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STRUCTURAL AREA INSPECTION FREQUENCY EVALUATION (SAIFE)

Volume IV. Software Documentation and User's Manual

Book 1. Initial Program

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DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

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FINAL REPORT

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16. Abstract

To assist in the evaluation of proposed structural inspection programs for commercial jet transport aircraft, a logic was developed to simulate structural defects, failures, and inspections. This logic was incorporated in a computer program entitled Structural Area Inspection Frequency Evaluation (SAIFE). With the objective of quantifying the evaluation process currently used to establish and modify inspection intervals, SAIFE accounts for the following factors: (1) aircraft design analysis; (2) fatigue testing; (3) production, service, and corrosion defects; (4) probability of crack or corrosion detection; and (5) aircraft modification economics. As a five-volume document, this report covers the initial contract effort plus a subsequent parametric analysis as follows: Volume I (entitled Executive Summary) presents the SAIFE logic and documents the methodology for the decision-making processes in the simulation logic. Volume II (entitled Description of Simulation Logic) details the SAIFE simulation logic, presents the background data for the analytical functions and decision-making processes, and includes data for a typical simulation problem. Volume III (entitled Demonstration Input, Inspection Survey, and MRR Data) presents data tabulations derived from historical trends and design input data for a SAIFE demonstration problem. As the user's manual for the SAIFE computer program, Volume IV contains detailed computer logic flow diagrams and a complete listing of the program which is written in SIMSCRIPT II.5. Volume V (entitled Results of Model Demonstration) presents the results of the program application to a hypothetical aircraft and compares these results with the service experience of operational aircraft.

17. Key Words	18. Distribution Statement
Aircraft experience simulation; aircraft inspection intervals; aircraft hazard rate and reliability; production, service, and corrosion defects; crack or corrosion detection probability; crack growth.	Document is available to the public through the National Technical Information Service, Springfield, Virginia 22151.

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METRIC CONVERSION FACTORS

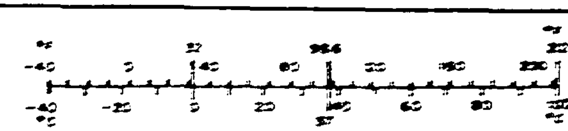
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



PREFACE

Technology Incorporated prepared this fourth volume of a five-volume report to document the simulation logic for the Structural Area Inspection Frequency Evaluation (SAIFE) in accordance with Article II, paragraph B of Contract DOT-FA74WA-3493. (Volume IV along with Volume V completes the requirements of Phase III of the contract.) The effort is sponsored by the Aircraft Safety and Noise Abatement Division, Systems Research and Development Service of the Federal Aviation Administration.

The principal Technology Incorporated personnel engaged on this program were Mr. Carter J. Dinkeloo, project engineer, who served as principal investigator; Mr. Martin S. Moran, research engineer, who developed the model for the SAIFE computer program; and Mr. Ronald I. Rockafellow, program manager.

The contract monitors for the FAA were Messrs. Herbert Spicer and Charles Troha of the Aircraft Safety and Noise Abatement Division. The technical monitor was Mr. Arnold E. Anderjaska of the Flight Standards Division.

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I. INTRODUCTION

It is the mutual goal of the FAA, airframe manufacturers, and air carriers to constantly improve the structural integrity and inspection efficiency of civil aircraft. The good safety record of U.S. air carriers indicates that the current process of establishing and modifying structural inspection programs has been successful. However, with the increasing size and complexity of second- and third-generation transport aircraft, there is a need to quantify more precisely the present, subjective evaluation process which relies heavily on reliability analyses of the new design and on operational experience of similar aircraft.

Because of the extreme complexity of the evaluation process, a computer simulation of all critical aircraft service life aspects was judged the most rational means for quantifying the process more exactly. As a five-volume document, this report documents the resultant Structural Area Inspection Frequency Evaluation (SAIFE) simulation logic. SAIFE accounts for the following factors: (1) aircraft design analysis; (2) component and full-scale fatigue testing; (3) production, service, and corrosion defects; (4) probability of crack or corrosion detection; and (5) aircraft modification econimics. It treats these factors in a logical sequence that realistically represents the procedure currently used to establish and modify inspection intervals. Figure 1 illustrates the data sources and analytical functions that are integrated into the SAIFE logic. SAIFE is designed to provide a repeatable method for evaluating proposed inspection programs. However, it is not intended to supplant the Maintenance Review Board or the air carrier use of the Standard Operations Specification - Aircraft Maintenance.

As Volume IV, this user's manual for the SAIFE program contains a system description, a program description, operating procedures, a sample input and output, and a source listing of the program. The detailed description of the program events and routines is presented in Appendix A, and the program source listing is contained in Appendix B which because of its voluminous computer-generated data is on the included microfiche.

The original computer model developed during the initial contract has been modified by the Engineering and Manufacturing Branch, Flight Standards National Field Office for the parametric study and is documented in Book 2 of this volume.

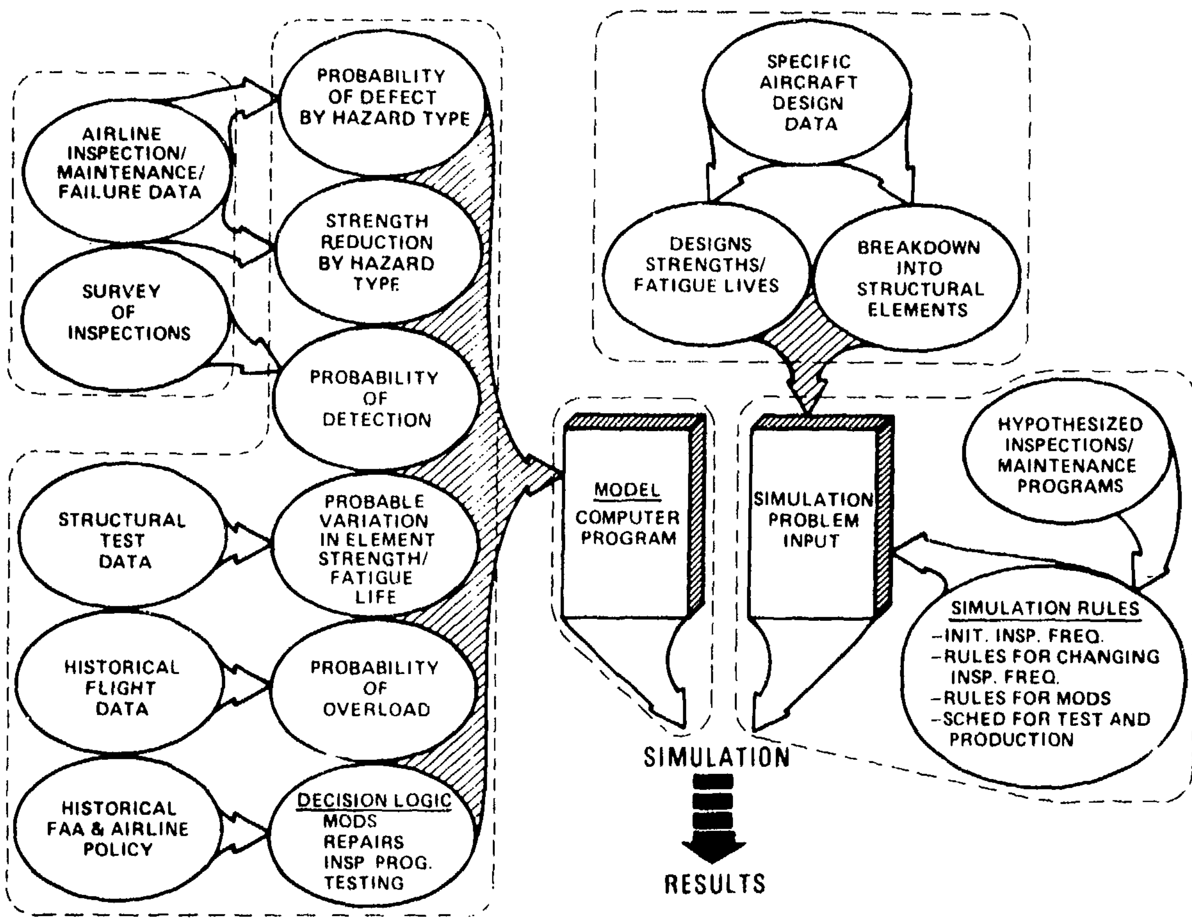


Figure 1. Approach to SAIFE Simulation

II. SYSTEM DESCRIPTION

The eight blocks in Figure 2 represent the major aspects of the SAIFE simulation logic. Block 1 accepts input data for the aircraft fleet and for each structural element in the aircraft. After determining whether element modifications are required because of the fatigue test results in Block 2, Block 1 assigns a fatigue life to each element in each aircraft. Block 3 determines whether production, service, or corrosion defects will occur; if it is determined that such defects will occur, Block 3 predicts the times when they will occur. After comparing the flight loads with the strength of each element, Block 4 predicts the time to failure for each element. Block 5 conducts the periodic inspections of each element. If defects are detected, Block 6 repairs the element and assigns it a new fatigue life. However, if an existing defect is allowed to grow until element failure, Block 5 deletes the aircraft from the fleet. Depending on the magnitude of the detected defects, special inspections and increased inspection frequencies may be called for in Block 7 and modifications may be instituted in Block 8. When all the aircraft have been deleted from the fleet or retired from service, the simulation is complete.

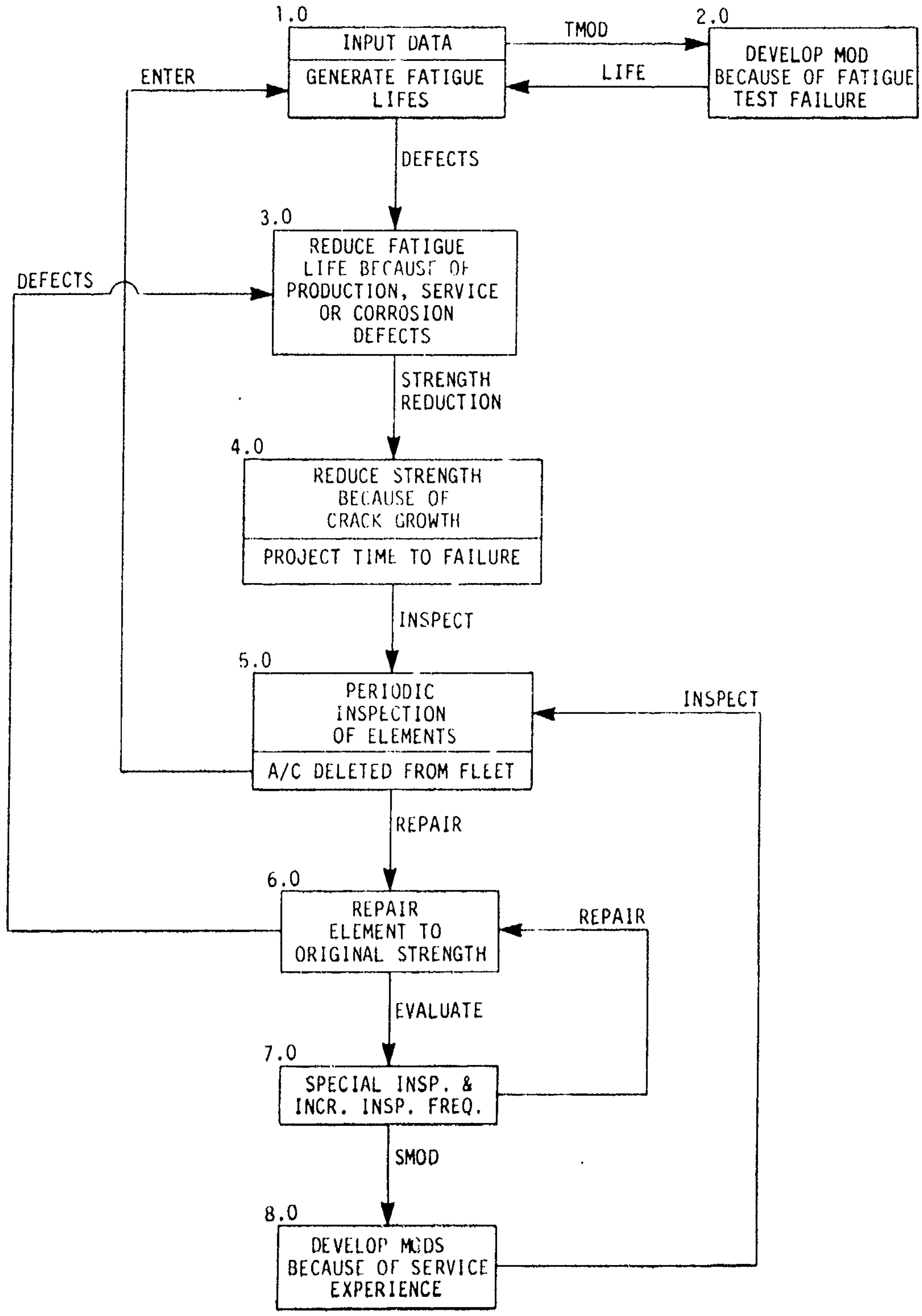


Figure 2. Major Aspects of SAIFE Logic

III. GENERAL PROGRAM DESCRIPTION

The SAIFE program is a large, complex math model designed to simulate the structural performance of aircraft in a fleet of aircraft and the effectiveness of the inspection program for the aircraft fleet. The aircraft model included in the math model is divided into structurally significant elements and the inspection program for each element is defined. Structural defects are classified as follows: fatigue and corrosion which are wear-out and aging phenomena; production or design defects; and operational or maintenance damage. These defects and the inspection program are treated as probabilistic phenomena interacting over time. If the simulation is to proceed properly, the passage of simulated time must be controlled. This control can be accomplished by a user-designed algorithm or it can be done automatically with a "simulation clock" in one of the special purpose simulation languages. SIMSCRIPT II.5 T (trademark, Consolidated Analysis Centers Inc., Los Angeles, California), a computer language designed for discrete-event simulation applications, was chosen for the SAIFE simulation. SIMSCRIPT II.5 is a large language designed to facilitate the simulation of large, complex systems, and to reduce the total time spent in designing, programming, and testing simulation models.

Because of the extensive detail, the program events and routines are described in Appendix A.

IV. OPERATING PROCEDURES

1. Computer Requirements

The SAIFE demonstration output presented in Volume V of this report was run on an IBM Model 360-65 computer using the SIMSCRIPT II.5 compiler, release 8F. The execution time per element ranged between 12 and 20 cpu seconds, and the compilation time was 205 cpu seconds. None of the demonstration runs required more than 325K bytes of core storage.

The run time and the core storage requirements depend on the values of the input variables. The variable that probably has the greatest effect on these requirements is the actual average fatigue life. The shorter the life, the greater the requirement: A shorter actual average fatigue life increases crack initiations across the fleet. These additional crack initiations, in turn, increase the inspection process, the repair activities, and the modification and interval change decisions. All these additional events require more execution time and storage space for event notices. The actual average fatigue life is shortened when the parameters involved in the distribution of the ratio of the actual to the predicted average fatigue life are so changed that the ratio is decreased.

Other variables which affect the run time and core storage requirements are as follows: with the actual average fatigue life established for all aircraft in the fleet, the requirements are increased if the parameters involved in the Weibull distribution of actual fatigue lives for individual aircraft are so changed that some lives are shortened and more crack initiations are introduced. In addition, regardless of the fatigue lives, the run time and storage requirements are increased if the defect occurrence rates are increased or the initial inspection intervals are decreased.

Since the seeds of the random number streams are initialized to the same values at the start of each execution, the user can reproduce the output, if desired, and more easily identify effects because of changes in the input parameters. Table 1 lists the ten seeds used by the IBM 360-65 to generate the demonstration output presented in Volume V.

2. Input

The program input consists of three parts. The first part contains input variables which pertain to the aircraft type under consideration. These variables are input only once per simulation run and are constant from element to element. The second part is optional and is explained in Section IV,2.2. The third part contains input variables whose values are unique to each element. These variables must be input in their entirety for each element being simulated.

TABLE 1. INITIAL RANDOM ROOTS

SEED.V(1) = 2116429302

SEED.V(2) = 683743814

SEED.V(3) = 964393174

SEED.V(4) = 1217426631

SEED.V(5) = 618433579

SEED.V(6) = 1157240309

SEED.V(7) = 15726055

SEED.V(8) = 48108509

SEED.V(9) = 1797920909

SEED.V(10) = 477424540

2.1 Aircraft Data

The input variables which pertain to the aircraft type are listed and described below in the order in which they are read in by SAIFE.

MODEL(*) - This one-dimensional alpha array of size two identifies the aircraft type under consideration. The total length of this identification cannot exceed eight characters.

SIZE.OF.FLEET - This integer variable is the number of aircraft in the fleet being simulated. The output format requires that this variable does not exceed 99999.

USAGE.LIFE - This real variable is the service life in flight hours of the aircraft being simulated. All aircraft in the fleet must have the same service life. The output format requires that this variable does not exceed 9999999.

BEGIN.PRODUCTION - This real variable is the time in flight hours relative to the start of the simulation when the first aircraft enters service. This variable in conjunction with the input variable START.TEST enables the user to start the fatigue test of the element before, after, or at the same time the first aircraft enters service.

PRODUCTION.TIME - This real variable defines the initial aircraft production rate. It is the time in flight hours between aircraft entering service.

2.PRODUCTION.TIME - This real variable defines the second aircraft production rate. It is the time in flight hours between aircraft entering service.

PRCHG - This real variable is the simulation time when the second aircraft production rate takes effect. Note that this time is measured from the time that the first aircraft enters service and not from the start of the simulation.

START.TEST - This real variable is the time in flight hours relative to the start of the simulation when the fatigue test of an element is begun. If no fatigue test is to be conducted, this variable is set to the machine upper limit.

TEST.ACCEL.FACT - This real variable is the fatigue test acceleration factor, that is, the quotient of the equivalent flight hours divided by the fatigue test hours.

C.GROWTH.RATE - This real variable is the corrosion area growth rate in sq. inches per hour for the aircraft being considered. The growth rate for each element in the aircraft is modified by its associated CRR (corrosion resistance rating).

C7 - If a modification is developed because of a fatigue test failure, this real variable is the percentage (expressed as a decimal fraction) of the test life when the inspection frequency is increased.

C28 - This real variable is the percentage (expressed as a decimal fraction) reduction in the remaining fatigue life of an element when corrosion occurs in a stress concentration.

C29 - This real variable is the percentage (expressed as a decimal fraction) reduction in the remaining fatigue life of an element when corrosion occurs outside a stress concentration.

MU.R - This real variable is the mean of the log-normal distribution of the ratio of the actual average fatigue life to the predicted average fatigue life.

SIG.R - This real variable is the standard deviation of the log-normal distribution of the ratio of the actual average fatigue life to the predicted average fatigue life.

A - This real variable is the result of fitting an exponential curve to flight load exceedance data. Aexp[BS_a] is the number of flight loads per hour which exceed the load level S_a.

B - This real variable is the result of fitting an exponential curve to flight load exceedance data. Aexp[BS_a] is the number of flight loads per hour which exceed the load level S_a.

1ABCD(*) - This one-dimensional real array of size four contains the initial lengths in flight hours of the inspection intervals of the four levels of scheduled inspections. 1ABCD(1) corresponds to the A-level interval; 1ABCD(2) corresponds to the B-level interval; 1ABCD(3) corresponds to the C-level interval; and 1ABCD(4) corresponds to the D-level interval.

CABCD(*) - This one-dimensional real array of size four contains the inspection cost at each level of inspection. CABCD(1) corresponds to the A-level cost; CABCD(2) corresponds to the B-level cost; CABCD(3) corresponds to the C-level cost; and CABCD(4) corresponds to the D-level cost.

SAMPLING - This real variable is the percentage of the fleet to be sampled during a D-level inspection.

LONG.LIST - This alpha variable is read in as "YES" when the long list output option is desired; otherwise, it is read in as "NO."

PCCL - This real variable is the percentage (read in as a decimal fraction) of the element critical crack length at which a crack, which initiated internally, becomes external.

2.2 Long List Data

Occasionally in the standard output, elements will appear with unusually long fatigue cracks or early element failures. It is desirable to have a more complete service history of aircraft with these early element failures than that offered by the standard output. This service history is available through what is called the long list option. This output option is accessed by reading in alpha characters "YES" for the aircraft input variable LONG.LIST. After this input, the element description and identification numbers of the aircraft to be tracked are read in. The input variables for the long list option are listed and described below in the order in which they are read in by SAIFE.

NOE - This integer variable is the number of elements to be processed under the long list option.

ELID(*,*) - This two-dimensional alpha array of size four by NOE identifies each element to be processed. This identification must appear in the first sixteen columns of the data card and must be identical to the description read into the variable ELEMENT(*) described in Section IV,2.3.

NOAC(*) - This one-dimensional integer array of size NOE is the number of aircraft to be tracked for each corresponding element.

