TRIP........... =     10.00
7.  CONTAINER NAME...................... =    10-TRIP

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
THE NUMBER OF CONTAINERS = 3
INFORMATION FOR CONTAINER # 3

1.  CONTAINER WEIGHT..................... =    290.00
2.  CONTAINER LIFE (# OF TRIPS)......... =     20.00
3.  CONTAINER COST...................... =    100.00
4.  LABOR IN MINUTES TO PACK/UNPK....... =     65.00
5.  CONTAINER MTBF (# OF TRIPS)......... =      8.00
6.  MAINTENANCE COST PER TRIP........... =     25.00
7.  CONTAINER NAME...................... =     20 TRIP

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
```

FIGURE 4

NOTE: MTBF (5) and MAINTENANCE (6) data elements can be used in two ways:

a. As the number of trips between maintenance with its associated maintenance costs.

b. As the probability that a container is destroyed. If this is the case, the maintenance cost would equal the acquisition cost of a container/its contents. The following table illustrates values to be used (assuming probabilities of failures on one-way trips). For probabilities of failure on a round trip, double the MMTBF.

Prob	1%	10%	20%	50%
MMTBF	100	10	5	2

Shipping Rates Data File

The "Shipping Rates" file contains the variable cost per hundred pounds to ship the item for each shipping location and the length of time required for the shipment. Figures 5 and 6 show an example "Shipping Rates" file.

The first section is the shipping data from a prime contractor to an integrating contractor. The second set of data is the data from a prime contractor to the depot. If the analysis does not include new production these elements will be filled with zeros. The next four rows comprise the shipments from an operating location to the depot, since this example has only four operating locations. (Specifically, the number of rows of shipments represents the number of operating locations).

NOTE: There may be an additional expense for small shipments and this is why there are two entries for a shipment size less than 500 pounds. The first entry is one time charge to account for any such additional expense.

```
DATA FOR SHIPMENT : PRIME CONTR TO INTEGRATING CONTR
THIS IS PAGE 1 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS.. =     18.75
2.  COST PER 100 LBS. FOR UP TO 500 LB. ITEMS. =     15.80
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =     15.00
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =     14.80
5.  COST PER 100 LBS. FOR UP TO 5000 LBS..... =     14.00
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =     13.50
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =      5.00
8.  SHIPPING TIME IN WEEKS................... =      2.00

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
DATA FOR SHIPMENT : PRIME CONTR TO DEPOT
THIS is PAGE 2 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS.. =      2.0C
2.  COST PER 100 LBS. FOR UP TO 500 LB. ITEMS. =     15.00
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =     14.50
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =     14.00
5.  COST PER 100 LBS. FOR UP TO 5000 LBS..... =     13.50
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =     12.00
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =     11.00
8.  SHIPPING TIME IN WEEKS................... =      1.00

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
DATA FOR SHIPMENT : OPERATING LOCATION TO DEPOT
THIS IS PAGE 3 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS. =       .00
2.  COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =     10.00
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =      9.00
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =      8.00
5.  COST PER 100 LBS. FOR UP TO 5000 LBS..... =      7.00
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =      6.00
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =      5.00
8.  SHIPPING TIME IN WEEKS................... =      2.00

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
DATA FOR SHIPMENT : OPERATING LOCATION TO DEPOT
THIS IS PAGE 4 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS. =       .00
2.  COST PER 100 LBS. FOR UP TO 500 LBS...... =      6.00
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =      5.90
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =      5.80
5.  COST PER 100 LBS. FOR UP TO 5000 LBS..... =      4.90
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =      4.80
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =      3.00
8.  SHIPPING TIME IN WEEKS................... =      2.00
```

FIGURE 5

```
ENTER THE # TO CHANGE, 99 TO CONTINUE
99
DATA FOR SHIPMENT : OPERATING LOCATION TO DEPOT
THIS IS PAGE 5 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS.. =      .00
2.  COST PER 100 LBS. FOR UP TO 500 LB. ITEMS. =     5.00
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =     5.00
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =     5.00
5.  COST PER 100 LBS. FOR UP TO 5000 LBS..... =     5.00
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =     5.00
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =     5.00
8.  SHIPPING TIME IN WEEKS................... =     2.00

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
DATA FOR SHIPMENT : OPERATING LOCATION TO DEPOT
THIS IS PAGE 6 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS.. =      .00
2.  COST PER 100 LBS. FOR UP TO 500 LB. ITEMS. =     9.00
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =     8.00
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =     7.00
5.  COST PER 100 LBS. FOR UP TO 5000 LBS..... =     6.00
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =     5.00
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =     4.00
8.  SHIPPING TIME IN WEEKS................... =     2.00

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
DATA FOR SHIPMENT : RETURN EMPTY CTNR TO PRIME
THIS IS PAGE 7 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS. =      .00
2.  COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =    11.00
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =    11.00
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =    11.00
5.  COST PER 100 LBS. FOR UP TO 5000 LBS..... =    11.00
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =    11.00
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =    11.00
8.  SHIPPING TIME IN WEEKS................... =     2.00

ENTER THE # TO CHANGE, 99 TO CONTINUE
99
DATA FOR SHIPMENT : RETURN EMPTY CTNR TO PRIME
THIS IS PAGE 8 OF 8 PAGES OF SHIPPING DATA