TLID(*,*) - This two-dimensional integer array of size NOE by NOAC(*) contains the identification numbers of the aircraft to be tracked for a particular element.

The above data are read in immediately following the aircraft input data only when the long list option is desired. Normally, the long list option will be used only after a standard run has indicated a problem area. Since the SAIFE program depends on many sequences of random numbers, all elements in the long list run must be in the same sequence as those in the first run. When the long list option is in effect, the standard output is suppressed.

2.3 Element Data

The input variables which are unique to each element and must be read in for each element are listed and described below in the order in which they are read in by SAIFE.

ELEMENT(*) - This one-dimensional alpha array of size four identifies the element being simulated. The total length of this identification cannot exceed sixteen characters.

PREDICTED.LIFE - This real variable is the average element fatigue life in flight hours predicted by analysis. If the actual average fatigue life is known, this variable can be entered as zero. The output format requires that this variable does not exceed 999999.

ACTUAL.AVG.FAT.LIFE - This real variable is the actual average element fatigue life in flight hours determined by fatigue test. If this value is not known before running the simulation, input zero and SAIFE will determine it statistically.

M1.MEAN - This real variable is the average slow crack propagation rate for the element being simulated.

M2.MEAN - This real variable is the average fast crack propagation rate for the element being simulated.

LGHT.TO.FAILURE - This real variable contains the element crack length which corresponds to zero residual strength or level-flight structural failure.

CRIT.CRK.LGT - This real variable is the element critical crack length, that is, the crack length when the crack propagation rate changes from slow to fast.

FSAF.LGT - This real variable is the element fail-safe crack length.

BIRTH.DEFECT.PROBABILITY - This real variable is the probability (expressed as a decimal fraction) that the element has a production defect when the aircraft enters service.

CRR - This integer variable is the element Corrosion Resistance Rating.

SDM.OCCURRENCE.RATE - This real variable is the service damage occurrence rate in occurrences per element per aircraft per flight hour.

LEAD.TIME - This real variable is the time in flight hours between the time when the decision is made to develop a modification and the time when the modification is ready for implementation.

T.FREQ.CHG - This real variable is the factor (expressed as a decimal fraction) by which inspection intervals are decreased because of a fatigue test failure.

S.FREQ.CHG - This real variable is the factor (expressed as a decimal fraction) by which inspection intervals are decreased because of unfavorable service experience.

FREQ.DECREASE - This real variable is the factor (expressed as a decimal fraction) by which inspection intervals are increased because of favorable service experience.

I.PROB - Given that there is fatigue crack initiation, this real variable is the probability that the crack initiates internally. This variable applies to all three allowable fatigue cracks.

C.PROB - Given that there is corrosion initiation, this real variable is the probability that the corrosion initiates internally.

INT.LVL.INSP - This alpha variable is the letter designation of the lowest internal inspection level.

EXT.LVL.INSP - This alpha variable is the letter designation of the lowest external inspection level.

A.REPAIR.COST - This real variable is the repair cost of a defect detected during an A-level inspection.

B.REPAIR.COST - This real variable is the repair cost of a defect detected during a B-level inspection.

C.REPAIR.COST - This real variable is the repair cost of a defect detected during a C-level inspection.

D.REPAIR.COST - This real variable is the repair cost of a defect detected during a D-level inspection.

MOD.TESTED - This alpha variable indicates whether or not a structural modification is to be fatigue tested. The two acceptable input values are YES or NO.

1ST.TOOLING - This real variable is the tooling cost in the development of the first structural modification.

AD.TOOLING - This real variable is the tooling cost in the development of any additional structural modifications.

1ST.MD.COST - This real variable is the installation cost of the first structural modification.

AD.MD.COST - This real variable is the installation cost of any additional structural modifications.

S.REPAIR.COST - This real variable is the repair cost of a defect detected during a special inspection.

LOCATED.IN.STRESS.CON - This real variable is the probability (expressed as a decimal fraction) that there is corrosion in a stress concentration.

1.CDM.OCCURRENCE.RATE - This real variable is the initial corrosion occurrence rate in occurrences per element per aircraft per flight hour.

2.CDM.OCCURRENCE.RATE - This real variable is the second corrosion occurrence rate in occurrences per element per aircraft per flight hour.

CDM.RATE.CHANGE - This real variable is the aircraft service time in flight hours when the second corrosion occurrence rate takes effect.

2.4 Format Specifications

Most of the input data are entered into SAIFE by the free-form read statement. The program has only three formatted read statements.

The aircraft type identification, the alpha array MODEL, is entered under the format specification 2A4. This identification must be contained in the first eight columns of the first card of the Aircraft Input Data. All subsequent data in this section can appear in any columns and on as many cards as desired. All input values must be separated from one another by at least one blank column and a value cannot be continued on the next card.

The element identification alpha array ELID is entered under the format specification 4A4. This identification must be contained in the first sixteen columns of the long list element data card. Subsequent data can appear in any column and on as many cards as desired. When a second element is to be identified, its description must again appear in the first sixteen columns of the data card.

The element identification alpha array ELEMENT is entered under the format specification 4A4. This identification must be contained in the first sixteen columns of the first card of each set of Element Input Data. As in the Aircraft Input Data, all subsequent data in this section can appear in any columns and on as many cards as desired.

Sample input data consisting of Aircraft Input Data and five sets of Element Input Data are illustrated in Figure 3. The aircraft type identification is HYBRID. The two cards immediately following the aircraft type card contain the Aircraft Input Data. The five elements shown in the sample are WSC-SWB-AFT-0000, WSC-SWB-AFT-0030, WSC-SWB-AFT-0060, WSC-SWB-AFT-0090, and WSC-SWB-AFT-0127. The Element Input Data for each element begins immediately after the element identification on the same card and terminates on the last card before the next element identification. The card following the last set of Element Input Data must contain EOD in the first four columns.

```
HYBRID
500  60000 150  50  100  5000  0  100  .002  .8  .20  .40  1.00  .354  .284325
-8.80901  25  200  1000  12000  1440  7080  13563  19691  .25  NO  1.0
WSC-SWB-AFT-0000 745200 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 2
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0030 690000 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 3
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0060 662400 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 1
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0090 593400 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 2
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0127 607200 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 3
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
EOD
```

Figure 3. Sample Input Data to Produce Standard Output

Figure 4 illustrates the same data except that the variable LONG.LIST is now entered as "YES." The Long List Input data appears between the Aircraft Input Data and the Element Input Data. The Long List Input causes the program to track aircraft numbers 100, 200, and 300 for the element WSC-SWB-AFT-0000; aircraft numbers 86 and 497 for the element WSC-SWB-AFT-0030; aircraft number 1 for the element WSC-SWB-AFT-0060; aircraft numbers 9, 10, 11, and 12 for the element WSC-SWB-AFT-0090; and aircraft numbers 323, 456, and 472 for the element WSC-SWB-AFT-0127.

3. Output

Each element to be simulated by SAIFE is identified by three groups of alpha characters and one group of numeric characters. The alpha characters define the basic element type and general location on the aircraft, and the numeric characters define the specific location of the element by identifying the wing or fuselage station number. For example, an element identified as WNG-STR-CEN-396 would be a wing stringer located midway between the front and rear spars and centered at wing station 396.

```
HYBRID
500  60000 150  50  100  5000  0  100  .002  .8  .20  .40  1.00  .354  .284325
-8.80901  25  200  1000  12000  1440  7080  13563  19691  .25  YES  1.0
5
WSC-SWB-AFT-0000     3     100  200  300
WSC-SWB-AFT-0030     2      86  497
WSC-SWB-AFT-0060     1       1
WSC-SWB-AFT-0090     4       9   10   11   12
WSC-SWB-AFT-0127     3     323  456  472
WSC-SWB-AFT-0000 745200 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 2
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0030 690000 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 3
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0060 662400 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 1
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0090 593400 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 2
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
WSC-SWB-AFT-0127 607200 0   8.00E-5 1.60E-3    140. 1.371 15.0 1.19E-5 3
13.31E-9 1476   .800 .650 .250 .466 .667 D B 33 78 144 208.5 YES
10000 10000 11584 11584 416   .056 9.154E-9 7.526E-8 7400
EOD
```

Figure 4. Sample Input Data to Produce Long List Output

The standard program output consists of two parts. The first part consists of the simulation results for each specific element. This part is printed for each set of Element Input Data. The second part consists of a summary of the first parts for an element type. In the example discussed above, WNG-STR-CEN identifies the element type. Whenever the program encounters a set of Element Input Data in which any single character of the three groups of alpha characters differs from those in the previous set of Element Input Data, a summary is printed.

A third output is available as an option. This long list option gives a more complete service history of certain selected aircraft and is discussed in Section IV,2.2. When the long list option is in effect, the standard output is suppressed.

3.1 Element Data

Figure 5 illustrates a sample output for the input shown in Figure 3. The aircraft type identification is the aircraft input array MODEL. The number of aircraft in the fleet is the aircraft input variable SIZE.OF.FLEET. The aircraft service life is the aircraft input variable USAGE.LIFE. The structural element identification is the element input array ELEMENT. The predicted average fatigue life is the element input variable PREDICTED.LIFE. The actual average fatigue life is the element input variable ACTUAL.AVG.FAT.LIFE.

AIRCRAFT TYPE: HYBRID

NUMBER OF AIRCRAFT IN FLEET: 500 AIRCRAFT SERVICE LIFE: 60000 HOURS

STRUCTURAL ELEMENT: WSC-SWB-AFT-0000

PREDICTED AVERAGE FATIGUE LIFE: 745200 HOURS ACTUAL AVERAGE FATIGUE LIFE: 670108 HOURS

NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS

	FIRST CRACK	CORROSION	SERVICE DAMAGE	PRODUCTION DEFECTS
OCCURRENCES	2	1	2	0
MIN(HRS)	32752	37720	32752	-----
MAX(HRS)	59789	37720	59789	-----
AVG(HRS)	46270	37720	46270	-----

NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	1	0	0	0
MIN(IN)	0.	2.22	0.	0.	0.
MAX(IN)	0.	2.22	0.	0.	0.
AVG(IN)	0.	2.22	0.	0.	0.

NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	0	0	0	1
MIN(SQ.IN)	0.	0.	0.	0.	35.47
MAX(SQ.IN)	0.	0.	0.	0.	35.47
AVG(SQ.IN)	0.	0.	0.	0.	35.47

INSPECTION INTERVALS(HRS)

INITIAL	25	200	1000	12000
2	25	200	1250	15000
3	25	200	1563	18750
4	25	200	1953	23438
5	25	200	684	8203
6	25	200	854	10254
7	25	200	1068	12817

NUMBER OF SPECIAL INSPECTIONS CONDUCTED: 1
NUMBER OF STRUCTURAL MODIFICATIONS: 0
FINAL ACTUAL AVERAGE MODIFIED FATIGUE LIFE: 670108 HOURS
NUMBER OF AIRCRAFT MODIFIED IN SERVICE: 0

STRUCTURAL FAILURES

AIRCRAFT NO.	FLT. HOURS

RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH

AIRCRAFT NO.	FLT. HOURS

Figure 5. Sample Standard Output Produced by Input Shown in Figure 3

AIRCRAFT TYPE: HYBRID

NUMBER OF AIRCRAFT IN FLEET: 500 AIRCRAFT SERVICE LIFE: 60000 HOURS

STRUCTURAL ELEMENT: WSC-SWB-AFT-0030

PREDICTED AVERAGE FATIGUE LIFE: 690000 HOURS ACTUAL AVERAGE FATIGUE LIFE: 424261 HOURS

NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS

	FIRST CRACK	CORROSION	SERVICE DAMAGE	PRODUCTION DEFECTS
OCCURRENCES	1	1	0	0
MIN(HRS)	51286	56541	0	-----
MAX(HRS)	51286	56541	0	-----
AVG(HRS)	51286	56541	0	-----

NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	0	0	0	0
MIN(IN)	0.	0.	0.	0.	0.
MAX(IN)	0.	0.	0.	0.	0.
AVG(IN)	0.	0.	0.	0.	0.

NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	0	0	0	0
MIN(SQ.IN)	0.	0.	0.	0.	0.
MAX(SQ.IN)	0.	0.	0.	0.	0.
AVG(SQ.IN)	0.	0.	0.	0.	0.

INSPECTION INTERVALS(HRS)

INITIAL	25	200	1000	12000
2	25	200	1250	15000
3	25	200	1563	18750
4	25	200	1953	23438

NUMBER OF SPECIAL INSPECTIONS CONDUCTED: 0
NUMBER OF STRUCTURAL MODIFICATIONS: 0
FINAL ACTUAL AVERAGE MODIFIED FATIGUE LIFE: 424261 HOURS
NUMBER OF AIRCRAFT MODIFIED IN SERVICE: 0

STRUCTURAL FAILURES	
AIRCRAFT NO.	FLT. HOURS

RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH	
AIRCRAFT NO.	FLT. HOURS

Figure 5 - Continued

AIRCRAFT TYPE: HYBRID

NUMBER OF AIRCRAFT IN FLEET: 500 AIRCRAFT SERVICE LIFE: 60000 HOURS

STRUCTURAL ELEMENT: WSC-SWB-AFT-0060

PREDICTED AVERAGE FATIGUE LIFE: 662400 HOURS ACTUAL AVERAGE FATIGUE LIFE: 547824 HOURS

NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS

	FIRST CRACK	CORROSION	SERVICE DAMAGE	PRODUCTION DEFECTS
OCCURRENCES	2	2	0	0
MIN(HRS)	41301	21125	0	-----
MAX(HRS)	58786	38060	0	-----
AVG(HRS)	50043	29592	0	-----

NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	1	0	0	0
MIN(IN)	0.	1.12	0.	0.	0.
MAX(IN)	0.	1.12	0.	0.	0.
AVG(IN)	0.	1.12	0.	0.	0.

NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	1	0	1	0
MIN(SQ.IN)	0.	6.61	0.	17.63	0.
MAX(SQ.IN)	0.	6.61	0.	17.63	0.
AVG(SQ.IN)	0.	6.61	0.	17.63	0.

INSPECTION INTERVALS(HRS)

INITIAL	25	200	1000	12000
2	25	200	1250	15000
3	25	200	1563	18750
4	25	200	1953	23438
5	25	200	684	8203
6	25	200	854	10254
7	25	200	1068	12817
8	25	200	1335	16022
9	25	200	1669	20027

NUMBER OF SPECIAL INSPECTIONS CONDUCTED: 1
NUMBER OF STRUCTURAL MODIFICATIONS: 0
FINAL ACTUAL AVERAGE MODIFIED FATIGUE LIFE: 547824 HOURS
NUMBER OF AIRCRAFT MODIFIED IN SERVICE: 0

STRUCTURAL FAILURES

AIRCRAFT NO.	FLT. HOURS

RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH

AIRCRAFT NO.	FLT. HOURS

Figure 5 - Continued

AIRCRAFT TYPE: HYBRID

NUMBER OF AIRCRAFT IN FLEET: 500 AIRCRAFT SERVICE LIFE: 60000 HOURS

STRUCTURAL ELEMENT: WSC-SWB-AFT-0090

PREDICTED AVERAGE FATIGUE LIFE: 593400 HOURS ACTUAL AVERAGE FATIGUE LIFE: 539763 HOURS

NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS

	FIRST CRACK	CORROSION	SERVICE DAMAGE	PRODUCTION DEFECTS
OCCURRENCES	6	6	3	0
MIN(HRS)	1603	5542	1603	-----
MAX(HRS)	48952	56707	48952	-----
AVG(HRS)	33185	25377	23168	-----

NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	2	2	1	0
MIN(IN)	0.	.51	.49	1.05	0.
MAX(IN)	0.	.65	.55	1.05	0.
AVG(IN)	0.	.58	.52	1.05	0.

NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	2	0	1	0
MIN(SQ.IN)	0.	1.65	0.	17.84	0.
MAX(SQ.IN)	0.	2.08	0.	17.84	0.
AVG(SQ.IN)	0.	1.86	0.	17.84	0.

INSPECTION INTERVALS(HRS)

INITIAL	25	200	1000	12000
2	25	200	1250	15000
3	25	200	1563	18750
4	25	200	1953	23438
5	25	200	684	8203
6	25	200	854	10254
7	25	200	1068	12817
8	25	200	1335	16022
9	25	200	1669	20027

NUMBER OF SPECIAL INSPECTIONS CONDUCTED: 1
NUMBER OF STRUCTURAL MODIFICATIONS: 0
FINAL ACTUAL AVERAGE MODIFIED FATIGUE LIFE: 539763 HOURS
NUMBER OF AIRCRAFT MODIFIED IN SERVICE: 0

STRUCTURAL FAILURES

AIRCRAFT NO.	FLT. HOURS

RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH

AIRCRAFT NO.	FLT. HOURS

Figure 5 - Continued

AIRCRAFT TYPE: HYBRID

NUMBER OF AIRCRAFT IN FLEET: 500 AIRCRAFT SERVICE LIFE: 60000 HOURS

STRUCTURAL ELEMENT: WSC-SWB-AFT-0127

PREDICTED AVERAGE FATIGUE LIFE: 607200 HOURS ACTUAL AVERAGE FATIGUE LIFE: 976224 HOURS

NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS

	FIRST CRACK	CORROSION	SERVICE DAMAGE	PRODUCTION DEFECTS
OCCURRENCES	1	3	0	0
MIN(HRS)	46529	25520	0	-----
MAX(HRS)	46529	59353	0	-----
AVG(HRS)	46529	43195	0	-----

NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	1	0	0	0
MIN(IN)	0.	3.33	0.	0.	0.
MAX(IN)	0.	3.33	0.	0.	0.
AVG(IN)	0.	3.33	0.	0.	0.

NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	1	0	1	0
MIN(SQ.IN)	0.	1.38	0.	2.96	0.
MAX(SQ.IN)	0.	1.38	0.	2.96	0.
AVG(SQ.IN)	0.	1.38	0.	2.96	0.

INSPECTION INTERVALS(HRS)

INITIAL	25	200	1000	12000
2	25	200	1250	15000
3	25	200	1563	18750
4	25	200	1953	23438
5	25	200	684	8203
6	25	200	854	10254
7	25	200	1068	12817

NUMBER OF SPECIAL INSPECTIONS CONDUCTED: 1
NUMBER OF STRUCTURAL MODIFICATIONS: 0
FINAL ACTUAL AVERAGE MODIFIED FATIGUE LIFE: 976224 HOURS
NUMBER OF AIRCRAFT MODIFIED IN SERVICE: 0

STRUCTURAL FAILURES

AIRCRAFT NO.	FLT. HOURS

RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH

AIRCRAFT NO.	FLT. HOURS

Figure 5 - Continued

AIRCRAFT TYPE: HYBRID

NUMBER OF AIRCRAFT IN FLEET: 500 AIRCRAFT SERVICE LIFE: 60000 HOURS

SUMMARY OF STRUCTURAL ELEMENT: ASC-S0B-AFT

NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS

	FIRST CRACK	CORROSION	SERVICE DAMAGE	PRODUCTION DEFECTS
OCCURRENCES	12	13	5	0
MIN(HRS)	1663	5542	1663	-----
MAX(HRS)	59780	59353	59789	-----
AVG(HRS)	49706	33464	32439	-----

NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	5	2	1	0
MIN(IN)	0.	.51	.49	1.05	0.
MAX(IN)	0.	3.33	.55	1.05	0.
AVG(IN)	0.	1.57	.52	1.05	0.

NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION

	A-LEVEL	B-LEVEL	C-LEVEL	D-LEVEL	SPECIAL
OCCURRENCES	0	4	0	3	1
MIN(SQ.IN)	0.	1.38	0.	2.96	35.47
MAX(SQ.IN)	0.	6.61	0.	17.84	35.47
AVG(SQ.IN)	0.	2.93	0.	12.81	35.87
INSPECTION INTERVALS(HRS)					
INITIAL	25	200	1000	12000	
SHORTEST	25	200	684	8293	
LONGEST	25	200	1953	23458	

NUMBER OF SPECIAL INSPECTIONS CONDUCTED: 4
NUMBER OF STRUCTURAL MODIFICATIONS: 0
NUMBER OF AIRCRAFT MODIFIED IN SERVICE: 0

STRUCTURAL FAILURES

AIRCRAFT NO.	FLT. HOURS	STA. NO.

RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH

AIRCRAFT NO.	FLT. HOURS	STA. NO.

Figure 5 - Concluded

The number of occurrences in the fleet and the times to initiation of the four types of aircraft defects considered by SAIFE are displayed next. Whenever there is a fatigue crack initiation and there are no other cracks in the element, a first crack is said to have occurred. A single element can experience more than one first crack in its lifetime by having a crack initiation after a repair. Similarly, there can be more than one occurrence of corrosion and service damage, although the program does not allow more than one corrosion or service damage defect to exist simultaneously in the same element.

Production defects are one-time occurrences unless there is a structural modification installed. These, too, can have production defects. The times to defect initiation are measured from the time when the aircraft enters service for the initial defects and from the time when the aircraft was last repaired for subsequent defects.

Next, the number and lengths of cracks detected in the fleet at each level of inspection are printed. These numbers include second and third crack detections. Following the crack detection output are the number and areas of corrosion defects detected in the fleet at each level of inspection. A history of the inspection interval changes is printed next. Each time that the aircraft service experience indicates that either an interval increase or an interval decrease is needed, the new interval values are printed. Although the number of interval changes allowed in the simulation is unlimited, the output array size limits the number printed to 30.

The number of fleet-wide special inspections performed is printed next. Each special inspection is always preceded by a decrease in inspection intervals. Defects detected during a special inspection can cause an additional decrease in inspection intervals. Next, the number of structural modifications developed is printed. This number includes modifications because of fatigue test failures or aircraft service experience. The final actual average fatigue life is printed next. If there have been no modifications, this number will be the same as that at the top of the page. If there have been modifications, this number is the actual average fatigue life of the most recently developed modification.

Shown next is the number of aircraft modified in service. If the only modification developed was due to a fatigue test failure, this number can be zero if the test life was such that retrofits were not reqired. If there were more than one modification requiring retrofits, this number can be greater than the size of the fleet. Finally, each time an aircraft experiences structural failure or its residual strength reaches its fail-safe strength, the aircraft number and the number of accrued flight hours are printed. The aircraft number is assigned by its relative time of entry into service. Aircraft No. 1 is the first aircraft to enter service.

3.2 Summary Data

The last section of Figure 5 illustrates a sample summary for the element type WSC-SWB-AFT. All the numbers represent a summary of all the specific elements of this type. Except for the shortest and longest inspection intervals, each number in the summary will appear in one of the specific element outputs. As indicated earlier, the number of interval changes allowed in the simulation is unlimited, and the number printed for a specific element is limited to 30. The shortest and longest intervals printed in the summary are determined from the unlimited number of changes occurring in the simulation.

3.3 Long List Data

Figure 6 illustrates a sample long list output for the input shown in Figure 4. For each element the long list headings contain the following: aircraft description, number of aircraft in the fleet, aircraft service life, element description, predicted average fatigue life of the element, actual average fatigue life of the element, and the initial inspection intervals. For each aircraft being tracked, the long list option causes selected information to be printed each time the program control passes to certain events and routines. These events and routines along with the information printed are the following:

Event ENTER.SERVICE - Prints aircraft identification number, number of hours from start of simulation, projected flignt hours until crack initiations, and the slow and fast crack growth rates.

Routine INSTALL.MODIFICATION - Prints aircraft identification number, flight time on aircraft, flight hours until crack initiations, and the slow and fast crack growth rates.

Event IN.SERVICE.DAMAGE - Prints aircraft identification number and flight time on aircraft.

Event CORROSION - Prints aircraft identification number, flight time on aircraft, revised slow and fast crack growth rates, revised times until crack initiations, and revised time until failure.

Event 1.STRENGTH.REDUCTION - Prints aircraft identification number, flight time on aircraft, and projected flight hours until element failure.

Event 2.STRENGTH.REDUCTION - Prints aircraft identification number, flight time on aircraft, and projected flight hours until element failure.

Event 3.STRENGTH.REDUCTION - Prints aircraft identification number, flight time on aircraft, and projected flight hours until element failure.

Event 1.ITE - Prints aircraft identification number, length of crack, and flight time on aircraft.

Event 2.ITE - Prints aircraft identification number, length of crack, and flight time on aircraft.

Event 3.ITE - Prints aircraft identification number, length of crack, and flight time on aircraft.

Event D.LEVEL.INSPECTION - Prints aircraft identification number and flight time on aircraft. If an inspection interval increase is implemented at this time, revised intervals are also printed.

Routine EXAMINE - For each defect found, prints size of defect, level of inspection, aircraft identification number, and flight time on aircraft.

Event REACH.FAIL.SAFE.LGT - Prints aircraft identification number and flight time on aircraft.

Event FAILURE - Prints aircraft identification number, flight time on aircraft, sum of crack lengths, and element residual strength.

Event RETIRE.FROM.SERVICE - Prints aircraft identification number and flight time on aircraft.

Event REPAIR - Prints aircraft identification number and projected times to crack initiations.

Event INCREASE.INSPECTION.FREQUENCY - Prints revised C-level and D-level inspection intervals.

Event IMMEDIATE.FLEET.INSPECTION - For each defect found, prints type of defect, size of defect, aircraft identification number, and flight time on aircraft.

```
                        AIRCRAFT TYPE: HYBRID

   NUMBER OF AIRCRAFT IN FLEET:   500                  AIRCRAFT SERVICE LIFE:   60000 HOURS

                        STRUCTURAL ELEMENT: WSC-SWB-AFT-0000

PREDICTED AVERAGE FATIGUE LIFE: 745200 HOURS            ACTUAL AVERAGE FATIGUE LIFE:  670108 HOURS

                        INITIAL INSPECTION INTERVALS

                              A-LEVEL     25 HOURS
                              B-LEVEL    200 HOURS
                              C-LEVEL   1000 HOURS
                              D-LEVEL  12000 HOURS

A/C NO. 100 ENTERS SERVICE   5100 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  653538 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT  838614 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT  950200 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000080 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001605 INCHES/HOUR

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1250 HOURS
    D-LEVEL INTERVAL NOW 15000 HOURS

A/C NO. 200 ENTERS SERVICE  15050 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  786645 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT 1101450 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT 1312006 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000074 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001490 INCHES/HOUR

D-LEVEL INSPECTION PERFORMED ON A/C NO. 100 AT  12000 HOURS

A/C NO. 300 ENTERS SERVICE  25050 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  358101 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT  853180 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT 1299263 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000094 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001883 INCHES/HOUR

D-LEVEL INSPECTION PERFORMED ON A/C NO. 200 AT  12000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1563 HOURS
    D-LEVEL INTERVAL NOW 18750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 100 AT  27000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 300 AT  12000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 200 AT  24000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1953 HOURS
    D-LEVEL INTERVAL NOW 23438 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 100 AT  45750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 300 AT  30750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 200 AT  42750 HOURS

A/C NO. 100 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

A/C NO. 200 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 300 AT  54188 HOURS

A/C NO. 300 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

INSPECTION INTERVAL DECREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW   684 HOURS
    D-LEVEL INTERVAL NOW  8203 HOURS
```

a. Structural Element: WSC-SWB-AFT-0000

Figure 6. Sample Long List Output Produced by Input Shown in Figure 4

```
FLEET AT - SPECIAL INSPECTION PERFORMED

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW   854 HOURS
    D-LEVEL INTERVAL NOW 10254 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1068 HOURS
    D-LEVEL INTERVAL NOW 12817 HOURS
```

a. Structural Element: WSC-SWB-AFT-0000 (Concluded)

```
                              AIRCRAFT TYPE: HYBRID
NUMBER OF AIRCRAFT IN FLEET:   500                    AIRCRAFT SERVICE LIFE:   60000 HOURS
                        STRUCTURAL ELEMENT: WSC-SWB-AFT-0030
PREDICTED AVERAGE FATIGUE LIFE: 690000 HOURS          ACTUAL AVERAGE FATIGUE LIFE:  424261 HOURS
                          INITIAL INSPECTION INTERVALS

                             A-LEVEL     25 HOURS
                             B-LEVEL    200 HOURS
                             C-LEVEL   1000 HOURS
                             D-LEVEL  12000 HOURS

A/C NO.  86 ENTERS SERVICE    4400 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  514080 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT  644584 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT  691441 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000073 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001468 INCHES/HOUR

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1250 HOURS
    D-LEVEL INTERVAL NOW 15000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  86 AT  12000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1563 HOURS
    D-LEVEL INTERVAL NOW 18750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  86 AT  27000 HOURS

A/C NO. 497 ENTERS SERVICE   44750 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  514414 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT  548364 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT  663849 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000073 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001468 INCHES/HOUR

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1953 HOURS
    D-LEVEL INTERVAL NOW 23438 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  86 AT  45750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 497 AT  12000 HOURS

A/C NO.  86 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 497 AT  35438 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 497 AT  58875 HOURS

A/C NO. 497 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS
```

b. Structural Element: WSC-SWB-AFT-0030

Figure 6 - Continued

AIRCRAFT TYPE: HYBRID

NUMBER OF AIRCRAFT IN FLEET: 500 AIRCRAFT SERVICE LIFE: 60000 HOURS

STRUCTURAL ELEMENT: WSC-SWB-AFT-0060

PREDICTED AVERAGE FATIGUE LIFE: 662400 HOURS ACTUAL AVERAGE FATIGUE LIFE: 547820 HOURS

INITIAL INSPECTION INTERVALS

A-LEVEL 25 HOURS
B-LEVEL 200 HOURS
C-LEVEL 1000 HOURS
D-LEVEL 12000 HOURS

A/C NO. 1 ENTERS SERVICE 150 HOURS FROM START OF SIMULATION

1ST CRACK INITIATION PROJECTED AT 379222 FLIGHT HOURS
2ND CRACK INITIATION PROJECTED AT 1099412 FLIGHT HOURS
3RD CRACK INITIATION PROJECTED AT 1158883 FLIGHT HOURS
SLOW CRACK GROWTH RATE = .000089 INCHES/HOUR
FAST CRACK GROWTH RATE = .001778 INCHES/HOUR

D-LEVEL INSPECTION PERFORMED ON A/C NO. 1 AT 12000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 1250 HOURS
D-LEVEL INTERVAL NOW 15000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 1 AT 24000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 1563 HOURS
D-LEVEL INTERVAL NOW 18750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 1 AT 39000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 1953 HOURS
D-LEVEL INTERVAL NOW 23438 HOURS

INSPECTION INTERVAL DECREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 684 HOURS
D-LEVEL INTERVAL NOW 8203 HOURS

FLEET WIDE SPECIAL INSPECTION PERFORMED

D-LEVEL INSPECTION PERFORMED ON A/C NO. 1 AT 53806 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 854 HOURS
D-LEVEL INTERVAL NOW 10254 HOURS

A/C NO. 1 RETIRED FROM SERVICE AT 60000 FLIGHT HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 1068 HOURS
D-LEVEL INTERVAL NOW 12817 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 1335 HOURS
D-LEVEL INTERVAL NOW 16022 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
C-LEVEL INTERVAL NOW 1669 HOURS
D-LEVEL INTERVAL NOW 20027 HOURS

c. Structural Element: WSC-SWB-AFT-0060

Figure 6 - Continued

```
                              AIRCRAFT TYPE: HYBRID

     NUMBER OF AIRCRAFT IN FLEET:   500                 AIRCRAFT SERVICE LIFE:   60000 HOURS

                        STRUCTURAL ELEMENT: WSC-SWB-AFT-0090

PREDICTED AVERAGE FATIGUE LIFE: 593400 HOURS           ACTUAL AVERAGE FATIGUE LIFE:  539763 HOURS

                              INITIAL INSPECTION INTERVALS

                                   A-LEVEL     25 HOURS
                                   B-LEVEL    200 HOURS
                                   C-LEVEL   1000 HOURS
                                   D-LEVEL  12000 HOURS

A/C NO.   9 ENTERS SERVICE     550 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  479151 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT 1077598 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT 1249581 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000083 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001657 INCHES/HOUR

A/C NO.  10 ENTERS SERVICE     600 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  638088 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT  704099 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT  884003 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000074 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001865 INCHES/HOUR

A/C NO.  11 ENTERS SERVICE     650 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  370220 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT  898843 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT 1143517 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000089 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001782 INCHES/HOUR

A/C NO.  12 ENTERS SERVICE     700 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT  648293 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT  661954 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT  724727 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000074 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001476 INCHES/HOUR

D-LEVEL INSPECTION PERFORMED ON A/C NO.   9 AT  12000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  10 AT  12000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1250 HOURS
    D-LEVEL INTERVAL NOW 15000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  11 AT  12000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  12 AT  12000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO   9 AT  24000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  10 AT  27000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1563 HOURS
    D-LEVEL INTERVAL NOW 18750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  11 AT  27000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  12 AT  27000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.   9 AT  39000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  10 AT  45750 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1953 HOURS
    D-LEVEL INTERVAL NOW 23438 HOURS
```

d. Structural Element: WSC-SWB-AFT-0090

Figure 6 - Continued

```
D-LEVEL INSPECTION PERFORMED ON A/C NO.  11 AT  45750 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  12 AT  45750 HOURS

INSPECTION INTERVAL DECREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW   684 HOURS
    D-LEVEL INTERVAL NOW  8203 HOURS

FLEET WIDE SPECIAL INSPECTION PERFORMED

D-LEVEL INSPECTION PERFORMED ON A/C NO.   9 AT  46500 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  10 AT  53953 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW   854 HOURS
    D-LEVEL INTERVAL NOW 10254 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  11 AT  53953 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.  12 AT  53953 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO.   9 AT  54703 HOURS

A/C NO.   9 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

A/C NO.  10 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

A/C NO.  11 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

A/C NO.  12 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1068 HOURS
    D-LEVEL INTERVAL NOW 12817 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1335 HOURS
    D-LEVEL INTERVAL NOW 16022 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1669 HOURS
    D-LEVEL INTERVAL NOW 20027 HOURS
```

d. Structural Element: WSC-SWB-AFT-0090 (Concluded)

```
                          AIRCRAFT TYPE: HYBRID

   NUMBER OF AIRCRAFT IN FLEET:  500            AIRCRAFT SERVICE LIFE:   60000 HOURS

                    STRUCTURAL ELEMENT: WSC-SWB-AFT-0127

PREDICTED AVERAGE FATIGUE LIFE: 607200 HOURS       ACTUAL AVERAGE FATIGUE LIFE:  976224 HOURS

                        INITIAL INSPECTION INTERVALS

                           A-LEVEL     25 HOURS
                           B-LEVEL    200 HOURS
                           C-LEVEL   1000 HOURS
                           D-LEVEL  12000 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1250 HOURS
    D-LEVEL INTERVAL NOW 15000 HOURS

A/C NO. 321 ENTERS SERVICE  27350 HOURS FROM START OF SIMULATION

    1ST CRACK INITIATION PROJECTED AT 1151052 FLIGHT HOURS
    2ND CRACK INITIATION PROJECTED AT 1562644 FLIGHT HOURS
    3RD CRACK INITIATION PROJECTED AT 1783578 FLIGHT HOURS
    SLOW CRACK GROWTH RATE = .000074 INCHES/HOUR
    FAST CRACK GROWTH RATE = .001487 INCHES/HOUR

INSPECTION INTERVAL INCREASE IMPLEMENTED
    C-LEVEL INTERVAL NOW  1563 HOURS
    D-LEVEL INTERVAL NOW 18750 HOURS
```

e. Structural Element: WSC-SWB-AFT-0127

Figure 6 - Continued

```
D-LEVEL INSPECTION PERFORMED ON A/C NO. 323 AT  12000 HOURS

A/C NO. 456 ENTERS SERVICE  40650 HOURS FROM START OF SIMULATION

     1ST CRACK INITIATION PROJECTED AT  488494 FLIGHT HOURS
     2ND CRACK INITIATION PROJECTED AT 1391054 FLIGHT HOURS
     3RD CRACK INITIATION PROJECTED AT 1602495 FLIGHT HOURS
     SLOW CRACK GROWTH RATE = .000095 INCHES/HOUR
     FAST CRACK GROWTH RATE = .001907 INCHES/HOUR

A/C NO. 472 ENTERS SERVICE  42250 HOURS FROM START OF SIMULATION

     1ST CRACK INITIATION PROJECTED AT 1436062 FLIGHT HOURS
     2ND CRACK INITIATION PROJECTED AT 2101312 FLIGHT HOURS
     3RD CRACK INITIATION PROJECTED AT 2294671 FLIGHT HOURS
     SLOW CRACK GROWTH RATE = .000066 INCHES/HOUR
     FAST CRACK GROWTH RATE = .001319 INCHES/HOUR

INSPECTION INTERVAL INCREASE IMPLEMENTED
     C-LEVEL INTERVAL NOW  1953 HOURS
     D-LEVEL INTERVAL NOW 23438 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 456 AT  12000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 472 AT  12000 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 323 AT  30750 HOURS

INSPECTION INTERVAL DECREASE IMPLEMENTED
     C-LEVEL INTERVAL NOW   684 HOURS
     D-LEVEL INTERVAL NOW  8203 HOURS

FLEET WIDE SPECIAL INSPECTION PERFORMED

INSPECTION INTERVAL INCREASE IMPLEMENTED
     C-LEVEL INTERVAL NOW   854 HOURS
     D-LEVEL INTERVAL NOW 10254 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 323 AT  45041 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 456 AT  31741 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 472 AT  30141 HOURS

INSPECTION INTERVAL INCREASE IMPLEMENTED
     C-LEVEL INTERVAL NOW  1068 HOURS
     D-LEVEL INTERVAL NOW 12817 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 323 AT  55295 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 456 AT  41995 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 472 AT  40395 HOURS

A/C NO. 323 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 456 AT  54812 HOURS

D-LEVEL INSPECTION PERFORMED ON A/C NO. 472 AT  53212 HOURS

A/C NO. 456 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS

A/C NO. 472 RETIRED FROM SERVICE AT  60000 FLIGHT HOURS
```

e. Structural Element: WSC-SWB-AFT-0127 (Concluded)

Figure 6 - Concluded

APPENDIX A

DETAILED PROGRAM DESCRIPTION

In the following detailed description of the SAIFE program, each event and routine in the program is presented separately. Except for the PREAMBLE, each presentation consists of a description, the definition of the local variables, if any, and a flow chart to illustrate the logic of the event or routine.

APPENDIX A

TABLE OF CONTENTS

1. PREAMBLE

The PREAMBLE is the definition section of a SIMSCRIPT program. All global variables and global arrays are defined. Temporary entities are defined and tally statistics are identified. Event notices and functions are defined and an event priority order is set. The global real variables are listed and described below in the order in which they appear in the PREAMBLE. Global real variables which are input variables are not included here but can be found in the input section.

Global Real Variables

FLEET.STR.RED - This variable is the sum of crack lengths found in the fleet since the last inspection frequency change.

1AAFL - This variable is the actual average fatigue life of the element design determined in the MAIN program.

CRRF - Assigned a value in routine INITIALIZATION according to the element corrosion resistance rating, this variable is multiplied by the aircraft corrosion growth rate to give the element corrosion growth rate.

COST.OF.REPAIRS - This variable is the sum of repair costs for the fleet since the last modification.

FIXIT.COST - This variable is the cost of repairing a defect found at a particular inspection level. Its value is set in the inspection events.

CHG.FREQ.TIME - This variable is set equal to TIME.V whenever an inspection interval change is scheduled in the event REPAIR.

1CRKT - Each time a first crack occurs, this variable is set equal to the service time on the aircraft.

1CORT - Each time corrosion occurs, this variable is set equal to the service time on the aircraft.

1SDT - Each time service damage occurs, this variable is set equal to the service time on the aircraft.

ACRKL, BCRKL, CCRKL, DCRKL, SCRKL - Each time a crack is found during an A-level, B-level, C-level, D-level, or Special inspection, the corresponding variable is set equal to the crack length.

ACA, BCA, CCA, DCA, SCA - Each time corrosion is found during an A-level, B-level, C-level, D-level, or Special inspection, the corresponding variable is set equal to the corrosion area.

AIRFRAME.TIME - This variable is the number of flight hours accumulated since the last modification for aircraft no longer in service.

G1CRK - Each time a first crack occurs, this variable is set equal to the service time on the aircraft.

G1COR - Each time corrosion occurs, this variable is set equal to the service time on the aircraft.

G1SD - Each time service damage occurs, this variable is set equal to the service time on the aircraft.

GACRK, GBCRK, GCCRK, GDCRK, GSCRK - Each time a crack is found during an A-level, B-level, C-level, D-level, or Special inspection, the corresponding variable is set equal to the crack length.

GACA, GBCA, GCCA, GDCA, GSCA - Each time corrosion is found during an A-level, B-level, C-level, D-level, or Special inspection, the corresponding variable is set equal to the corrosion area.

CINSL, DINSL - Each time there is an inspection interval change, these variables are set equal to the C-level and D-level intervals, respectively.

KSMP - This variable is set equal to 1.0 in the A-level, B-level, and C-level inspection events and set equal to the D-level sampling percentage in the D-level inspection event.

The global integer variables are listed next. Again, input variables are not included in this list.

Global Integer Variables

ID - In each event and routine, this variable is the identification number of the aircraft being processed.

IDCK - This variable is initialized to zero and incremented by one each time an aircraft enters service.

I - This variable is used as a local index or array subscript in different locations in the program.

COUNT.ELEMENT - Each time new element data is read in, this variable is incremented by one.

NICHG - This variable is the number of times that the inspection intervals have changed.

LHTA - This variable is the identification number of the aircraft among the ten high-time aircraft with the fewest flight hours.