1.  ONE TIME SURCHARGE FOR LESS THAN 500 LBS. =      .00
2.  COST PER 100 LBS. FOR UP TO 500 LBS...... =     3.00
3.  COST PER 100 LBS. FOR UP TO 1000 LBS..... =     3.00
4.  COST PER 100 LBS. FOR UP TO 2000 LBS..... =     3.00
5.  COST PER 100 LBS. FOR OP TO 5000 LBS..... =     3.00
6.  COST PER 100 LBS. FOR UP TO 24000 LBS.... =     3.00
7.  COST PER 100 LBS. FOR OVER 24000 LBS..... =     3.00
8.  SHIPPING TIME IN WEEKS................... =     2.00
```

FIGURE 6

DELIVERY SCHEDULE FILE

The "Delivery Schedule" file contains the production and spares delivery schedules. This data is used for fielding a new aircraft system. If analysis is for a mature system all data would be zeros.

NOTE: This file is an unformatted (random access) file, and cannot be typed out. The only way to view or modify this data is to run SIMTEC.

The seventh set of data is for shipping empty containers back to the prime contractor from the integrating contractor. (This occurs because empty containers have different cost rates than full containers). The last section contains information for shipping any leftover empty containers from the prime contractor to the depot after production is finished. The shipping time for the operating locations is to be the length of time in weeks to complete a round-trip (including maintenance time). To reemphasize, all data must be completed even if rates do not vary for different shipment sizes.

The information contained in Figures 5 and 6 is stored in file B1-3.

PROGRAM OPERATION

Throughout the remainder of this guide, all underlined words are to be typed in by the user. A carriage return is indicated by the symbol "↵".

SIMTEC is programmed for use on IBM-PC compatible computers. Operating SIMTEC on other computer systems will necessitate code changes so the model can interface with the system. Most changes will center around system-unique requirements since SIMTEC is written in FORTRAN 77.

Because SIMTEC requires extensive file manipulation it should be loaded onto a Winchester-type hard disk before running. Operation from the floppy disk will be very time consuming.

Copy the entire floppy disk using the copy *.* MSDOS Command, then put the floppy disk in a safe place as a backup disk.

If you elect to run SIMTEC from the floppy disk you should first make a backup copy using the procedure outlined above.

RUNNING SIMTEC

"7" You are now ready to run SIMTEC. Input the following command at the prompt:

7SIMTEC↵

A series of questions follow this command allowing the user to attach, create, and/or modify data files. Sample files are provided for instruction, refer to Appendix B for file names. The user can enter values or use existing data for production delivery schedules, spares delivery schedules, and predict a new monthly failure distribution. If there is a change to either or both delivery schedules, the program will enable the user to input the month and the number of containers that are to arrive. If there are no changes to be made, the program will omit the additional questions and the shipping rates file, and the results, provided number 4 Print Option = 1. If the print option = 0, then only the results will be printed. the "Operating Location Record", and "Aircraft Record" schedules will be suppressed.

An example printout of the program operation is included in Appendix B.

Note that the printout consists of an input routine for file management, a shipping schedule, container data, shipping cost, and container programs (one for each option). These areas are discussed in detail below.

Shipping Schedules

The shipping schedule is a permanent file created by SIMTEC. If a new production or spare delivery is required, all monthly deliveries must be changed since all previous data will be retained until updated. Once the complete schedule is created, the run time of SIMTEC is shortened (if no changes are required and failures need not be predicted), and SIMTEC will use the previously predicted data to evaluate additional containers or to do sensitivity runs. Note that the first two lines of the shipping schedule are input while the remaining four lines are computer generated.

1. # of FAILURES = Total of the computer generated output in the shipping schedule. (Last 4 lines in this particular case.) This is a computer generated value.

2. # of SHIPMENTS = # of failures times the NRTS rate. (In this case the NRTS rate is 1.0, so the number of shipments = number of failures). This is a computer generated value.

3. MONTH = How long it ran. (In this case the model ran for 13 months - 1 business year.) This value is a computer generated value.

Container Data. The data is input on the "Container Data" data file.

Shipping Data. The values in this table are input on the "Shipping Rates" data file.

Container Program. These values are all computer generated. Note that there are 3 of these - one for each type of shipping container evaluated.

1. TOTAL CONTAINERS = total number of containers needed to satisfy shipping schedule using a particular container.

2. SPARE STORAGE = number of containers used to store an item.

3. PROD SHIP = number of containers used as production containers.

4. CONTAINER COST = total cost of container being evaluated.

5. SHIPPING COST = total cost of shipping the containers.

6. PACK/UNPACK COST = total cost to pack and unpack the containers.

7. TOTAL COST OF THIS OPTION = total cost to satisfy the shipping schedule (CONTAINER COST + SHIPPING COST + PACK/UNPACK COST).

8. NUMBER OF EXTRA SPARES REQUIRED = extra spare items (radios, engines, etc.) needed to satisfy the schedule. Note, SIMTEC looks for available assets when needed. Even though spare items may be indicated, more assets may not be needed, but only delivered earlier to meet the demands.

9. NUMBER OF REPLACEMENT CONTAINERS = containers purchased to replace old containers.

10. # OF PROD CONTAINERS USED ALSO AS SPARES = number of production containers which are used as spares.

11. # OF CONTAINERS SHIPPED TO DEPOT & NOT USED = number of containers shipped to the depot which can be reused but are not. Note, this information is printed out because SIMTEC does not ship available empty containers from the prime to the depot until production is finished, so SIMTEC may purchase more containers than would really be needed.

Through simulating the "real world," SIMTEC predicts failures, generates a shipping schedule based on engineering and logistics data and shows trade-offs available to lower transportation costs. Additionally, sensitivity runs enable the decision maker to obtain more information about the environment.

As with all simulation models, SIMTEC does not make a decision but rather provides increased information so a more intelligent decision may result.

APPENDIX A

The model was developed for the Air Force to evaluate engine containers for the Air Launched Cruise Missile. There were five available containers and one proposed container in the evaluation. Different shipment sizes were also being evaluated to trade-off lower shipping costs (quantity discounts) with the possibility of needing additional containers.

Table I lists the six containers evaluated. Note the variance among the four data elements among the six container candidates. This illustrates that there are a variety of container options available that will satisfy the operational need.

CONTAINER DATA

CONTAINER	TYPE	WEIGHT	LIFE	COST	PACK/UNPACK TIME (MIN)
1	Double Wall (DW-FIP) Foam-In-Place	58	2	$ 75.00	65
2	Triple Wall (TW-FIP) Foam-In-Place	164	10	$100.00	65
3	Wood Foam-In-Place	169	20	$100.00	65
4	Wood-Metal	295	30	$200.00	100
5	Aluminum	170	9999	$900.00	100
6	Fiberglass	50	100	$200.00	65

*#one-way trips; 999 indicates unlimited life.

TABLE I

In this evaluation different shipping modes were not evaluated, but different shipment sizes were evaluated by allowing quantity discounts for larger shipments using commercial shippers. Rates do not vary between operating locations and depot. In the military shipping system costs are based only on volume rather than weight. Different rates were used for shipping empty containers, depending on whether the container material is wood or metal.

There are peculiarities in this network which affect life cycle transportation costs. The peculiarities are programmed into the model so that cost effects are considered in the final results.

The first peculiarity is an engine inventory requirement. The prime manufacturer requires an engine inventory for assembly of the missile system. This inventory of engines will affect the number of potential reusable containers, but not the number of potential nonreusable containers. The reason is that the reusable containers will not be freed for further shipping demands until the prime manufacturer's inventory requirements is satisfied. Hence, additional reusable containers must be acquired. New containers must be acquired for every shipping demand if the containers are nonreusable, so the inventory will not impact the total number of nonreusable containers. The production inventory requirement is equivalent to a 60-day supply of engines.