1.NUM.OF.RETIRE - This variable is the number of aircraft that have been retired from service.

2.NUM.OF.CRASH - This variable is the number of aircraft which have been removed from service because of structural failure.

ITRNL - This variable is the numeric identification of the lowest internal level of inspection.

EXT.INSP.LEVEL - This variable is the numeric identification of the lowest external level of inspection.

ILL, ELL - These variables are the numeric identifications of the lowest internal and external levels of inspection, respectively. If either of these variables is less than three, it is set equal to three.

TO.BE.MODIFIED - This variable is the number of aircraft with a pending retrofit modification.

BEEN.MODIFIED - This variable is the number of aircraft that have had a current retrofit modification installed.

IDCK - This variable is the number of aircraft in service when a modification is implemented because of a fatigue test failure.

OICR, OCOR, OSDM, OPD - These variables are the number of occurrences of first cracks, corrosion, service damage, and production defects, respectively, for a particular element.

OSCR, OSCO - These variables are the number of cracks and corrosion defects, respectively, detected during a special inspection for a particular element.

NSIC - This variable is the number of special inspections conducted for a particular element.

NSMD - This variable is the number of aircraft modified in service for a particular element.

NSFL - This variable is the number of aircraft experiencing structural failure for a particular element.

NMD - This variable is the number of structural modifications made on a particular element.

NRFS - This variable is the number of aircraft with the residual strength for a particular element reaching the fail-safe strength.

SNRES - This variable is the number of aircraft with the residual strength for a particular element type reaching the fail-safe strength.

J - this variable is used as a local index or array subscript in different locations in the program.

LOX - If the long list option is in effect, this variable is the ascending sequential position of the element being processed among those elements read in under the long list option.

GOICR, GOCOR, GOSDM - These variables are the number of occurrences of first cracks, corrosion damage, and service damage, respectively, for a particular element type.

GOSCR, GOSCO - These variables are the number of cracks and corrosion defects, respectively, detected during a special inspection for a particular element type.

GOPD - This variable is the number of occurrences of production defects for a particular element type.

SNSIC - this variable is the number of special inspections conducted for a particular element type.

SNMD - This variable is the number of structural modifications made on a particular element type.

SNSMD - This variable is the number of aircraft modified in service for a particular element type.

SNSFL - This variable is the number of aircraft experiencing structural failure for a particular element type.

The real arrays are listed next. Unless otherwise noted, all arrays are 1-dimensional. As before, input arrays are not included in this list.

Real Arrays

C.INTERVAL, D.INTERVAL - The elements of these arrays are the current C-level and D-level inspection intervals for each aircraft in the fleet.

ABCD - This array is of size four and contains the most recent intervals for each of the four levels of inspection.

CKREP.TIME - This array is the simulation time of the most recent crack repair for each aircraft.

CORRP.TIME - This array is the simulation time of the most recent corrosion repair for each aircraft.

LAST.SD - This array is the simulation time of the most recent occurrence of service damage for each aircraft.

OCCUR.MOD - This array is the simulation time when the most recent modification was installed for each aircraft.

MSR, MFR - These arrays are the slow and fast crack growth rates, respectively, for each aircraft.

SC, SD - These arrays contain each of the inspection interval changes for the C-level and D-level, respectively.

XRN - This array is the random number selected to calculate the time until structural failure for each aircraft.

MRDD - This array is the simulation time of the most recently detected defect at either a C-level or D-level inspection for each of the ten high-time aircraft.

GCRI - This array is the corrosion multiplying factor for each aircraft.

The following are the integer arrays. Again, unless otherwise noted, all arrays are 1-dimensional and input arrays are not included.

Integer Arrays

A1SR, A2SR, A3SR - These arrays contain the event notice identification numbers for each aircraft for the events 1.STRENGTH. REDUCTION, 2.STRENGTH.REDUCTION, and 3.STRENGTH.REDUCTION, respectively.

AF - This array is the event notice identification number for each aircraft for event FAILURE.

AIRPLANE - This array is the temporary entity identification number for each aircraft.

AAL, ABL, ACL, ADL - These arrays are the event notice identification numbers for each aircraft for the events A.LEVEL.INSPECTION, B.LEVEL.INSPECTION, C.LEVEL.INSPECTION, and D.LEVEL.INSPECTION, respectively.

AC, ATII - These arrays are the event notice identification numbers for each aircraft for events COROSION and T.INSPECTION.INCREASE, respectively.

ACID - This array contains the identification numbers of those aircraft experiencing structural failure for a particular element.

OICR, OICO - These arrays are the number of cracks and corrosion defects, respectively, detected at each of the four levels of inspection for a particular element.

SACID - This array contains the identification numbers of those aircraft experiencing structural failure for a particular element type.

GOICR, GOICO - These arrays are the number of cracks and corrosion defects, respectively, detected at each of the four levels of inspection for a particular element type.

HI.TIME.ACRFT - This array contains the identification numbers of the ten high-time aircraft.

APID - This array contains the identification numbers of those aircraft with a particular element whose residual strength has reached the fail-safe strength.

SAPID - This array contains the identification numbers of those aircraft with a particular element type whose residual strength has reached the fail-safe strength.

STIM - This array contains the flight hours on each aircraft when the residual strength for a particular element reaches the fail-safe strength.

SSTIM - This array contains the flight hours on each aircraft when the residual strength for a particular element type reaches the fail-safe strength.

FLTHR - This array contains the flight hours on each aircraft when structural failure occurs for a particular element.

SFLTHR - This array contains the flight hours on each aircraft when structural failure occurs for a particular element type.

ARFSL - This array is the event notice identification number for each aircraft for event REACH.FAIL.SAFE.LGT.

A1E, A2E, A3E - These arrays are the event notice identification numbers for each aircraft for events 1.ITE, 2.ITE, and 3.ITE, respectively.

The global alpha arrays are listed next. As before, input arrays are not included in this list.

Global Alpha Arrays

1.CR.EXISTS, 2.CR.EXISTS, 3.CR.EXISTS - The elements of these arrays are set equal to "YES" for each aircraft whenever there is a first, second, and third crack initiation, respectively.

CO.EXISTS - This array is set equal to "YES" for each aircraft when it has corrosion initiation.

SD.SCH - This array is set equal to "YES" for each aircraft that has event IN.SERVICE.DAMAGE scheduled.

SSTAN - This array is the station number which identifies each aircraft experiencing the failure of a particular element type.

SELNB - This array is the station number which identifies each aircraft with a particular element type whose residual strength has reached the fail-safe strength.

AIL, FSH - This array is set equal to "YES" for each aircraft when vents REACH.FAIL.SAFE.LGT and FAILURE, respectively, are scheduled.

IE1, IE2, IE3 - This array is set equal to "YES" for each aircraft that has events 1.ITE, 2.ITE, and 3.ITE, respectively, scheduled.

TMOD.PENDING - This array is set equal to "YES" for each aircraft that has a modification pending because of a fatigue test failure.

SMOD.PENDING - This array is set equal to "YES" for each aircraft that has a modification pending because of service experience.

INSP.SCH - This array is set equal to "YES" for each aircraft that has inspections below the overhaul level scheduled.

1.INT, 2.INT, 3.INT - These arrays are set equal to "YES" for each aircraft that has a first crack, second crack, or third crack, respectively, initiated internally.

C.INT - This array is set equal to "YES" for each aircraft that has corrosion initiated internally.

The temporary entity definitions and tally statements are self-explanatory. The events, functions, and routines are described in detail in the following sections.

2. MAIN

2.1 Description

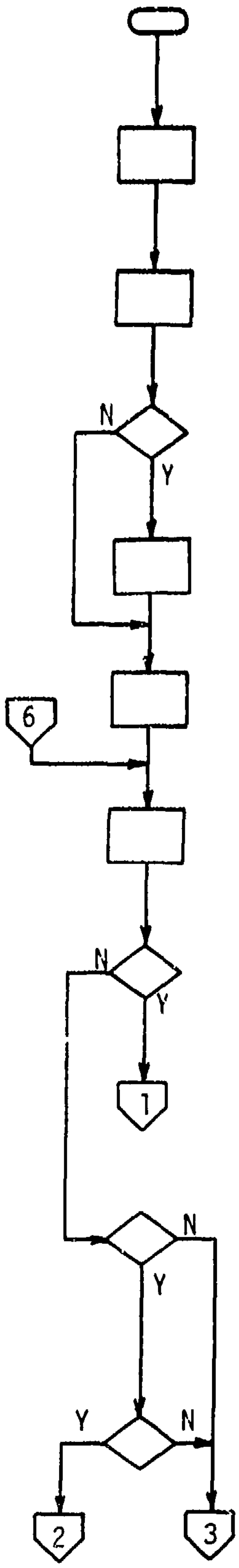
In the MAIN program, space is reserved for all global arrays. The following operations are performed in the order given: all input data is read in; the actual average fatigue life of the element type is calculated; the necessity of a structural modification because of a fatigue test failure is determined; the first event ENTER.SERVICE is scheduled; and the simulation is initiated.

2.2 Local Variables

NFTS - This real variable is the time in flight hours from when the second production rate goes into effect to when the last aircraft enters service.

SATL - This real variable is the earliest simulation time at which a structural modification because of a fatigue test failure is ready for installation.

2.3 Flow Chart



MAIN.

Reserve aircraft arrays.

Read aircraft data.

Does LONG.LIST="YES" ?

Read in elements and aircraft to be tracked.

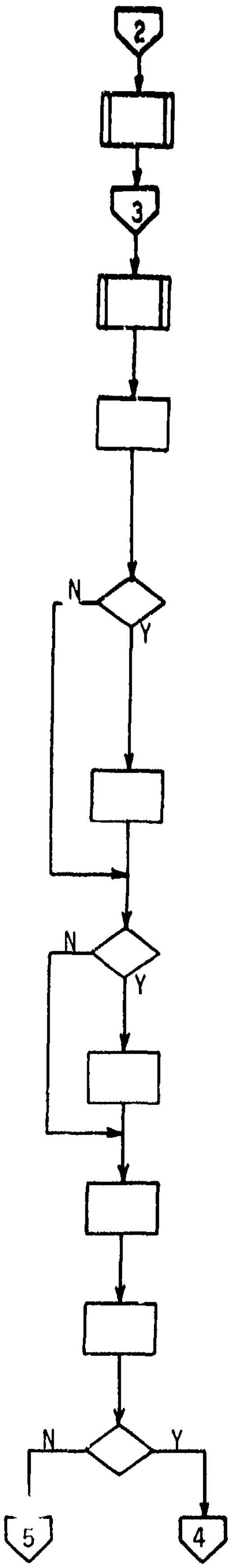
Reserve element arrays.

Read element data.

Does ELEMENT(1)="EOD" ?

Is this element a different element type than previous element?

Does LONG.LIST="NO"?



Call routine SUMMARY.

Call routine INITIALIZATION.

Calculate actual average fatigue life of element type.

Does fatigue test failure occur at less than twice the aircraft service life?

Schedule a structural modification.

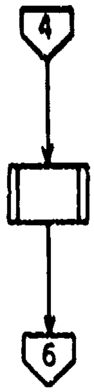
Is long list option in effect?

Print long list headings.

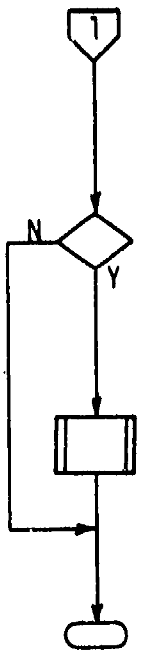
Schedule event ENTER.SERVICE.

Start simulation.

Does LONG.LIST="NO"?



Call routine DISPLAY.OUTPUT.



Does LONG.LIST="NO"?

Call routine SUMMARY.

END.

3. INITIALIZATION

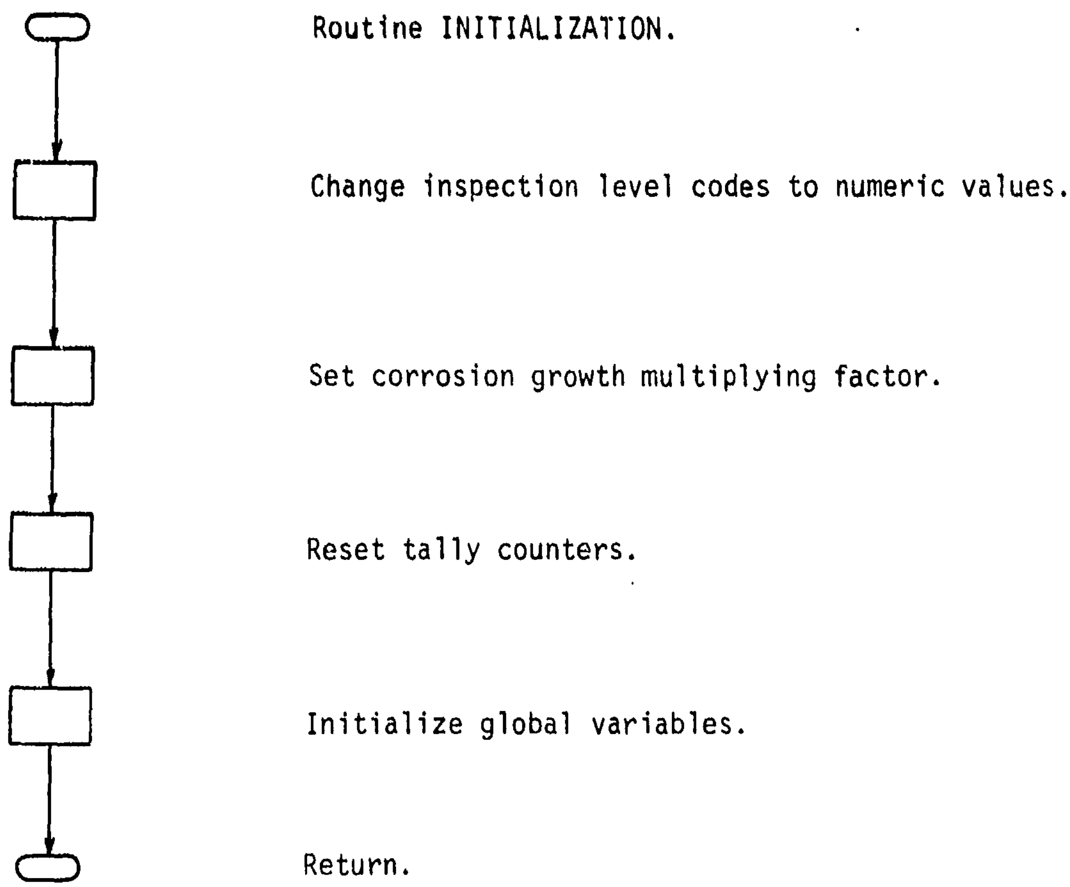
3.1 Description

This routine is called immediately after reading each new set of element input data. This routine changes the inspection level codes to numeric values, sets the corrosion growth multiplying factor based on the corrosion resistance rating, and resets the tally counters. It also initializes all the element global variables which are not part of the input. This routine is called from the MAIN program.

3.2 Local Variables

There are no local variables in this routine.

3.3 Flow Chart



4. SUM.INITIALIZE

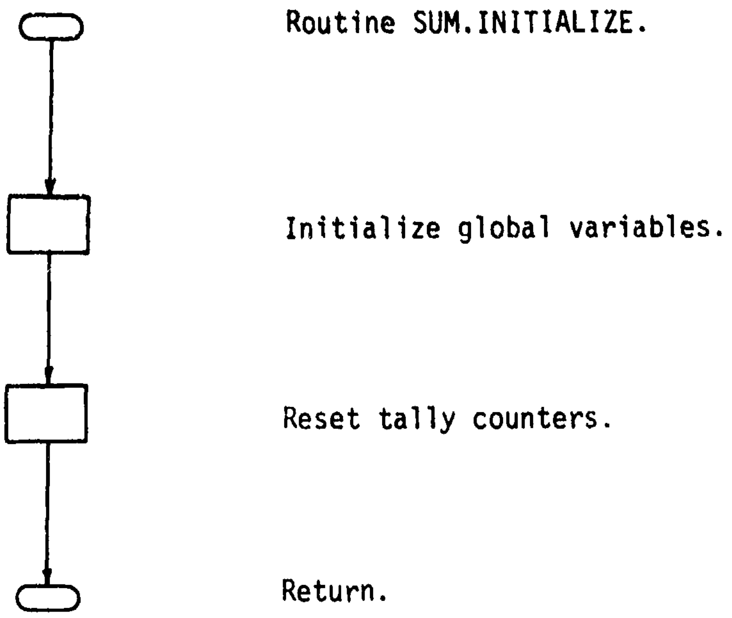
4.1 Description

This routine is called each time a new element type is read in. The element type is identified by the first twelve characters of the element identification. This routine initializes the global variables and resets the tally counters. This routine is called from the MAIN program.

4.2 Local Variables

There are no local variables in this routine.

4.3 Flow Chart



5. REAL.LIFE

5.1 Description

This routine accepts (1) the predicted average fatigue life of a particular element design and (2) the mean and standard deviation of the log-normal distribution of the ratio of the actual average fatigue life to the predicted average fatigue life. A random selection is made from the distribution and multiplied by the predicted average fatigue life. The resulting actual average fatigue life is returned to the calling routine. REAL.LIFE can be called from the MAIN program and events IMPLEMENT.MODIFICATION and T.IMPLEMENT.MOD.

5.2 Local Variables

MEAN - This real variable, whose value is passed from the calling routine, is the mean of the ratio distribution.

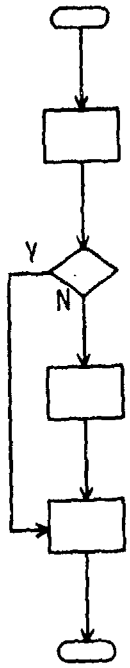
RATIO - This real variable, determined to be log-normally distributed, is the ratio of the actual fatigue life of an element design to its predicted fatigue life.

STD.DEV - This real variable, whose value is passed from the calling routine, is the standard deviation of the ratio distribution.

PDL - This real variable is the design predicted average fatigue life passed from the calling routine.

RFL - This real variable is the element actual average fatigue life which is returned to the calling routine.

5.3 Flow Chart



Routine REAL.LIFE.

Randomly select RATIO from distribution.

Is RATIO within allowable limits?

Set RATIO to limit.

Calculate actual average fatigue life.

Return with actual average fatigue life.

6. ENTER.SERVICE

6.1 Description

This event represents the entry into service of a new aircraft. The temporary entity AIRCRAFT is created and identified by the variable AIRPLANE(ID). The entity attributes TAIL.ID and ENTRY.TIME are defined and the AIRPLANE is filed in the set ACTIVE.FLEET. The routine FATIGUE.LIFE.SCATTER is called to determine the times to first, second, and third crack initiations. The slow and fast crack growth rates are calculated. The times to corrosion initiation and service damage are calculated. If either of these times is less than the service life of the aircraft, the corresponding defect is scheduled. If there is a production defect, the time to first crack initiation is replaced by a time drawn from a distribution of times to crack initiation of aircraft with production defects. If the long list option is in effect for each aircraft being tracked, this routine prints the following: (1) aircraft identification and time it enters service, (2) times to crack initiations, and (3) slow and fast crack growth rates. Crack initiations, D-level inspection, and retirement from service are also scheduled. If the present aircraft is not the last aircraft of the fleet, another ENTER.SERVICE is scheduled. This event can only be scheduled in the MAIN program and within itself.

6.2 Local Variables

DEFECT.LIFE - This real variable is the time to first crack initiation when the aircraft has a production defect.

HOURS.TO.CORROSION - This real variable is the time to corrosion initiation.

SECOND.LIFE - This real variable is the time to second crack initiation.

STD.SLOW - This real variable is the standard deviation of the distribution of slow crack growth rates.

FIRST.LIFE - This real variable is the time to first crack initiation when the aircraft has no production defect.

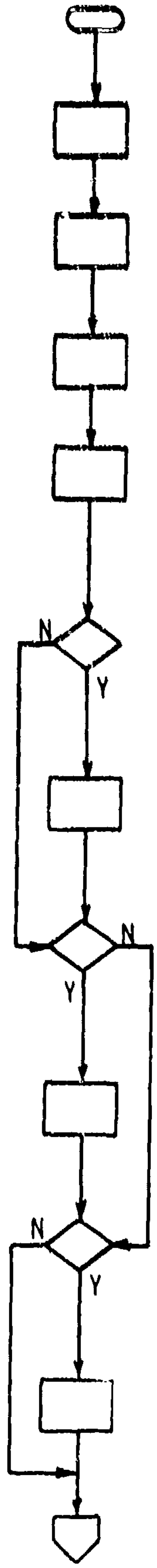
OURS.TO.SERVICE.DAMAGE - This real variable is the time to service damage occurrence.

RN - This real variable is a uniformly distributed random number between zero and one.

STD.FAST - This real variable is the standard deviation of the distribution of fast crack growth rates.