There are also two engine maintenance activities. These depot demands generate from the operating locations. The processes are recertification and refurbishment of the engine and both are a function of time, rather than being caused by a failure. Seven days are needed for recertification and 21 days are needed for refurbishment. Recertification time and refurbishment time affect the number of whole spare engines needed to fill the pipeline. While these processes are being performed, the spare engines are not available to satisfy further demands.

Figure 1 illustrates the transportation network approximated by the model. Containers with production engines are shipped from the engine manufacturer to the prime contractor, and returned empty if the container is reusable. Containers with spare engines are shipped from the engine manufacturer to the depot and will also serve as storage containers. After production is finished, all serviceable containers are shipped empty to the depot as replacement containers. Finally, full containers are shipped to and from the operating locations and the depot for recertification and refurbishment of the engines. Shipments require one week, i.e., round-trips require two weeks.

SHIPPING NETWORK

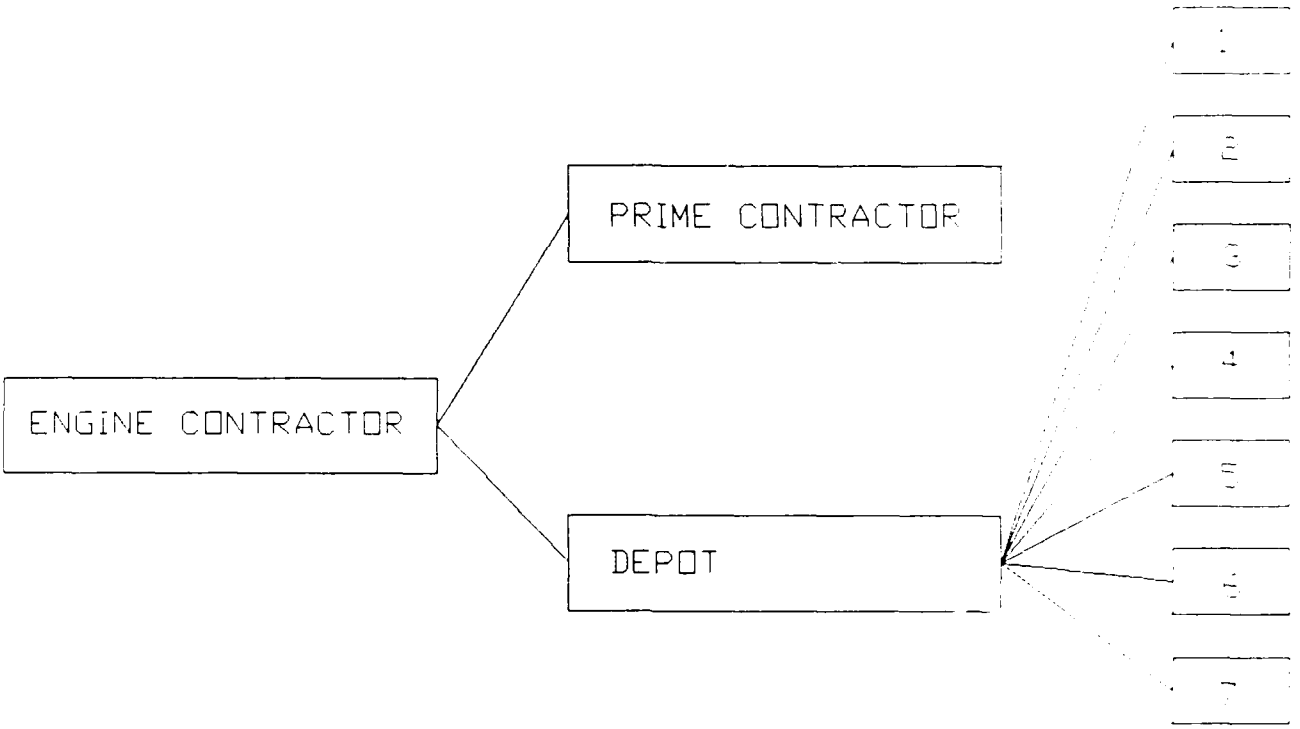

FIGURE 1

RESULTS

The fiberglass container shows the lowest life cycle cost, used for both production and depot deliveries, among the six containers evaluated. The fiberglass container is the most economical container because its data elements were most suited for this shipping network with its constraints. Long life, low weight, moderate cost, and moderate labor expense are all associated with the fiberglass container. For another shipping network, with its own schedule, rates, and constraints another container may be more economical than the fiberglass option. Table II shows possible cost savings from using the fiberglass container. The fiberglass containers shows a cost advantage of over $250,000 when compared to TW-FIP container, the next lowest cost option, and this does not include the cost of foam-in-place equipment. Also shown is that transportation costs can double by selecting an inappropriate container. The wood-metal option has a transportation expense twice the transportation expense of the fiberglass option.

COST COMPARISON

	CONT	DEV COST	CONT COST	SHIP COST	PK/UNPK COST	TOTAL COST
TW-FIP	2,162	$ 0	$216,200	$777,630	$108,147	$1,101,977
FIBERG	371	6,000	74,200	656,910	108,147	845,257
DIFFER	1,791	($6,000)	$142,000	$120,720	$ 0	$ 256,720
WD-MET	784	$ 0	$156,800	$1,249,741	$299,484	$1,706,025
FIBERG	371	6,000	$ 74,200	656,910	108,147	845,257
DIFFER	413	($6,000)	$ 82,600	$ 592,831	$191,337	$ 860,768

TABLE II

The fiberglass option is the only container which has not been fully developed, so the data for the container are engineering estimates. A sensitivity analysis was performed because of the uncertainty related to data for a container requiring additional development. Also, the sensitivity analysis highlights cost drivers that affect transportation costs which illustrates another use of the model.

Weight sensitivity is evaluated by steadily increasing the weight of the fiberglass container while holding engine weight constant. Figure III is a graph showing the weight line. As shown, the fiberglass option remains as the lowest cost option as long as the weight of the container including engine is less than 250 pounds.

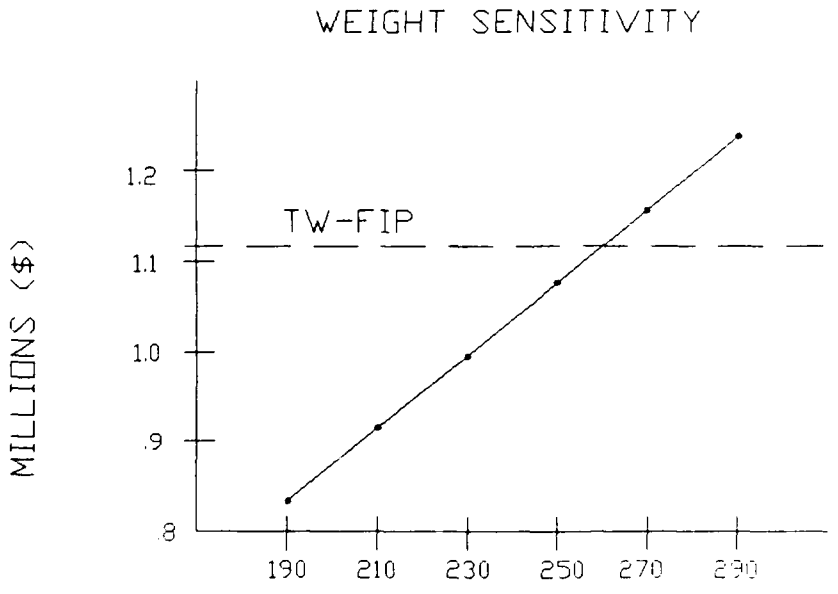

FIGURE 3

Figure IV shows that the acquisition cost of the fiberglass container is not very sensitive. Acquisition costs are raised to $900 per container and the fiberglass container remains the lowest life cycle cost option. Cost is not sensitive because less fiberglass containers are needed for the program than TW-FIP containers. The fiberglass container is good for 100 one-way trips compared to 10 one-way trips for the TW-FIP container.

NUMBER OF REQUIRED CONTAINERS

Monthly Shipments

Fiberglass	TW-FIP
371	2,178

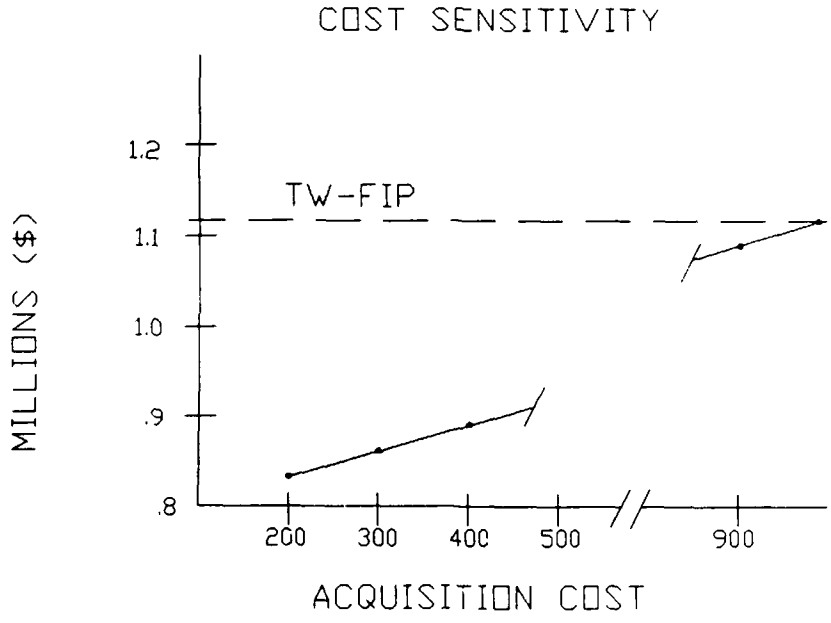

FIGURE 4

Durability sensitivity shows that as long as the life of the fiberglass container is greater than 75 one-way trips, costs do not change. When the life drops below 60 trips, costs begin to rise since more and more replacement containers are needed. Figure V illustrates the durability sensitivity.

CONTAINER DURABILITY

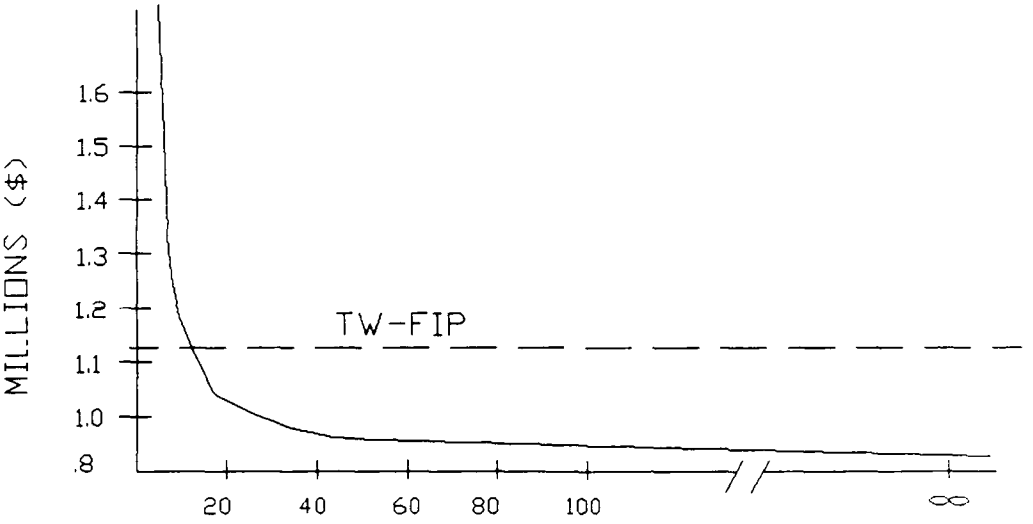

FIGURE 5

Pack/unpack sensitivity is not evaluated since the data used is considered a worse possible case, and a much lower pack/unpack time is expected in reality.

APPENDIX B

```
**********************************************
**********       SIMTEC             ***********
**********  SIMULATION TECHNIQUE    ***********
**********       FOR                ***********
**********   SHIPPING CONTAINERS    ***********
**********      VERSION 2.2         ***********
**********    26 APRIL 1988         ***********
**********************************************
**********************************************

          LIFE CYCLE COST ANALYSIS
        AF PACKAGING EVALUATION ACTIVITY

 ENTER "O" TO READ OLD A/C DATA FILE
   OR "N" TO CREATE A NEW A/C DATA FILE
    "O" IS THE DEFAULT

 ENTER YOUR A/C DATA FILENAME
B1-1
 ENTER "R" TO REVIEW THE A/C DATA FILE
 ENTER "S" TO SKIP TO THE CONTAINER DATA FILE
   "S" IS THE DEFAULT
R
1. NUMBER OF YEARS IN LIFE CYCLE =  1
2. # OF OPERATING LOCATIONS.....=  4
3. # OF CTNRS. EVALUATED.......=  3
4. PRINT OPTION.................=  1
    0 = RESULTS ONLY
    1 = FILES & RESULTS
5. HELP OPTION..................=  0
    0 = SUPPRESSES PRINTING
    1 = PRINTS ARRAYS
6. LAST MONTH DELIVERY .........=  10
      NUMBER FROM 1 TO 13
7. SCHEDULE PRINT OPTION .......=  2
     0 = NO SCHEDULE
     1 = SCHEDULE
     2 = SCHEDULE & A/C FILES ONCE
     3 = SCHEDULE & A/C FILES EACH MONTH
8. INPUT SEED ..................= -26.00
9. ITEM WEIGHT .................=  140.0
 INPUT # TO CHANGE, 99 TO CONTINUE
   99 IS THE DEFAULT

1. A/C TYPE ....................= B-1
2. AVG. # FLYING HRS. PER YEAR.....=   900.00
3. STD. DEVIATION IN FLYING HRS.....=   180.00
       USUALLY = 20% OF #2
4. ACCUMULATED FLYING HRS ..........=      .00
5. STD. DEVIATION IN ACCUM FLYING HRS=     .00
       USUALLY = 20% OF #4
6. AVG HRS BETWEEN PRGM DEPOT MAINT..=  2000.00
7. STD DEVIATION IN PRGM DEPOT MAINT =    40.00
       USUALLY = 20% OF #6
8. NRTS: % OF ITEMS SENT TO DEPOT ...=     1.00
9. MTBF FOR ITEM ...................=   500.00
10. STD DEVIATION FOR MTBF .........=   100.00
       USUALLY = 20% OF # 9
11. TOTAL # A/C IN SIMULATIION .....=    35
12. PRESENT # OF A/C AT BASES ......=     0
13. # OF ITEMS ON EACH A/C .........=     1
14. # OF MONTHS THE A/C WILL BE
     DOWN FOR MAINTENANCE...........= 4.00
15. STD DEVIATION OF DOWNTIME ......=  .80
       USUALLY = 20% OF #14
  INPUT # TO CHANGE, 99 TO CONTINUE
     99 IS THE DEFAULT
```

```
THE NUMBER OF OPERATING LOCATIONS =  4
INFO FOR LOCATION  1
   1. # OF A/C ..............=     12
   2. MONTH THE A/C ARRIVE ...=      1