THIRD.LIFE - This real variable is the time to third crack initiation.

6.3 Flow Chart



Event ENTER.SERVICE.

Create an AIRCRAFT and file in ACTIVE.FLEET.

Determine times to first three crack initiations.

Calculate slow and fast crack growth rates.

Determine times to corrosion initiation and service damage.

Is time to corrosion initiation less than aircraft service life?

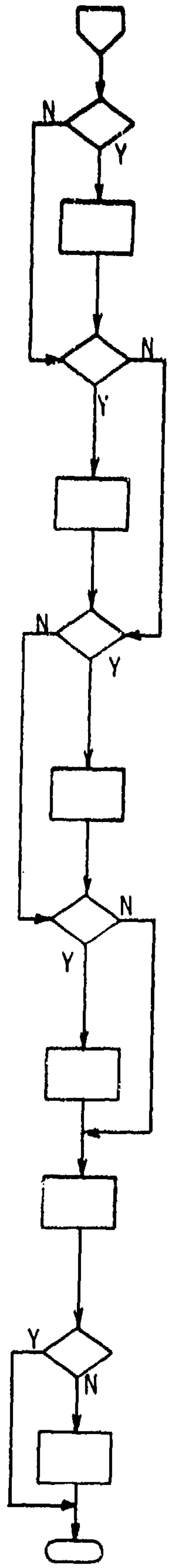
Schedule a corrosion initiation.

Is time to service damage less than aircraft service life?

Schedule a service damage occurrence.

Is random number less than probability of a production defect?

Determine new time to first crack initiation.



Is long list option in effect?

Print long list output if aircraft is one being tracked.

Is time to first crack initiation less than aircraft service life or is corrosion initiation scheduled?

Schedule first crack initiation.

Is time to second crack initiation less than aircraft service life or is corrosion initiation scheduled?

Schedule second crack initiation.

Is time to third crack initiation less than aircraft service life or is corrosion initiation scheduled?

Schedule third crack initiation.

Schedule first D-level inspection and aircraft retirement.

Is this last aircraft to enter service?

Schedule event ENTER.SERVICE.

Return.

7. FATIGUE.LIFE.SCATTER

7.1 Description

This routine receives the actual average fatigue life of the element design from the calling routine and returns the times to crack initiation of the first three fatigue cracks for the element in a particular aircraft. These times are random selections from a two-parameter Weibull distribution. This routine can be called from routine INSTALL.MODIFICATION and events ENTER.SERVICE and REPAIR.

7.2 Local Variables

ALPHA - This real variable is the shape parameter of the fatigue life distribution.

FIRST.LIFE - This real variable is the time to first crack initiation. This time is returned to the calling routine.

N - This integer variable, passed from the calling routine, identifies the random number stream to be used.

RN - This real variable is a uniformly distributed random number.

THIRD.LIFE - This real variable is the time to third crack initiation. This time is returned to the calling routine.

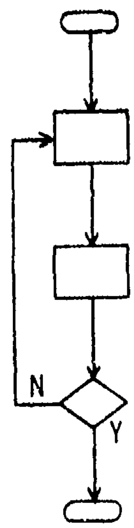
BETA - This real variable is the scale parameter of the fatigue life distribution.

LIFE - This real array of length three is used to temporarily hold the times to crack initiation of the three fatigue cracks.

RFL - This real variable is the element actual average fatigue life passed from the calling routine.

SECOND.LIFE - This real variable is the time to second crack initiation. This time is returned to the calling routine.

7.3 Flow Chart



Routine FATIGUE.LIFE.SCATTER.

Draw uniformly distributed random number.

Calculate time to crack initiation.

Times calculated for [illegible] cracks?

Return.

8. INSTALL.MODIFICATION

8.1 Description

This routine represents the installation of a structural modification caused by a fatigue test failure or by aircraft service experience. The modification is installed during a repair or a D-level inspection. All previously scheduled defect initiations are cancelled, and new times to defect initiations are calculated for each aircraft when it is modified. This routine can be called from the events REPAIR and D.LEVEL.INSPECTION.

8.2 Local Variables

DEFECT.LIFE - This real variable is the time to crack initiation drawn from a distribution of fatigue lives of elements having production defects.

HOURS.TO.CORROSION - This real variable contains the value returned by routine PREDICT.CORROSION.

RST - This real variable is the remaining service time to retirement of the aircraft being considered.

STD.FAST - This real variable is the standard deviation of the distribution of fast crack growth rates.

THIRD.LIFE - This real variable is the time to third crack initiation returned by routine FATIGUE.LIFE.SCATTER.

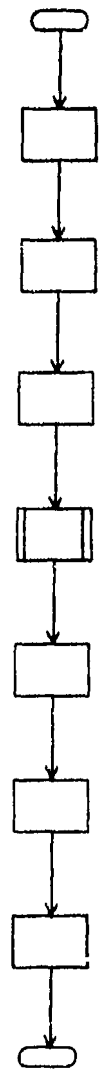
FIRST.LIFE - This real variable is the time to first crack initiation returned by routine FATIGUE.LIFE.SCATTER.

RN - This real variable is drawn from a uniform distribution of random numbers between 0 and 1.

SECOND.LIFE - This real variable is the time to second crack initiation returned by routine FATIGUE.LIFE.SCATTER.

STD.SLOW - This real variable is the standard deviation of the distribution of slow crack growth rates.

8.3 Flow Chart



Routine INSTALL.MODIFICATION.

Set C-level and D-level intervals to initial values.

Cancel previously scheduled inspections.

Cancel previously scheduled FAILURE.

Call routine FATIGUE.LIFE.SCATTER.

Cancel previously scheduled defect initiations.

Cancel previously scheduled REACH.FAIL.SAFE.LGT.

Schedule new defect initiations.

Return.

9. IN.SERVICE.DAMAGE

9.1 Description

This event represents the occurrence of a service damage defect. This occurrence results in the immediate initiation of the next scheduled crack. A new time to service damage is determined. If the new time is less than the remaining time in service of the aircraft, this event is scheduled once again. This event can be scheduled from within itself or in event ENTER.SERVICE.

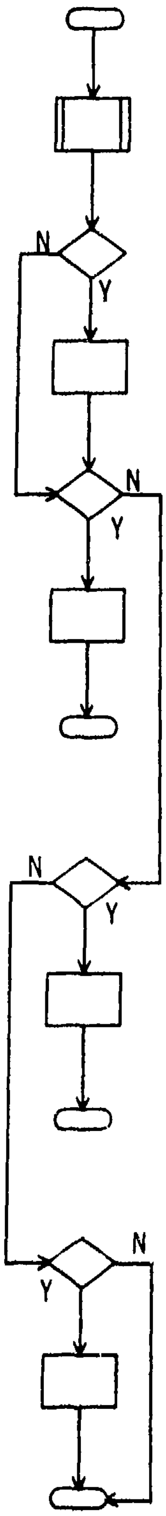
9.2 Local Variables

IDSDM - This integer variable is the identification number of the aircraft for which the event was scheduled.

RST - This real variable is the remaining service time to retirement of the aircraft being considered.

OURS.TO.SERVICE.DAMAGE - This real variable is the value returned by routine PREEDICT.SERVICE.DAMAGE.

9.3 Flow Chart



Event IN.SERVICE.DAMAGE.

Call routine PREEDICT.SERVICE.DAMAGE.

Is time to service damage less than remaining service time of aircraft?

Schedule event IN.SERVICE.DAMAGE.

Is first crack initiation scheduled?

Reschedule first crack to occur immediately.

Return.

Is second crack initiation scheduled?

Reschedule second crack to occur immediately.

Return.

Is third crack initiation scheduled?

Reschedule third crack to occur immediately.

Return.

10. T.IMPLEMENT.MOD

10.1 Description

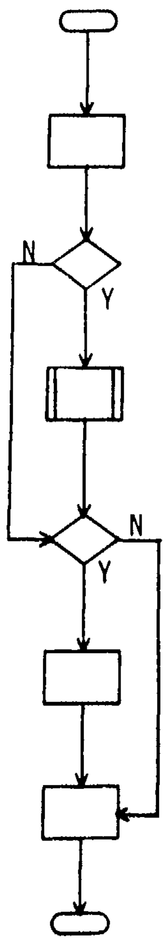
This event represents the development of a structural modification because of a fatigue test failure. This event determines the actual average fatigue life of the modification and schedules an increase in inspection frequencies at some percentage of the fatigue test life. This event is scheduled in the MAIN program.

10.2 Local Variables

NSIG - This real variable is (SIG.R)(.85) and is based on the assumption that a modification usually improves the actual average fatigue life of a particular design.

NMU - This real variable is MU.R+0.15(1.0-MU.R) and is also based on the foregoing assumption for NSIG.

10.3 Flow Chart



Event T.IMPLEMENT.MOD.

Set actual average fatigue life equal to predicted.

Does MOD.TESTED="NO"?

Call routine REAL.LIFE.

Is fatigue test life less than aircraft service life?

Indicate that aircraft in service require retrofit.

Schedule event T.INSPECTION.INCREASE.

Return.

11. PREEDICT.SERVICE.DAMAGE

11.1 Description

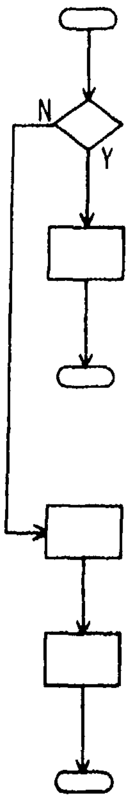
This routine generates the time to service damage occurrence for a given aircraft from a constant service damage occurrence rate. If the service damage occurrence rate is zero in the input, the routine sets the time to service damage occurrence as twice that of the aircraft service life. This routine can be called from events ENTER.SERVICE and IN.SERVICE.DAMAGE.

11.2 Local Variables

OURS.TO.SERVICE.DAMAGE - This real variable is the time to service damage occurrence in flight hours. This time is returned by the routine.

RN - This real variable is a uniformly distributed random number between 0 and 1.

11.3 Flow Chart



Routine PREEDICT.SERVICE.DAMAGE.

Is service damage occurrence rate $\leq$ 0?

Set time to service damage equal to twice aircraft service life.

Return.

Select uniformly distributed random number.

Calculate time to service damage.

Return.

12. PREDICT.CORROSION

12.1 Description

This routine generates time to corrosion initiation for a given aircraft from a time-dependent occurrence rate approximated by two constant rates. The first constant occurrence rate, the second constant occurrence rate, and the service time on the aircraft when the second rate goes into effect are all input variables. This routine can be called from the routine INSTALL. MODIFICATION and events ENTER.SERVICE and REPAIR.

12.2 Local Variables

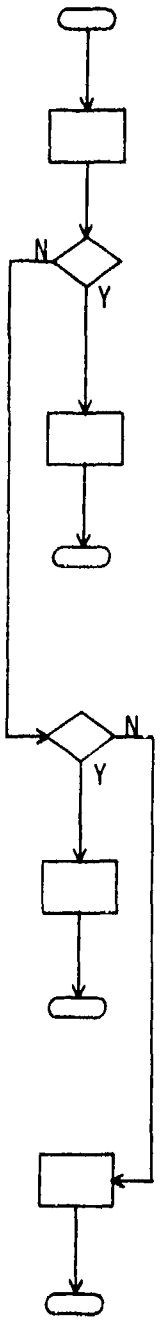
CRCT - This real variable is the remaining time in flight hours until the second corrosion occurrence rate goes into effect. This variable can be negative indicating that the second rate is already in effect.

LD - This real variable is used to hold an intermediate value during the calculation of time to corrosion initiation. The calculation uses a combination of both corrosion occurrence rates.

HOURS.TO.CORROSION - This real variable is the flight time until corrosion initiation. This time is returned to the calling routine.

RN - This real available is a uniformly distributed random number.

12.3 Flow Chart



Routine PREDICT.CORROSION.

Select uniformly distributed random number.

Is time on aircraft greater than time at which second occurrence rate goes into effect?

Calculate time to corrosion initiation using second rate.

Return.

Is selected random number > random number required to yield corrosion initiation at time of occurrence rate change?

Calculate time to corrosion initiation using first rate.

Return.

Calculate time to corrosion initiation using combination of both occurrence rates.

Return.

13. CORROSION

13.1 Description

This event represents the initiation of a corrosion defect. The remaining time to crack initiation of all scheduled cracks is reduced by a corrosion damage factor. If either of the events FAILURE or REACH.FAIL.SAFE.LGT is scheduled, its remaining time until occurrence is also reduced by the corrosion damage factor. This event can be scheduled in the routine INSTALL. MODIFICATION and in events ENTER.SERVICE and REPAIR.

13.2 Local Variables

CDM.MULTIPLYING.FACTOR - This real variable is the factor which when multiplied by the remaining time to crack initiation accounts for the shortening effect of corrosion on fatigue lives.

NFTM - If a FAILURE has been scheduled, this real variable is the remaining time until its occurrence.

REMAINING.LIFE - This real variable is the remaining time until a scheduled crack initiation.

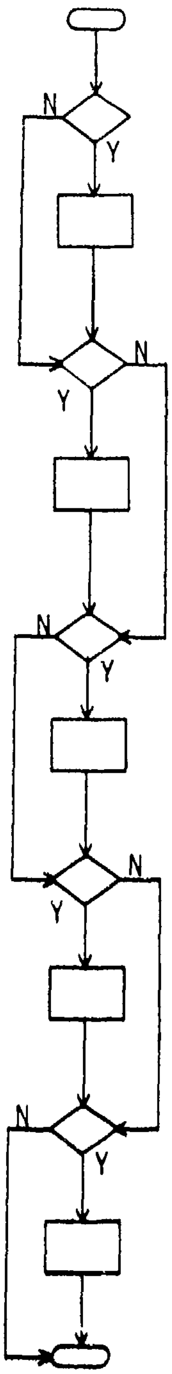
TRT - If a REACH.FAIL.SAFE.LGT has been scheduled, this real variable is the remaining time until its occurrence multiplied by the corrosion damage factor.

IDCO - This integer variable contains the identification number of the aircraft for which the event CORROSION was scheduled.

REDUCED.REMAINING.LIFE - This real variable is the REMAINING. LIFE multiplied by the corrosion damage factor.

RST - This real variable is the remaining service time of the aircraft under consideration.

13.3 Flow Chart



Event COROSION .

Is event REACH.FAIL.SAFE.LGT scheduled?

Reduce remaining time to occurrence of REACH.FAIL.SAFE.LGT by corrosion damage factor.

Is event FAILURE scheduled?

Reduce remaining time to occurrence of FAILURE by corrosion damage factor.

Is first crack initiation scheduled?

Reduce remaining time to first crack initiation by corrosion damage factor.

Is second crack initiation scheduled?

Reduce remaining time to second crack initiation by corrosion damage factor.

Is third crack initiation scheduled?

Reduce remaining time to third crack initiation by corrosion damage factor.

Return.

14. RATE

14.1 Description

This routine statistically generates element crack growth rates which reflect variation in material properties and load environment. The growth rates are randomly drawn from a normal distribution which is defined by a mean growth rate and a standard deviation passed from the calling routine. If a random draw yields a negative growth rate, the rate is set equal to the mean growth rate minus four standard deviations. Thus, the user must be sure that the standard deviation is always less than one-fourth of the mean. This routine is defined as a function in the routine PREAMBLE and is used in event ENTER.SERVICE and routine INSTALL.MODIFICATION.

14.2 Local Variables

G1 - This real variable is used to hold intermediate values in the calculation of the crack growth rate.

M - This real variable is the mean crack growth rate passed from the calling routine.

RN - This real variable is a uniformly distributed random number between 0 and 1.

S - This real variable is the crack growth rate standard deviation passed from the calling routine.

Z - This real variable is the element crack growth rate returned to the calling routine.

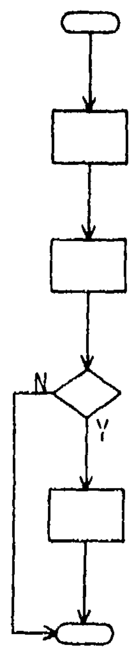
G2 - This real variable is used to hold intermediate values in the calculation of the crack growth rate.

N - This integer variable, passed from the calling routine, identifies the random number stream to be used.

RNI - This real variable, equal to 1.0 - RN, is a uniformly distributed random number between 0 and 1.

W - This real variable is used to hold intermediate values in the calculation of the crack growth rate.

14.3 Flow Chart



Routine RATE.

Select uniformly distributed random number.

Calculate crack growth rate.

Is calculated growth rate negative?

Set growth rate equal to mean minus four standard deviations.

Return.

15. 1.STRENGTH.REDUCTION

15.1 Description

This event represents the initiation of the first crack. If the long list option is in effect, the aircraft identification number and flight hours are printed for those aircraft being tracked. A uniform random number is compared with the probability of internal cracking to determine whether this crack initiates internally. If it does initiate internally, the time until it becomes external is calculated and the event 1.ITE is scheduled. Next, the time to structural failure is calculated by using the three-part residual strength curve described in Vol. II. If this time is less than the remaining service life of the aircraft, the event FAILURE is scheduled. The time until the residual strength of the element reaches the fail-safe strength is calculated, and event REACH.FAIL.SAFE.LGT is scheduled. This event can be scheduled in events ENTER.SERVICE, INSTALL.MODIFICATION, and REPAIR.

15.2 Local Variables

ARG - This real variable is used as an intermediate value in the calculation of time until structural failure.

GR2 - This real variable is the fast crack growth rate.

IDISR - This integer variable is the aircraft identification number.

K1, K11, K13, K4, K9, LG - These real variables are used as intermediate values in the calculation of time until structural failure.

LIST - This real variable is set equal to 1.0 when the long list option is in effect and the aircraft being processed is one of those being tracked.

R2 - This real variable is the strength degradation rate when the crack length is between the critical crack length and the fail-safe length.

SF - This real variable is the element fail-safe strength.

S1 - This real variable is the element residual strength when the crack is at the critical crack length.

TAR - This real variable is the simulation time at which the aircraft being processed retires from service.

T1 - This real variable is the time in flight hours for the crack to grow from its initiation to the critical crack length.

GR1 - This real variable is the element slow crack growth rate.

K10, K12, K2, K8, LGK5 - These real variables are used as intermediate values in the calculation of time until structural failure.

R1 - This real variable is the strength degradation rate from crack initiation to critical crack length.

R3 - This real variable is the strength degradation rate from fail-safe strength to structural failure.

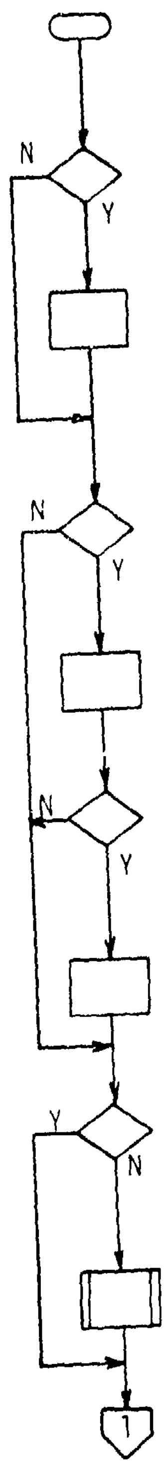
SU - This real variable is the ultimate strength of the element.

T - This real variable is the time in flight hours until a crack initiated internally becomes external.

TTF - This real variable is the time in flight hours until element failure.

T2 - This real variable is the time in flight hours until the fail-safe strength is reached.

15.3 Flow Chart



Event 1.STRENGTH.REDUCTION.

Is long list option in effect?

Print ID number and flight hours for aircraft being tracked.

Does crack initiate internally?

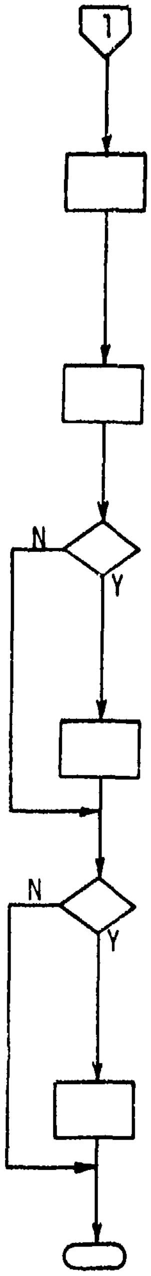
Set 1.INT to "YES".

Is time until crack becomes external less than remaining service life of aircraft?

Schedule event 1.ITE.

Is aircraft presently inspected below overhaul level?

Call routine INSPECTION.SCHEDULER.



Calculate time until residual strength equals fail-safe strength.

Calculate time until structural failure.

Is time until fail-safe strength less than remaining service life of aircraft?

Schedule event REACH.FAIL.SAFE.LGT.

Is time until failure less than remaining service life of aircraft?

Schedule event FAILURE.

Return.