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT
```

```
THE NUMBER OF OPERATING LOCATIONS =  4
INFO FOR LOCATION  2
   1. # OF A/C ..............=      5
   2. MONTH THE A/C ARRIVE ...=      5

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT
```

```
THE NUMBER OF OPERATING LOCATIONS =  4
INFO FOR LOCATION  3
   1. # OF A/C ..............=     10
   2. MONTH THE A/C ARRIVE ...=      7

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT
```

```
THE NUMBER OF OPERATING LOCATIONS =  4
INFO FOR LOCATION  4
   1. # OF A/C ..............=      4
   2. MONTH THE A/C ARRIVE ...=      8

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT
```

```
 YOU HAVE COMPLETED THE A L DATA LIST
   ENTER 99 TO CONTINUE, 1 TO REVIEW LIST
     99 IS THE DEFAULT

 ENTER "O" TO READ THE OLD CONTAINER DATA FILE
 ENTER "N" TO CREATE A NEW CONTAINER DATA FILE
    "O" IS THE DEFAULT

 ENTER YOUR CONTAINER DATA FILENAME
B1-2
 ENTER "R" TO REVIEW THE CONTAINER DATA FILE
 ENTER "S" TO SKIP TO THE SHIPPING RATES FILE
    "S" IS THE DEFAULT
R



THE NUMBER OF CONTAINERS =  3
INFORMATION FOR CONTAINER  #  1
1. CONTAINER WEIGHT .............=    190.00
2. CONTAINER LIFE (# OF TRIPS)...=      2.00
3. CONTAINER COST ...............=    200.00
4. LABOR IN MINUTES TO PACK/UNPK.=     65.00
5. CONTAINER MTBF (# OF TRIPS)...=    100.00
6. MAINTENANCE COST PER TRIP ....=    200.00
7. CONTAINER NAME ...............= NON-REUSAB

 ENTER THE # TO CHANGE, 99 TO CONTINUE
    99 IS THE DEFAULT

THE NUMBER OF CONTAINERS =  3
INFORMATION FOR CONTAINER  #  2
1. CONTAINER WEIGHT .............=    204.00
2. CONTAINER LIFE (# OF TRIPS)...=     10.00
3. CONTAINER COST ...............=    100.00
4. LABOR IN MINUTES TO PACK/UNPK.=     65.00
5. CONTAINER MTBF (# OF TRIPS)...=      5.00
6. MAINTENANCE COST PER TRIP ....=     10.00
7. CONTAINER NAME ...............= 10-TRIP

 ENTER THE # TO CHANGE, 99 TO CONTINUE
    99 IS THE DEFAULT

THE NUMBER OF CONTAINERS =  3
INFORMATION FOR CONTAINER  #  3
1. CONTAINER WEIGHT .............=    240.00
2. CONTAINER LIFE (# OF TRIPS)...=     20.00
3. CONTAINER COST ...............=    100.00
4. LABOR IN MINUTES TO PACK/UNPK.=     65.00
5. CONTAINER MTBF (# OF TRIPS)...=      8.00
6. MAINTENANCE COST PER TRIP ....=     25.00
7. CONTAINER NAME ...............= 20-TRIP

 ENTER THE # TO CHANGE, 99 TO CONTINUE
    99 IS THE DEFAULT
```

```
 YOU HAVE COMPLETED THE CONTAINER DATA LIST
    ENTER 99 TO CONTINUE, 1 TO REVISW
       99 IS THE DEFAULT

 ENTER "O" TO READ AN OLD SHIPPING RATES FILE
 ENTER "N" TO CREATE A NEW SHIPPING RATES FILE
     "O" IS THE DEFAULT

 ENTER YOUR SHIPPING RATES DATA FILENAME
B1-3
 ENTER "R" TO REVIEW THE SHIPPING RATES FILE
 ENTER "S" TO SKIP TO THE DELIVERY SCHEDULE FILE
      "S" IS THE DEFAULT
R



DATA FOR SHIPMENT : PRIME CONTR TO INTEGRATING CONTR
THIS IS PAGE  1 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=      18.75
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =      15.80
3. COST PER 100 LBS. FOR UP TO 1000 LBS.....=      15.00
4. COST PER 100 LBS. FOR UP TO 2000 LBS.....=      14.80
5. COST PER 100 LBS. FOR UP TO 5000 LBS.....=      14.00
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=     13.50
7. COST PER 100 LBS. FOR OVER 24000 LBS.....=       5.00
8. SHIPPING TIME IN WEEKS ..................=       2.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT

DATA FOR SHIPMENT : PRIME CONTR TO DEPOT
THIS IS PAGE  2 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=       2.00
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =      15.00
3. COST PER 100 LBS. FOR UP TO 1000 LBS.....=      14.50
4. COST PER 100 LBS. FOR UP TO 2000 LBS.....=      14.00
5. COST PER 100 LBS. FOR UP TO 5000 LBS.....=      13.50
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=     12.00
7. COST PER 100 LBS. FOR OVER 24000 LBS.....=      11.00
8. SHIPPING TIME IN WEEKS ..................=       1.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT

DATA FOR SHIPMENT :  OPERATING LOCATION TO DEPOT
THIS IS PAGE  3 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=        .00
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =      10.00
3. COST PER 100 LBS. FOR UP TO 1000 LBS.....=       9.00
4. COST PER 100 LBS. FOR UP TO 2000 LBS.....=       8.00
5. COST PER 100 LBS. FOR UP TO 5000 LBS.....=       7.00
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=      6.00
7. COST PER 100 LBS. FOR OVER 24000 LBS.....=       5.00
8. SHIPPING TIME IN WEEKS .. ...............=       2.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT
```

```
DATA FOR SHIPMENT :  OPERATING LOCATION TO DEPOT
THIS IS PAGE  4 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=        .00
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =       6.00
3. COST PER 100 LBS. FOR UP TO 1000 LBS......=       5.90
4. COST PER 100 LBS. FOR UP TO 2000 LBS......=       5.80
5. COST PER 100 LBS. FOR UP TO 5000 LBS......=       4.90
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=       4.80
7. COST PER 100 LBS. FOR OVER 24000 LBS......=       3.00
8. SHIPPING TIME IN WEEKS ...................=       2.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT

DATA FOR SHIPMENT :  OPERATING LOCATION TO DEPOT
THIS IS PAGE  5 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=        .00
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =       5.00
3. COST PER 100 LBS. FOR UP TO 1000 LBS......=       5.00
4. COST PER 100 LBS. FOR UP TO 2000 LBS......=       5.00
5. COST PER 100 LBS. FOR UP TO 5000 LBS......=       5.00
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=       5.00
7. COST PER 100 LBS. FOR OVER 24000 LBS......=       5.00
8. SHIPPING TIME IN WEEKS ...................=       2.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT

DATA FOR SHIPMENT :  OPERATING LOCATION TO DEPOT
THIS IS PAGE  6 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=        .00
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =       9.00
3. COST PER 100 LBS. FOR UP TO 1000 LBS......=       8.00
4. COST PER 100 LBS. FOR UP TO 2000 LBS......=       7.00
5. COST PER 100 LBS. FOR UP TO 5000 LBS......=       6.00
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=       5.00
7. COST PER 100 LBS. FOR OVER 24000 LBS......=       4.00
8. SHIPPING TIME IN WEEKS ...................=       2.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT

DATA FOR SHIPMENT : RETURN EMPTY CTNR TO PRIME
THIS IS PAGE  7 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=        .00
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =      11.00
3. COST PER 100 LBS. FOR UP TO 1000 LBS......=      11.00
4. COST PER 100 LBS. FOR UP TO 2000 LBS......=      11.00
5. COST PER 100 LBS. FOR UP TO 5000 LBS......=      11.00
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=      11.00
7. COST PER 100 LBS. FOR OVER 24000 LBS......=      11.00
8. SHIPPING TIME IN WEEKS ...................=       2.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT

DATA FOR SHIPMENT : RETURN EMPTY CTNR TO DEPOT
THIS IS PAGE  8 OF  8 PAGES OF SHIPPING DATA
1. ONE TIME SURCHARGE FOR LESS THAN 500 LBS..=        .00
2. COST PER 100 LBS. FOR UP TO 500 LB. ITEMS =       3.00
3. COST PER 100 LBS. FOR UP TO 1000 LBS......=       3.00
4. COST PER 100 LBS. FOR UP TO 2000 LBS......=       3.00
5. COST PER 100 LBS. FOR UP TO 5000 LBS......=       3.00
6. COST PER 100 LBS. FOR UP TO 24000 LBS.....=       3.00
7. COST PER 100 LBS. FOR OVER 24000 LBS......=       3.00
8. SHIPPING TIME IN WEEKS ...................=       2.00

 ENTER THE # TO CHANGE, 99 TO CONTINUE
      99 IS THE DEFAULT
```

```
 YOU HAVE COMPLETED THE SHIPPING DATA LIST.
       ENTER 99 TO CONTINUE. 1 TO REVIEW
           99 IS THE DEFAULT




 ENTER "O" TO READ AN OLD DELIVERY SCHEDULE FILE
 ENTER "N" TO CREATE A NEW DELIVERY SCHEDULE FILE
      "O" IS THE DEFAULT

 ENTER YOUR DELIVERY SCHEDULE FILENAME
B1-4
DO YOU NEED TO MAKE ANY DELIVERY SCHEDULE CHANGES ?
ENTER Y OR N ("Y" IS THE DEFAULT)

  "Y" WILL DISPLAY THE CURRENT SCHEDULES


CURRENT PRODUCTION DELIVERY SCHEDULE IS :

     9   16   20   37   49   55   52   35   21   15    0    0    0
DO YOU WISH TO CHANGE PRODUCTION DELIVERY SCHEDULE DATA?
ENTER Y OR N  ("N" IS THE DEFAULT)

 CAUTION !! "Y" DESTROYS THE EXISTING SCHEDULE!!


CURRENT SPARES DELIVERY SCHEDULE IS :

    11   22   28   34   39   39   56   47   41   25   18   12   12
DO YOU WISH TO CHANGE SPARES DELIVERY SCHEDULE DATA?
ENTER Y OR N  ("N" IS THE DEFAULT)

 CAUTION!! "Y" DESTROYS THE EXISTING SCHEDULE!!