16. 2.STRENGTH.REDUCTION

16.1 Description

This event represents the second crack initiation. If the long list option is in effect, the aircraft identification number and flight hours are printed for those aircraft being tracked. A uniform random number is compared with the probability of internal cracking to determine whether this crack initiates internally. If it does initiate internally, the time until it becomes external is calculated and the event 2.ITE is scheduled. Next, the time to structural failure is calculated by using the same three-part residual strength curve as in event 1.STRENGTH.REDUCTION. However, the crack growth rate is now one calculated by a least-squares fit of points determined from the sum of crack lengths of the two cracks. This calculation is described in Vol. II. If the time until failure is less than the remaining service life of the aircraft, the event FAILURE is scheduled. The time until the residual strength of the element reaches the fail-safe strength is calculated and event REACH.FAIL.SAFE.LGT is scheduled. This event can be scheduled in events ENTER.SERVICE, INSTALL.MODIFICATION, and REPAIR.

16.2 Local Variables

ARG - This real variable is used as an intermediate value in the calculation of time until element failure.

CL - This real variable is the crack length when the crack initiated.

GR1 - This real variable is the slow crack growth rate.

K10, K12, K2, K8, LGK5, N - These real variables are used as intermediate values in the calculation of time until element failure.

R2 - This real variable is the strength degradation rate when the composite crack length is between the critical crack length and the fail-safe length.

SF - This real variable is the fail-safe strength of the element.

SU - This real variable is the ultimate strength of the element.

T - This real variable is the time in flight hours until a crack initiated internally becomes external.

TAR - This real variable is the simulation time at which the aircraft being processed retires from service.

TCL - This real variable is the time it takes a single crack to grow from its initiation to the critical crack length.

T1 - This real variable is the time until the first crack reaches its critical crack length.

W, WXS, WY, Y - These real variables are used as intermediate values in the calculation of time until structural failure.

CCL - This real variable is the critical crack length of the element.

DL - This real variable is the length of the first crack at the time of corrosion initiation.

GR2 - This real variable is the fast crack growth rate of the element.

ID2SR - This integer variable is the aircraft identification number.

K1, K11, K13, K4, K9, LG - These real variables are used as intermediate values in the calculation of time until structural failure.

LIST - This real variable is set equal to 1.0 when the long list option is in effect and the aircraft being processed is one of those being tracked.

R1 - This real variable is the strength degradation rate between the time that a first crack initiates until the time that this crack reaches its critical length.

R3 - This real variable is the strength degradation rate from fail-safe strength until structural failure.

SMW - This real variable is used as an intermediate value in the calculation of time until structural failure.

S1 - This real variable is the element residual strength when the first crack is at the critical crack length.

TAC - This real variable is the time of corrosion initiation.

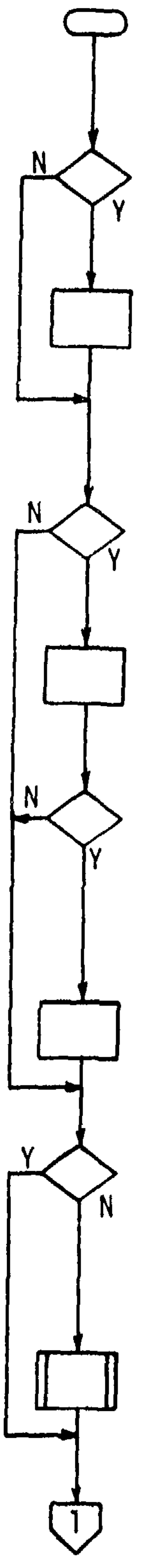
TA1 - This real variable is the time of first crack initiation.

TTF - This real variable is the time in flight hours until structural failure.

T2 - This real variable is the time in flight hours from when an element has a residual strength until when it has a fail-safe strength.

WX, WXY, X - These real variables are used as intermediate values in the calculation of time until structural failure.

16.3 Flow Chart



Event 2.STRENGTH.REDUCTION .

Is long list option in effect?

Print ID number and flight hours for aircraft being tracked.

Does crack initiate internally?

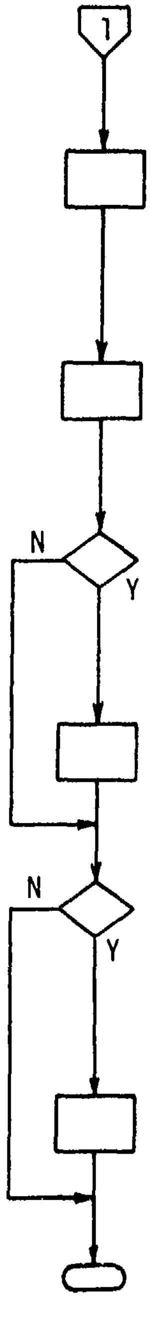
Set 2.INT to "YES".

Is time until crack becomes external less than remaining service life of aircraft?

Schedule event 2.ITE.

Is aircraft presently inspected below overhaul level?

Call routine INSPECTION.SCHEDULER.



Calculate time until residual strength equals fail-safe strength.

Calculate time until structural failure.

Is time until fail-safe strength less than remaining service life of aircraft?

Schedule event REACH.FAIL.SAFE.LGT.

Is time until failure less than remaining service life of aircraft?

Schedule event FAILURE.

Return.

17. 3.STRENGTH.REDUCTION

17.1 Description

This event represents the third crack initiation. If the long list option is in effect, the aircraft identification number and flight hours are printed for those aircraft being tracked. A uniform random number is compared with the probability of internal cracking to determine whether this crack initiates internally. If it does initiate internally, the time until it becomes external is calculated and the event 3.ITE is scheduled. Next, the time to structural failure is calculated by using the same three-part residual strength curve as in event 1.STRENGTH.REDUCTION. However, the crack growth rate is now calculated by a least-squares fit of points determined from the sum of crack lengths of the three cracks. This calculation is described in Vol. II. If the time until failure is less than the remaining service life of the aircraft, the event FAILURE is scheduled. The time until the residual strength of the element reaches the fail-safe strength is calculated and event REACH.FAIL.SAFE.LGT is scheduled. This event can be scheduled in events ENTER.SERVICE, INSTALL.MODIFICATION, and REPAIR.

17.2 Local Variables

ARG - This real variable is used as an intermediate value in the calculation of time until structural failure.

CL - This real variable is the crack length when the crack initiated.

GR1 - This real variable is the slow crack growth rate.

K10, K12, K2, K8, LGK5, N - These real variables are used as intermediate values in the calculation of time until structural failure.

R2 - This real variable is the strength degradation rate when the composite crack length is between the critical crack length and the fail-safe length.

SF - This real variable is the fail-safe strength of the element.

SU - This real variable is the ultimate strength of the element.

T - This real variable is the time in flight hours until a crack initiated internally becomes external.

TAR - This real variable is the simulation time at which the aircraft being processed retires from service.

TA2 - This real variable is the time of the second crack initiation.

TTF - This real variable is the time in flight hours until structural failure.

T2 - This real variable is the time in flight hours from when the element has a residual strength until it reaches a fail-safe strength.

WX, WXY, X, Y - These real variables are used as intermediate values in the calculation of time until structural failure.

1CL - This real variable is the crack length of the first crack at third crack initiation.

CCL - This real varaible is the critical crack length of the element.

DL - This real variable is the length of the first crack at the time of corrosion initiation.

GR2 - This real variable is the fast crack growth rate of the element.

ID3SR - This integer variable is the aircraft identification number.

K1, K11, K13, K4, K9, LG - These real variables are used as intermediate values in the calculation of time until structural failure.

LIST - This real variable is set equal to 1.0 when the long list option is in effect and the aircraft being processed is one of those being tracked.

R1 - This real variable is the strength degradation rate from when the first crack initiates until it reaches its critical crack length.

R3 - This real variable is the strength degradation rate from fail-safe strength until structural failure.

SMW - This real variable is used as an intermediate value in the calculation of time until structural failure.

S1 - This real variable is the element residual strength when the first crack is at the critical crack length.

TAC - This real variable is the time of corrosion initiation.

TA1 - This real variable is the time of first crack initiation.

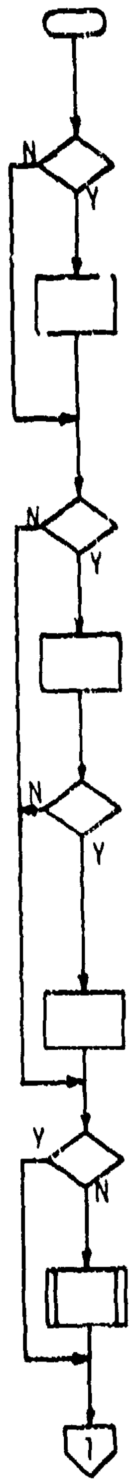
TCL - This real variable is the time it takes a single crack to grow from its initiation to the critical crack length.

T1 - This real variable is the time until the first crack reaches its critical crack length.

W, WXS, WY, XK, Y2 - These real variables are used as intermediate values in the calculation of time until structural failure.

2CL - This real variable is the length of the second crack at the time of the third crack initiation.

17.3 Flow Chart



Event 3.STRENGTH.REDUCTION .

Is long list option in effect?

Print ID number and flight hours for aircraft being tracked.

Does crack initiate internally?

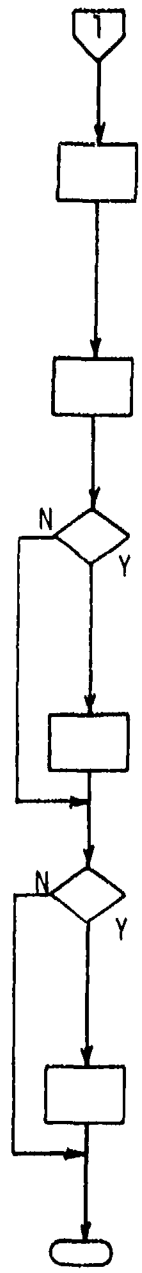
Set 3.INT to "YES".

Is time until crack becomes external less than remaining service life of aircraft?

Schedule event 3.ITE.

Is aircraft presently inspected below overhaul level?

Call routine INSPECTION.SCHEDULER.



Calculate time until residual strength equals fail-safe strength.

Calculate time until structural failure.

Is time until fail-safe strength less than remaining service life of aircraft?

Schedule event REACH.FAIL.SAFE.LGT.

Is time until failure less than remaining service life of aircraft?

Schedule event FAILURE.

Return.

18. 1.ITE

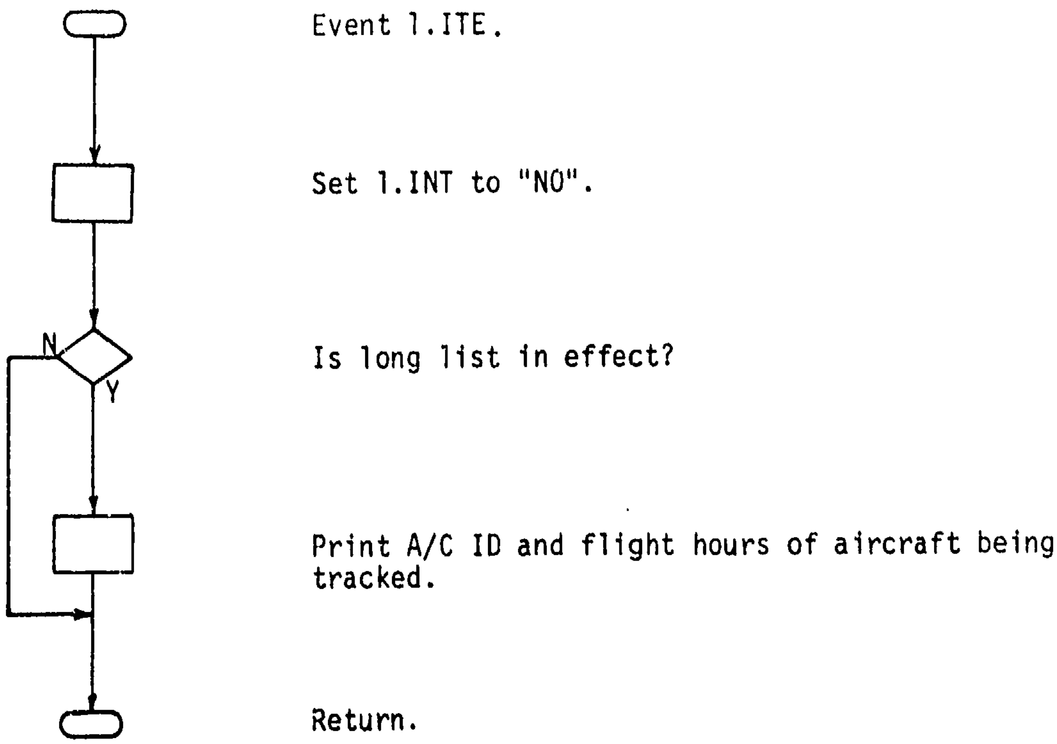
18.1 Description

This event represents the time when a first crack which initiated internally becomes external. This time is defined as the time when the element crack length reaches a percentage of the critical crack length. This percentage is an input parameter. At this time the appropriate element of the alpha array 1.INT is changed from "YES" to "NO". If the long list option is in effect, the aircraft identification and flight hours are printed for those aircraft being tracked. This event is scheduled in event 1.STRENGTH.REDUCTION.

18.2 Local Variables

IDIE - This integer variable is the aircraft identification number.

18.3 Flow Chart



19. 2.ITE

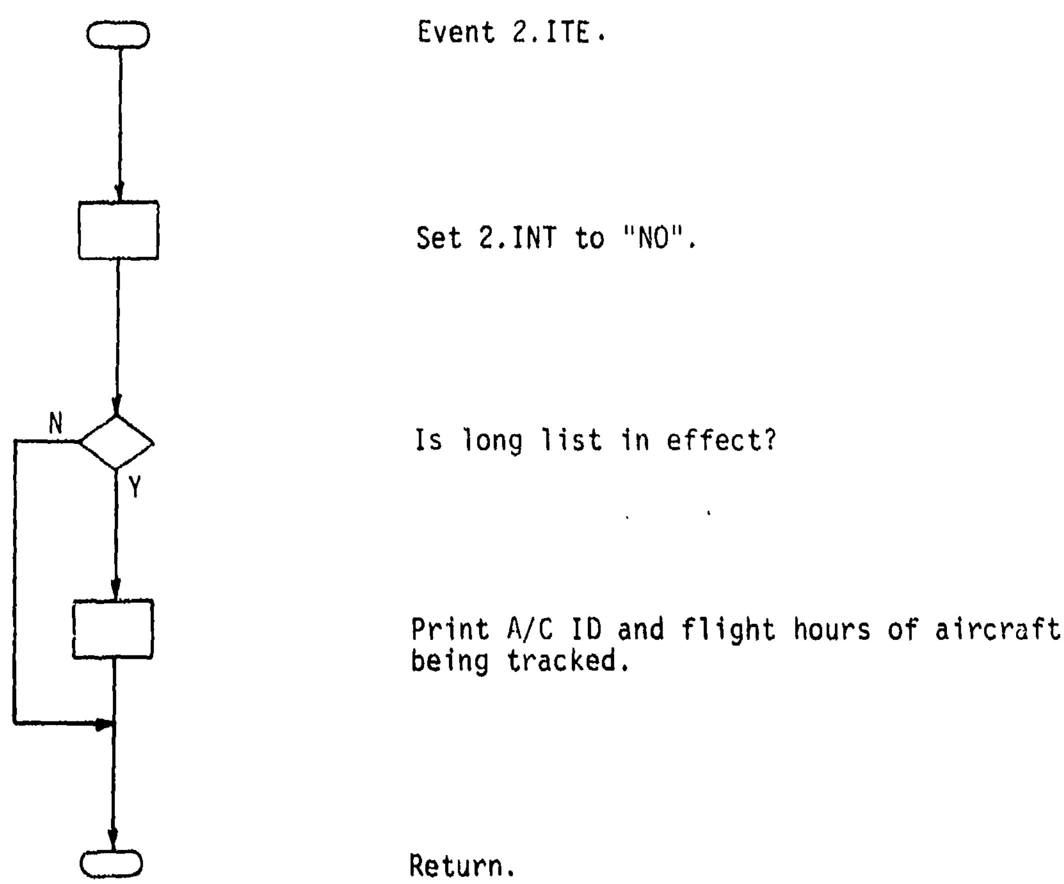
19.1 Description

This event represents the time when a second crack which initiated internally becomes external. This time is defined as the time when the element crack length reaches a percentage of the critical crack length. This percentage is an input parameter. At this time the appropriate element of the alpha array 2.INT is changed from "YES" to "NO". If the long list option is in effect, the aircraft identification and flight hours are printed for those aircraft being tracked. This event is scheduled in event 2.STRENGTH.REDUCTION.

19.2 Local Variables

ID2E - This integer variable is the aircraft identification number.

19.3 Flow Chart



20. 3.ITE

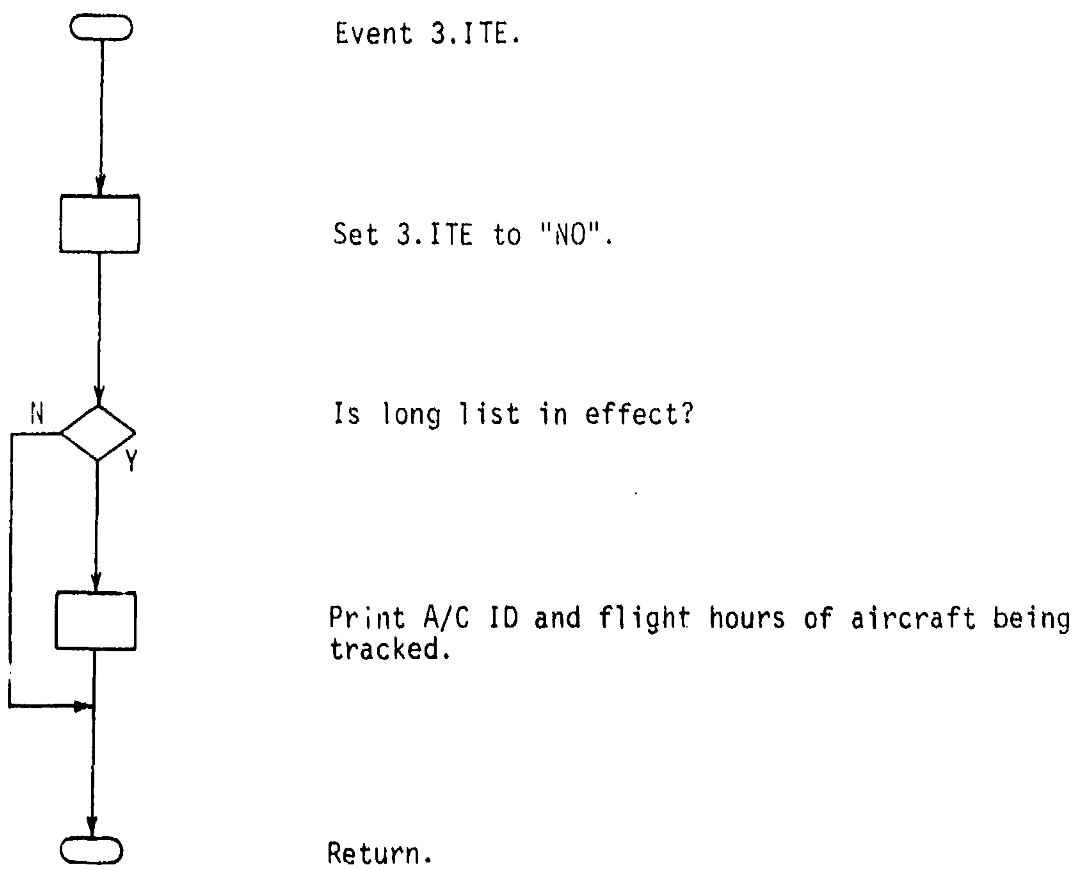
20.1 Description

This event represents the time when a first crack which initiated internally becomes external. This time is defined as the time when the element crack length reaches a percentage of the critical crack length. This percentage is an input parameter. At this time the appropriate element of the alpha array 3.INT is changed from "YES" to "NO". If the long list option is in effect, the aircraft identification and flight hours are printed for those aircraft being tracked. This event is scheduled in event 3.STRENGTH.REDUCTION.

20.2 Local Variables

ID3E - This integer variable is the aircraft identification number.

20.3 Flow Chart



21. INSPECTION.SCHEDULER

21.1 Description

This routine schedules all inspections below the overhaul level on a given aircraft. To conserve execution time, the inspections are scheduled so that the aircraft is not inspected before the defect reaches its minimum detectable size at each level of inspection. This routine is called from events 1. STRENGTH.REDUCTION and COROSION.

21.2 Local Variables

C1 - This real variable is the corrosion growth rate used to calculate the time to the minimum detectable corrosion area.