DO YOU NEED TO PREDICT A NEW SHIPPING SCHEDULE?
ENTER Y OR N  ("Y" IS THE DEFAULT)
```

OPERATING LOCATION RECORD

LOC	DOWN	FH	HRS	REC	NUM
1	0	69.23	.00	0	15.00
2	0	69.23	.00	0	5.00
3	0	69.23	.00	0	10.00
4	0	69.23	.00	0	4.00

AIRCRAFT RECORD

	ACTM	FDMNXT	OPT	FPT	LOC	FLAG
1	919.59	1903.75	398.67	617.73	1	0
2	871.75	2043.60	285.54	641.11	1	0
3	800.91	1925.10	284.30	364.74	1	0
4	798.38	2051.32	78.64	464.52	1	0
5	810.89	1974.34	367.76	607.97	1	0
6	839.22	2032.82	178.98	481.43	1	0
7	750.59	1948.40	19.94	270.52	1	0
8	798.15	2082.54	386.08	499.01	1	0
9	944.36	1982.00	303.80	695.79	1	0
10	781.75	1999.63	201.06	290.34	1	0
11	855.62	1986.61	387.27	409.01	1	0
12	884.66	2030.20	104.90	704.96	1	0
13	776.58	2032.60	403.93	531.42	1	0
14	785.27	1964.07	180.00	433.89	1	0
15	861.27	1999.84	497.90	594.22	1	0
16	761.37	2029.04	336.28	498.77	1	0
17	561.20	1981.48	219.30	488.04	2	0
18	611.99	1920.48	432.56	562.71	2	0
19	635.86	2030.56	217.63	360.99	2	0
20	646.01	1962.70	245.50	597.93	2	0
21	606.67	2020.59	49.50	499.12	2	0
22	443.68	2026.03	192.39	575.74	3	0
23	545.84	2030.80	94.43	564.13	3	0
24	510.95	2052.99	34.14	367.22	3	0
25	549.32	2079.40	562.26	742.19	3	0
26	542.93	2037.84	137.39	478.97	3	0
27	464.78	1997.50	122.18	380.72	3	0
28	480.05	1905.33	147.37	711.42	3	0
29	480.08	1957.34	261.02	376.29	3	0
30	492.92	2039.06	258.98	483.65	3	0
31	492.07	2060.92	258.42	652.80	3	0
32	419.70	1982.79	15.44	463.93	4	0
33	399.12	1980.32	50.28	363.97	4	0
34	468.26	1991.93	138.22	626.28	4	0
35	455.82	2082.95	187.86	494.51	4	0

SHIPPING SCHEDULE

	1	2	3	4	5	6
1	9	11	0	0	0	0
2	16	22	0	0	0	0
3	20	28	0	0	0	0
4	37	34	1	0	0	0
5	49	39	6	0	0	0
6	55	39	6	0	0	0
7	52	56	2	1	1	0
8	35	47	2	0	1	0
9	21	41	3	3	0	0
10	15	25	5	0	2	0
11	0	18	4	3	3	0
12	0	12	3	2	3	2

# OF FAILURES	# OF SHIPMENTS	MONTH
57	57	14

CONTAINER DATA

NAME	WT	LIFE	COST	LABOR/MIN	MTBF	MAINTENANCE
NON-REUSAB	190.	2.	200.	65.	100.	200.
10-TRIP	204.	10.	100.	65.	5.	10.
20-TRIP	290.	20.	100.	65.	8.	25.

SHIPPING COSTS

<500	<500	<1000	<2000	<5000	<24000	>24000	SHIP-TIME (W
18.75	15.80	15.00	14.80	14.00	13.50	5.00	2.00
2.00	15.00	14.50	14.00	13.50	12.00	11.00	1.00
.00	10.00	9.00	8.00	7.00	6.00	5.00	2.00
.00	6.00	5.90	5.80	4.90	4.80	3.00	2.00
.00	5.00	5.00	5.00	5.00	5.00	5.00	2.00
.00	9.00	8.00	7.00	6.00	5.00	4.00	2.00
.00	11.00	11.00	11.00	11.00	11.00	11.00	2.00
.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00

CONTAINER PROGRAM
****

TOTAL CONTAINERS	SPARES STORAGE	PROD SHIP	CONTAINER COST	SHIPPING COST	PACK/UNPACK COST	CONTAINER MAINTENANCE
1161	852	309	232200.00	30705.74	5245.50	200.0

THESE RESULTS USE CONTAINER TYPE : NON-REUSAB
AS THE PRODUCTION SHIPPING CONTAINER

**TOTAL COST OF THIS OPTION = 268351.30

NUMBER OF EXTRA SPARES REQUIRED = 27
NUMBER OF REPLACEMENT CONTAINERS = 441
OF PROD CONTAINERS USED ALSO FOR SPARES = 0
OF CONT SHIPPED TO DEPOT FOR REUSE= 0
OF CONTAINERS SHIPPED TO DEPOT & NOT USED= 0

CONTAINER PROGRAM
****

TOTAL CONTAINERS	SPARES STORAGE	PROD SHIP	CONTAINER COST	SHIPPING COST	PACK/UNPACK COST	CONTAINER MAINTENANCE
720	411	309	72000.00	12724.22	5245.50	3000.0

THESE RESULTS USE CONTAINER TYPE : 10-TRIP
AS THE PRODUCTION SHIPPING CONTAINER

**TOTAL COST OF THIS OPTION = 112969.70

NUMBER OF EXTRA SPARES REQUIRED = 27
NUMBER OF REPLACEMENT CONTAINERS = 0
OF PROD CONTAINERS USED ALSO FOR SPARES = 0
OF CONT SHIPPED TO DEPOT FOR REUSE= 8
OF CONTAINERS SHIPPED TO DEPOT & NOT USED= 8

CONTAINER PROGRAM
****

TOTAL CONTAINERS	SPARES STORAGE	PROD SHIP	CONTAINER COST	SHIPPING COST	FAC UNFAC COST	CONTAINER MAINTENANCE
**********	*******	****	*********	********	**********	**********
720	411	309	72000.00	45934.87	5245.50	4325.00

THESE RESULTS USE CONTAINER TYPE : 20-TRIP
AS THE PRODUCTION SHIPPING CONTAINER

**TOTAL COST OF THIS OPTION = 127505.40

NUMBER OF EXTRA SPARES REQUIRED = 27
NUMBER OF REPLACEMENT CONTAINERS = 0
OF PROD CONTAINERS USED ALSO FOR SPARES = 0
OF CONT SHIPPED TO DEPOT FOR REUSE= 0
OF CONTAINERS SHIPPED TO DEPOT & NOT USED= 0

Stop - Program terminated.