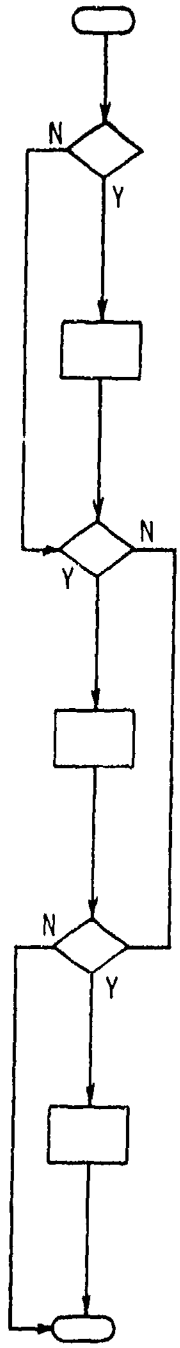
N - This integer variable indicates whether a crack initiation or a corrosion initiation caused this routine to be called.

TML - This real variable is the time to the minimum detectable defect size calculated for each level of inspection.

M1 - This real variable is the crack growth rate used to calculate the time to the minimum detectable crack length.

S.INSP.AT - This real variable is the simulation time at which the first inspection at each level is scheduled.

21.3 Flow Chart



Routine INSPECTION.SCHEDULER.

Is lowest external inspection level less than or equal to A-level?

Calculate time to minimum detectable size. Schedule A-level inspection.

Is lowest external inspection level less than or equal to B-level?

Calculate time to minimum detectable size. Schedule B-level inspection.

Is lowest external inspection level less than or equal to C-level?

Calculate time to minimum detectable size. Schedule C-level inspection.

Return.

22. A.LEVEL.INSPECTION

22.1 Description

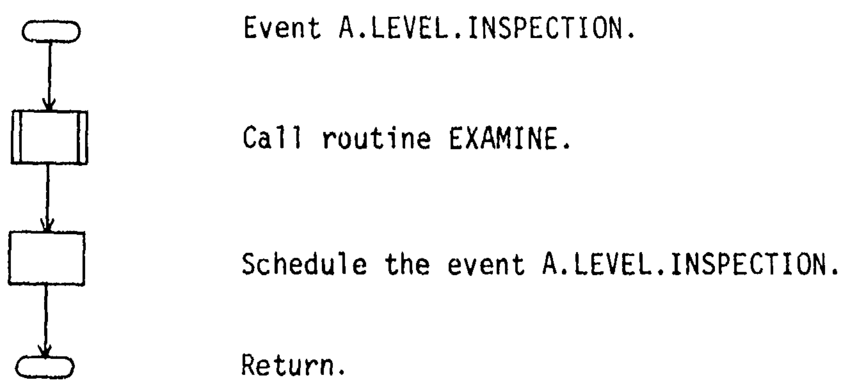
This event represents the performance of an A-level inspection. The constants which define the probability of detection equation at the A-level are passed to the routine EXAMINE which handles the actual inspection calculations for all levels of inspection. This event can be scheduled in the routine INSPECTION. SCHEDULER and the events A.LEVEL.INSPECTION, B.LEVEL.INSPECTION, C.LEVEL.INSPECTION, and D.LEVEL.INSPECTION.

22.2 Local Variables

FOUND - Not used in this event, this real variable is returned by routine EXAMINE with a non-zero value whenever a defect is found.

IDA - This integer variable is the identification number of the aircraft being inspected.

22.3 Flow Chart



23. B.LEVEL.INSPECTION

23.1 Description

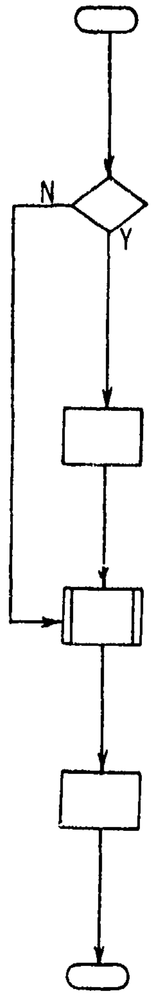
This event represents the performance of a B-level inspection. The constants which define the probability of detection equation at the B-level are passed to the routine EXAMINE. The inspection interval for each inspection level is not necessarily an even multiple of all lower level intervals. If an A-level inspection is scheduled, it is cancelled and rescheduled at present time plus one A-level interval later. This event can be scheduled in the routine INSPECTION.SCHEDULER and the events B.LEVEL.INSPECTION, C.LEVEL.INSPECTION, and D.LEVEL.INSPECTION.

23.2 Local Variables

FOUND - Not used in this event, this real variable is returned by routine EXAMINE with a non-zero value whenever a defect is found.

IDB - This integer variable is the identification number of the aircraft being inspected.

23.3 Flow Chart



Event B.LEVEL.INSPECTION.

Is lowest external inspection level less than or equal to A-level?

Reschedule the A-level inspection.

Call routine EXAMINE.

Schedule the event B.LEVEL.INSPECTION.

Return.

24. C.LEVEL.INSPECTION

24.1 Description

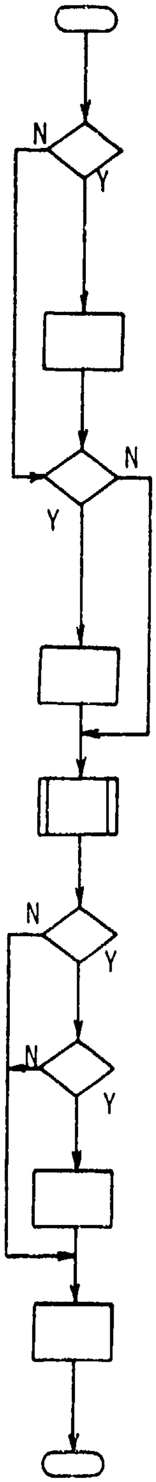
This event represents the performance of a C-level inspection. If there is either an A-level or a B-level inspection currently scheduled, it is cancelled and rescheduled at one A-level interval or B-level interval, respectively, later. The constants which define the probability of defect detection equation at the C-level are passed to the routine EXAMINE. If a crack is detected and the aircraft is one of the ten high-time aircraft, the time of detection is stored. This event can be scheduled in the routine INSPECTION.SCHEDULER and the events C.LEVEL.INSPECTION and D.LEVEL.INSPECTION.

24.2 Local Variables

FOUND - This real variable is returned by routine EXAMINE with a value of one whenever a crack is detected.

IDC - This integer variable is the identification number of the aircraft being inspected.

24.3 Flow Chart



Event C.LEVEL.INSPECTION.

Is lowest external inspection level less than or equal to B-level?

Reschedule B-level inspection.

Is lowest external inspection level less than or equal to A-level?

Reschedule A-level inspection.

Call routine EXAMINE.

Was crack detected?

Is aircraft one of ten high-time aircraft?

Retain time of detection.

Schedule event C.LEVEL.INSPECTION.

Return.

25. D.LEVEL.INSPECTION

25.1 Description

This event represents the performance of a D-level inspection. If the long list option is in effect on this element, the identification number and flight hours are printed for each aircraft being tracked. If there are any lower level inspections currently scheduled, they are cancelled and rescheduled at one inspection interval later. The constants which define the probability of defect detection equation at the D-level are passed to the routine EXAMINE. The defect histories of the ten high-time aircraft are now examined. If all of the ten high-time aircraft have gone one D-level interval without any cracks detected at either the C-level or the D-level, then the C-level and D-level inspection intervals are increased by the input factor FREQ. DECREASE.

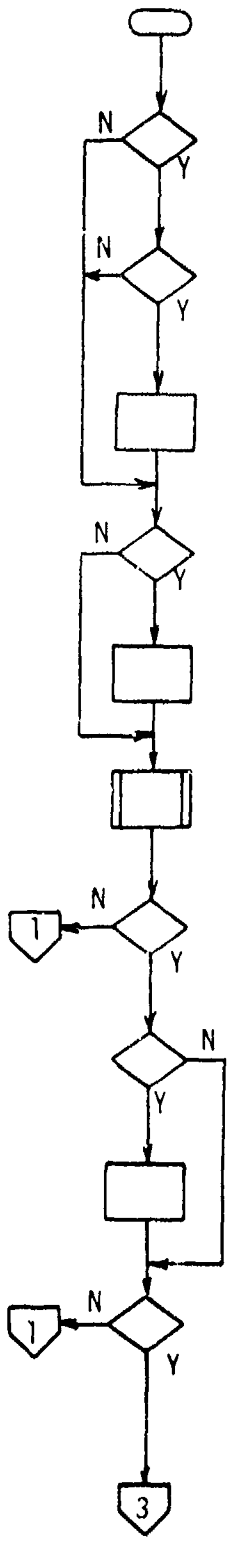
Any pending modifications are installed at this time. This event can be scheduled in the events ENTER.SERVICE and D.LEVEL. INSPECTION.

25.2 Local Variables

FOUND - This real variable is returned by routine EXAMINE with a value of one whenever a crack is detected.

IDD - This integer variable is the identification number of the aircraft being inspected.

25.3 Flow Chart



Event D.LEVEL.INSPECTION.

Is long list option in effect on this element?

Is this aircraft being tracked?

Print aircraft number and flight hours.

Are lower level inspections scheduled?

Reschedule lower level inspections.

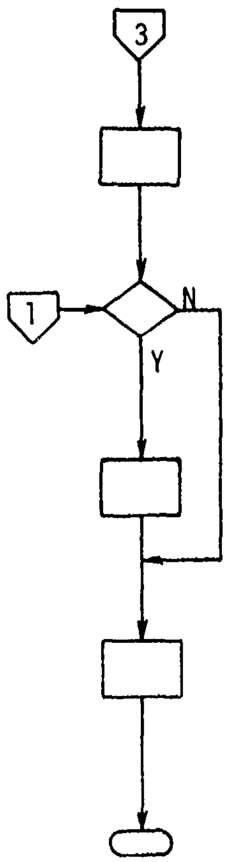
Call routine EXAMINE.

Is aircraft one of ten high-time aircraft?

Was crack detected?

Retain time of detection.

Have all ten high-time aircraft gone one D-level interval without any cracks detected at either C-level or D-level?



Increase C-level and D-level inspection intervals.

Is a modification pending on this aircraft?

Install modification.

Schedule event D.LEVEL.INSPECTION.

Return.

26. EXAMINE

26.1 Description

This routine performs the numerical comparison which determines whether a defect is detected at each level of inspection. The constants which define the probability of defect detection equation are passed to this routine from the events which represent the different levels of inspection. If the long list option is in effect, each time a defect is detected on one of the aircraft being tracked, the following are printed: the size of the defect, the inspection level, the aircraft identification number, and the number of flight hours on the aircraft. This routine can be called from events A.LEVEL.INSPECTION, B.LEVEL.INSPECTION, C.LEVEL.INSPECTION, and D.LEVEL.INSPECTION.

26.2 Local Variables

AREA - This real variable is the calculated area of the corrosion defect.

CL - This real variable is the calculated length of the fatigue cracks.

LIST - This real variable is set equal to 1.0 if the long list option is in effect and the aircraft being inspected is one of those being tracked.

M2 - This real variable is the fast crack growth rate for the aircraft being inspected.

TAC - This real variable is the simulation time of the corrosion initiation.

TA2 - This real variable is the simulation time of the second crack initiation.

XA - This real variable is one of the probability of detection equation constants passed by the calling event.

YA - This real variable is one of the probability of detection equation constants passed by the calling event.

Z - This alpha variable is the level of inspection being performed.

ZL - This real variable is one of the probability of detection equation constants passed by the calling event.

CCL - This real variable is the critical crack length of the element.

FOUND - This real variable is set equal to two whenever corrosion is detected and to one whenever a crack is detected.

M1 - This real vairable is the slow crack growth rate for the aircraft being inspected.

N - This integer variable identifies the inspection level and is passed by the calling event.

TA1 - This real variable is the simulation time of the first crack initiation.

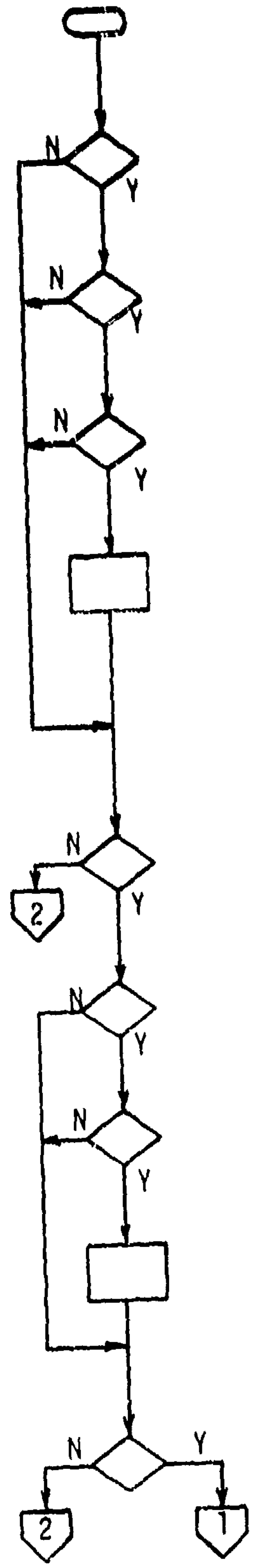
TA3 - This real variable is the simulation time of the third crack initiation.

XL - This real variable is one of the probability of detection equation constants passed by the calling event.

YL - This real variable is one of the probability of detection equation constants passed by the calling event.

ZA - This real variable is one of the probability of detection equation constants passed by the calling event.

26.3 Flow Chart



Routine EXAMINE.

Does corrosion exist?

Is the area inspected?

Is random number less than probability of detection?

Set tally counters to defect size.
Let FOUND=2.

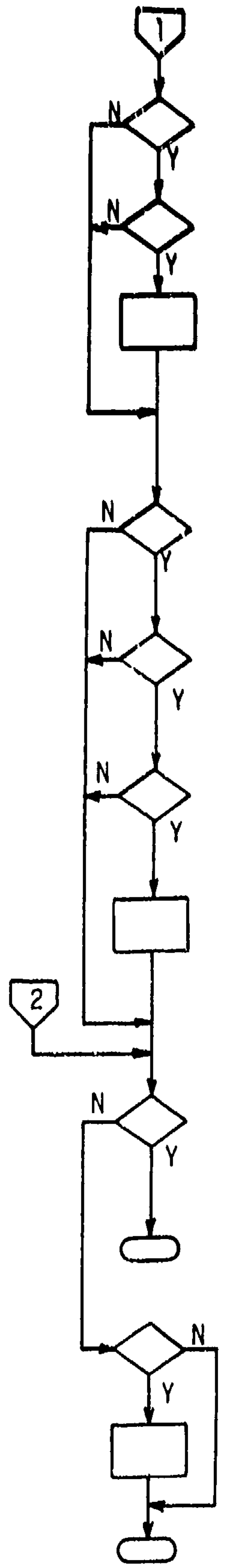
Does first crack exist?

Is the area inspected?

Is random number less than probability of detection?

Set tally counters to defect size.
Let FOUND=1.

Does second crack exist?



Is the area inspected?

Is random number less than probability
of detection?

Set tally counters to defect size.
Let FOUND=1.

Does third crack exist?

Is the area inspected?

Is random number less than probability
of detection?

Set tally counters to defect size.
Let FOUND=1.

Was routine called from D.LEVEL.INSPECTION?

Return.

Is FOUND greater than zero?

Schedule event REPAIR.

Return.

27. <u>PODD</u>

27.1 <u>Description</u>

This routine, defined as a function in the PREAMBLE, computes the probability of detecting a crack or corrosion defect of a given size. This probability is returned to the calling routine. PODD is called from routine EXAMINE and event IMMEDIATE. FLEET.INSPECTION.

27.2 <u>Local Variables</u>

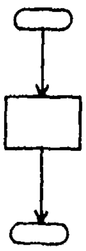
L - This real variable is the size of the defect under consideration.

Y - This real variable is an empirically determined equation constant for each level of inspection.

X - This real variable is the maximum probability of detection at a given inspection level.

Z - This real variable is the minimum defect size detectable at a given inspection level.

27.3 <u>Flow Chart</u>



Routine PODD.

Compute probability of detection.

Return.

28. CANCEL.SCHEDULED.INSPECTIONS

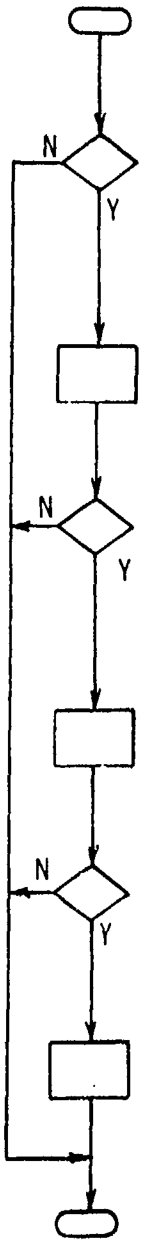
28.1 Description

This routine cancels all scheduled inspections below the overhaul level on a given aircraft. Whenever a defect is detected and repaired, it is assumed that all other defects existing on that particular element are also repaired. This routine is called at this time to cancel all subsequent inspections. Also, if an element fails or an aircraft with existing defects is retired, this routine is called to cancel all scheduled inspections. This routine can be called from events FAILURE, RETIRE. FROM.SERVICE, and REPAIR.

28.2 Local Variables

There are no local variables in this routine.

28.3 Flow Chart



Routine CANCEL.SCHEDULED.INSPECTIONS.

Is lowest level external inspection less than or equal to C-level?

Cancel the C-level inspection.

Is lowest level external inspection less than or equal to B-level?

Cancel the B-level inspection.

Is lowest level external inspection equal to A-level?

Cancel the A-level inspection.

Return.

29. REACH.FAIL.SAFE.LGT

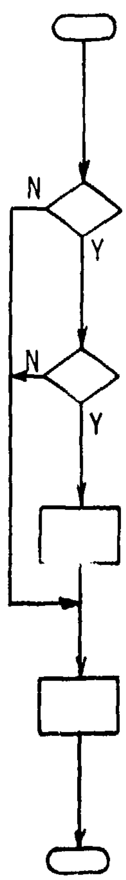
29.1 Description

This event represents the time when the residual strength of the element has been reduced to the fail-safe strength. The time and aircraft identification number are saved as part of the output. The calculation of the strength reduction is based on the sum of all crack lengths in the element. This event can be scheduled in events 1.STRENGTH.REDUCTION, 2.STRENGTH.REDUCTION, and 3.STRENGTH.REDUCTION.

29.2 Local Variables

IDRFS - This integer variable is the identification number of the aircraft being processed.

29.3 Flow Chart



Event REACH.FAIL.SAFE.LGT.

Is long list option in effect?

Is this aircraft one of those being tracked?

Print aircraft number and flight hours.

Build output arrays.

Return.

30. FAILURE

30.1 Description

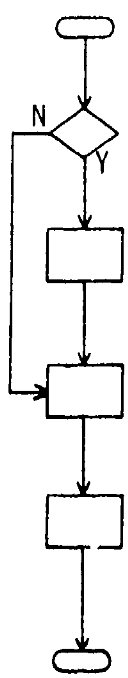
This event represents structural failure. When this event occurs, the aircraft is removed from the active fleet. If this aircraft was one of the ten high-time aircraft being monitored for the purpose of increasing inspection intervals, it is replaced by the next high-time aircraft in active service. Any remaining scheduled events are cancelled and their event notices destroyed. This event can be scheduled in events 1.STRENGTH.REDUCTION, 2.STRENGTH.REDUCTION, and 3.STRENGTH.REDUCTION.

30.2 Local Variables

HOLD - This integer variable serves as an intermediate storage for aircraft identification numbers when replacing one of the ten high-time aircraft.

IDFA - This integer variable is the identification number of the aircraft under consideration.

30.3 Flow Chart



Event FAILURE.

Is aircraft one of ten high time aircraft?

Replace with next high time aircraft in active service?

Remove aircraft from ACTIVE.FLEET.
File aircraft in CRASHED.FLEET.

Cancel scheduled events; destroy event notices.

Return.

31. RETIRE.FROM.SERVICE

31.1 Description

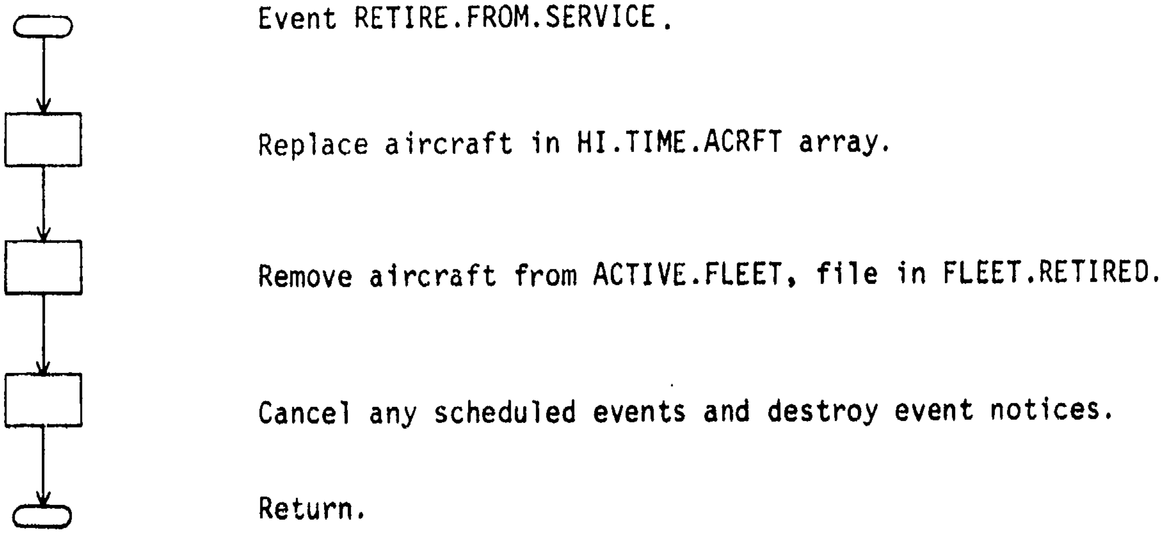
This event represents the retirement of an aircraft from active service. The aircraft is replaced in the HI.TIME.ACRFT array by that active aircraft not in the array which has the highest time in service. The aircraft being retired is removed from the set ACTIVE.FLEET and filed in the set FLEET.RETIRED. All remaining scheduled events for this aircraft are cancelled and the event notices destroyed. This event can only be scheduled in the event ENTER.SERVICE.

31.2 Local Variables

HOLD - This integer variable is used as an intermediate storage to hold aircraft identification numbers during the HI.TIME.ACRFT replacement.

IDRET - This integer variable is the identification number of the aircraft being retired from service.

31.3 Flow Chart



32. REPAIR

32.1 Description

This event represents the structural repair of an element. If there is a modification pending on the element, it is installed at this time. If the events FAILURE and REACH.FAIL. SAFE.LGT are scheduled, they are cancelled. It is assumed that all existing defects are repaired and that new times to defect occurrences are determined in the same manner as when the aircraft entered service. The size and number of all existing cracks are compared with the inspection interval decrease criteria. If these criteria are met, then the events which decrease inspection intervals and perform special fleet-wide inspections are scheduled. All defects that were scheduled but had not occurred by this time are not affected by this event and will occur as originally scheduled. This event can be scheduled in events D.LEVEL.INSPECTION, EXAMINE, and IMMEDIATE.FLEET.INSPECTION.

32.2 Local Variables

AAFL - This real variable is the actual average fatigue life of the element design.

CL - This real variable is the calculated fatigue crack length.

HOURS.TO.CORROSION - This real variable is the time in flight hours to corrosion initiation.

MAX.CRK - This real variable is the maximum crack length in the element.

RST - This real variable is the remaining service time of the aircraft.

STR.RED - This real variable is the element strength reduction because of all existing cracks.

TA1 - This real variable is the simulation time of the first crack initiation.

TA3 - This real variable is the simulation time of the third crack initiation.

CCL - This real variable is the element critical crack length.

FIRST.LIFE - This real variable is the time in flight hours to first crack initiation.

IDREP - This integer variable is the aircraft identification number.

POT.CRK - This real variable is the sum of the maximum crack length and the length that the crack will grow during the shortest internal inspection interval.

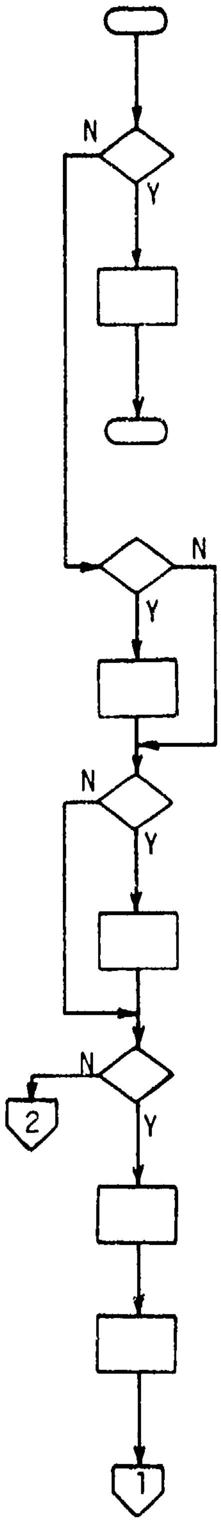
SECOND.LIFE - This real variable is the time in flight hours to the second crack initiation.

TAC - This real variable is the simulation time of the corrosion initiation.

TA2 - This real variable is the simulation time of the second crack initiation.

THIRD.LIFE - This real variable is the time in flight hours to the third crack initiation.

32.3 Flow Chart



Event REPAIR.

Is modification pending on this aircraft?

Install modification.

Return.

Is event FAILURE scheduled?

Cancel event FAILURE.

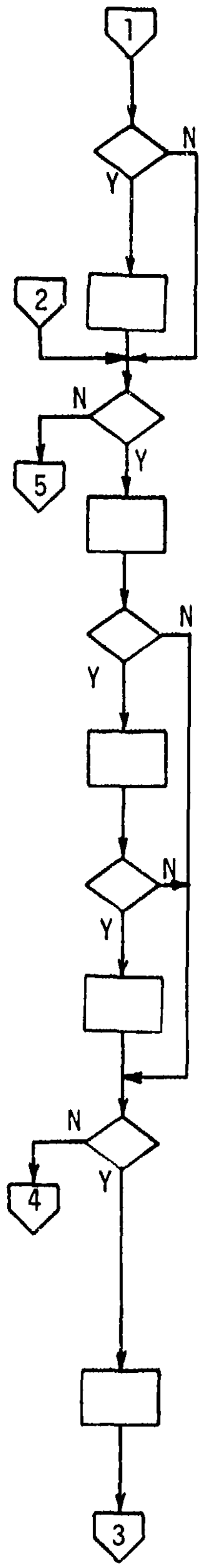
Is event REACH.FAIL.SAFE.LGT scheduled?

Cancel event REACH.FAIL.SAFE.LGT.

Does corrosion exist?

Set corrosion factor equal to 1.0.

Determine new time to corrosion initiation.



Is time to corrosion initiation less than remaining service life of aircraft?

Schedule corrosion initiation.

Does first crack exist?

Calculate crack length.

Does second crack exist?

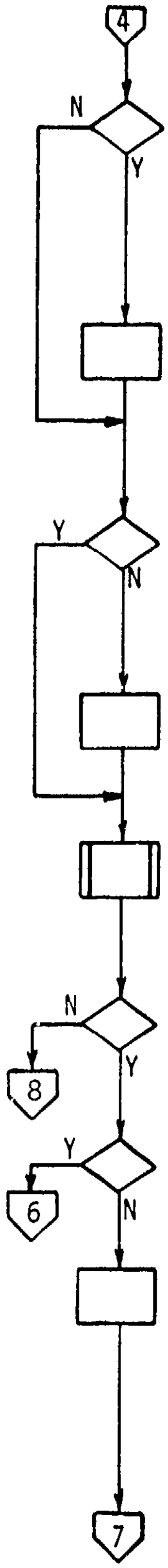
Calculate crack length.

Does third crack exist?

Calculate crack length.

Is sum of crack lengths plus crack growth rate times inspection interval greater than one-half the fail-safe crack length?

Increase inspection frequency and perform a special fleet wide inspection.



Is sum of crack lengths found in entire fleet greater than one-fifth of fleet size times fail-safe crack length?

Increase inspection frequency and perform a special fleet wide inspection.

Is there a modification pending somewhere in the fleet?

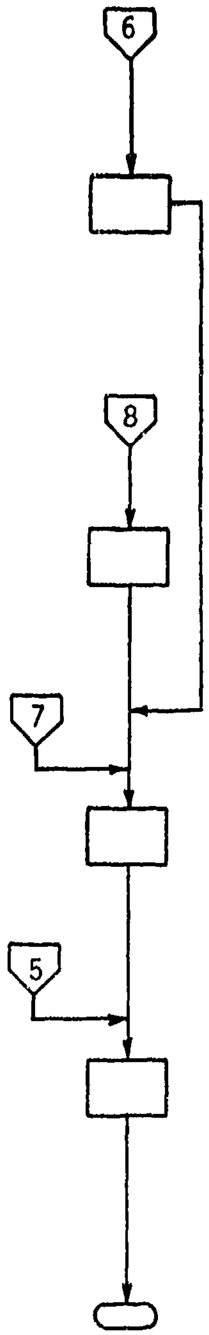
Schedule event DECISION.ON.MOD.

Call routine FATIGUE.LIFE.SCATTER.

Does second crack exist?

Does third crack exist?

Let time to first crack initiation be set to time to third crack initiation and times to second and third crack initiations be set to shortest times from routine FATIGUE.LIFE.SCATTER.



Let times to all three crack initiations be taken from FATIGUE.LIFE.SCATTER.

Set time to first crack to time to second crack. Set time to second crack to time to third crack. Set time to third crack from FATIGUE.LIFE.SCATTER.

Reschedule crack initiations for those cracks with times to crack initiation less than remaining service life of aircraft.

Cancel scheduled inspections below overhaul level.

Return.

33. T.INSPECTION.INCREASE

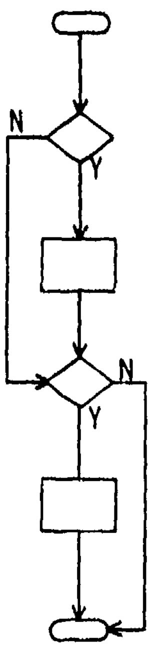
33.1 Description

This event represents an inspection frequency increase for a particular aircraft pending a structural modification because of a fatigue test failure. The factor by which the inspection frequency for both the close internal and the close external inspection is increased depends on the element being considered and is an input parameter. This event can only be scheduled in event T.IMPLEMENT.MOD.

33.2 Local Variables

IDTI - This integer variable is the identification number of the aircraft under consideration.

33.3 Flow Chart



Event T.INSPECTION.INCREASE.

Is lowest internal level or lowest external level of inspection equal to C-level?

Increase C-level inspection frequency.

Is lowest internal level or lowest external level of inspection equal to D-level?

Increase D-level inspection frequency.

Return.

34. INCREASE.INSPECTION.FREQUENCY

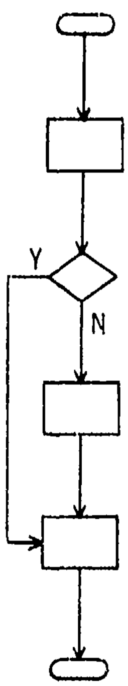
34.1 Description

This event represents a fleet-wide increase in the frequencies of the lowest level internal and external inspections. These may or may not be the same levels. However, the A-level and B-level frequencies are never changed. All scheduled inspections are cancelled and rescheduled to reflect the frequency increase. This event can be scheduled in events REPAIR and IMMEDIATE.FLEET.INSPECTION.

34.2 Local Variables

DIFF - This real variable is the difference in flight hours between the old and new lowest internal level inspection intervals.

34.3 Flow Chart



Event INCREASE.INSPECTION.FREQUENCY.

Increase lowest internal level frequency.

Is lowest internal level equal to lowest external level?

Increase lowest external level frequency.

Rescheduled scheduled inspections for each aircraft.

Returned.

35. IMMEDIATE.FLEET.INSPECTION

35.1 Description

This event represents an immediate fleet-wide inspection caused by finding a defect considered too hazardous to depend on scheduled inspections for detection of additional defects. Existing crack lengths and corrosion areas are calculated along with the associated probabilities of detection. As in the scheduled inspections, these probabilities are compared with a random number to determine whether or not the defect is detected. This event is always preceded by the event INCREASE.INSPECTION.FREQUENCY. Defects found during this inspection can cause an additional increase in the frequency of normally scheduled inspections. This event can only be scheduled in event REPAIR.

35.2 Local Variables

AREA - This real variable is the area in sq. inches of an existing corrosion defect.

CL - This real variable is the length in inches of an existing fatigue crack.

M1 - This real variable is the slow crack growth rate for a particular aircraft.

POT.CRK - This real variable is the sum of the maximum crack length detected on a particular aircraft plus the product of the average crack growth rate and the current lowest internal level inspection interval.

SR - This real variable is the sum of the lengths of all cracks detected on a particular aircraft.

TAC - This real variable is the time of initiation of an existing corrosion defect.

TA2 - This real variable is the time of initiation of an existing second fatigue crack.

CCL - This real variable is the critical crack length of the element under consideration.

FOUND - This real variable serves as a switch which is set equal to two when corrosion is detected and set equal to one when a crack is detected.

MAX.CRK - This real variable is the maximum crack length detected on a particular aircraft.

M2 - This real variable is the fast crack growth rate for a particular aircraft.

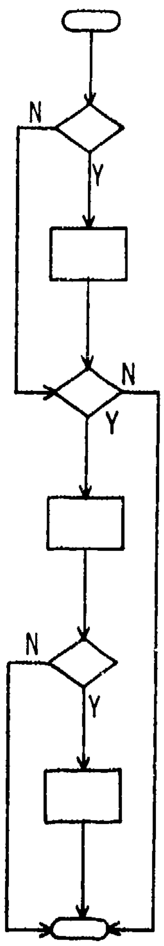
POT.STR.RED - This real variable is the sum of the detected crack lengths on a particular aircraft plus the product of the crack growth rate and the current lowest internal level inspection interval.

STR.RED - This real variable is equal to SR.

TA1 - This real variable is the time of initiation of an existing first fatigue crack.

TA3 - This real variable is the time of initiation of an existing third fatigue crack.

35.3 Flow Chart



Event IMMEDIATE.FLEET.INSPECTION.

Does corrosion exist?

Calculate corrosion area and test for detection.

Do cracks exist?

Calculate crack lengths and test for detection.

Do detected cracks meet criteria for inspection frequency increase?

Schedule event INCREASE.INSPECTION.FREQUENCY to occur immediately.

Return.

36. DECISION.ON.MOD

36.1 Description

This event makes the decision on whether or not to develop a structural modification because of service experience. The decision to develop a modification is made by comparing the cost per flight hour of the modification with the repair cost per flight hour plus the increased inspection cost per flight hour. The modification cost per flight hour is found by dividing the total fleet modification cost by the remaining service life of the fleet. The repair cost per flight hour is found by dividing the total fleet repair costs since the last modification by the fleet flight time since the last modification. The increased inspection cost per flight hour is found by dividing the projected increased inspection costs by the remaining service life of the fleet. A modification is justified when

$$MCPH < RCPH + ICPH$$

where MCPH = modification cost per flight hour
RCPH = repair cost per flight hour
ICPH = increased inspection cost per flight hour

This event can be scheduled only in event REPAIR.

36.2 Local Variables

ACCUMULATED.HRS - This real variable is the total fleet time since the last modification.

MD.COST - This real variable is the cost of installing a modification on a single aircraft. The costs for additional modifications can differ from those for the initial modifications.

NFTS - This real variable is the total production time of all aircraft entering service after the second production rate goes into affect.

POST.MOD.HRS - This real variable is the total fleet service time remaining after the modification.

TOOLING - This real variable is the tooling cost in the development of a modification. The costs for additional modifications can differ from those for the initial modifications.

ICPH - This real variable is the increased inspection cost per flight hour.

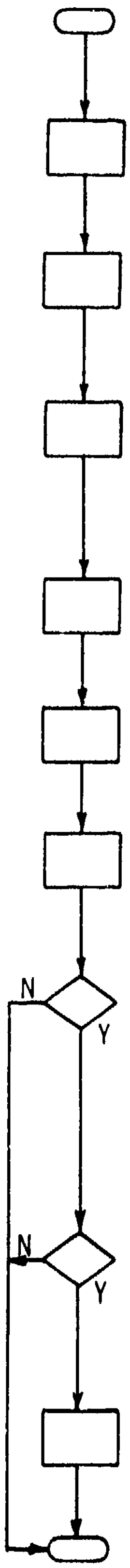
MCPH - This real variable is the modification cost per flight hour.

MRFH - This real variable is the service time remaining on a particular aircraft after its modification.

NPDL - This real variable is the number of aircraft which have entered service.

RCPH - This real variable is the repair cost per flight hour of the fleet.

36.3 Flow Chart



Event DECISION.ON.MOD.

Accumulate remaining service life of active fleet.

Determine fleet flight time since last modification.

Add service life of aircraft not yet produced to remaining service life of active fleet.

Calculate increased inspection costs per flight hour.

Calculate modification cost per flight hour.

Calculate repair cost per flight hour.

Is repair cost per hour plus increased inspection cost per hour greater than modification cost per hour?

Can modification be developed before last aircraft in fleet retires?

Schedule event IMPLEMENT.MODIFICATION.

Return.

37. IMPLEMENT.MODIFICATION

37.1 Description

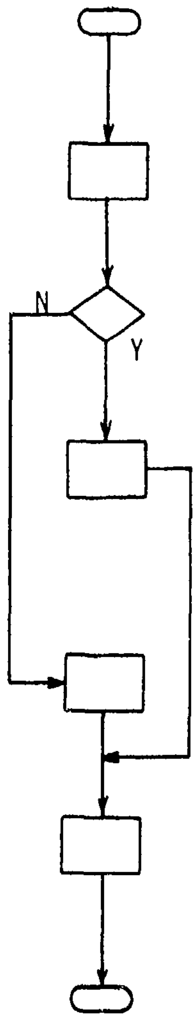
This event represents the development of a modification because of service experience. If the modification is to be fatigue tested, the actual average fatigue life is set equal to the original predicted life of the element design. Otherwise, the actual average fatigue life is determined by calling event REAL.LIFE. Elements of the alpha array SMOD.PENDING are set equal to "YES" to indicate which aircraft have service modifications pending. These modifications will be installed at the next D-level inspection or defect repair. Intervals for all levels of inspection are set to their initial values. This event can be scheduled only in event DECISION.ON.MOD.

37.2 Local Variables

NSIG - This real variable is the standard deviation of the ratio distribution passed to routine REAL.LIFE.

NMU - This real variable is the mean of the ratio distribution passed to routine REAL.LIFE.

37.3 Flow Chart



Event IMPLEMENT.MODIFICATION.

Set inspection intervals to initial values.

Is modification tested?

Set actual average fatigue life equal to predicted average fatigue life.

Call routine REAL.LIFE.

Set alpha array SMOD.PENDING.

Return.

38. DISPLAY.OUTPUT

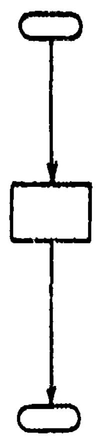
38.1 Description

This routine prints the standard output for each element. It is called from the MAIN program immediately after the completion of each element simulation. This output is suppressed if the long list option is in effect.

38.2 Local Variables

All the local variables are used to temporarily hold output values.

38.3 Flow Chart



Routine DISPLAY.OUTPUT.

Print output.

Return.

39. SUMMARY

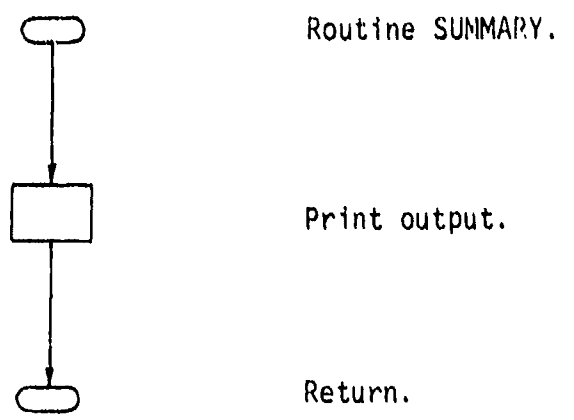
39.1 Description

This routine prints the standard output summary for each element type. The output of routine DISPLAY.OUTPUT for all the elements in an element type is contained in this output summary. This routine is called from the MAIN program each time a new element type is read in and at the end of the program run. This output is suppressed if the long list option is in effect.

39.2 Local Variables

All the local variables are used to temporarily hold output values.

39.3 Flow Chart



APPENDIX B

INITIAL PROGRAM SOURCE LISTING

```
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>  P L E A S E   N O T E  <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

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PREAMBLE
      THE SYSTEM OWNS AN ACTIVE.FLEET, A FLEET.RETIRED AND A CRASHED.FLEET
''
'' GLOBAL REAL VARIABLES
''
      DEFINE PREDICTED.LIFE, ACTUAL.AVG.FAT.LIFE, START.TEST,
             TEST.ACCEL.FACT, BEGIN.PRODUCTION, PRODUCTION.TIME, USAGE.LIFE
          AS REAL VARIABLES
      DEFINE LGHT.TO.FAILURE, FLEET.STR.REQ, CRIT.CRK.LGT, LEAD.TIME, 1AAFL
          AS REAL VARIABLES
      DEFINE HIGH.DEFECT.PROBABILITY, SEV, OCCURRENCE.RATE, C.GROWTH.RATE,
             CRRF, LOCATE.IN.STRESS.CON, SAMPLING,
             AU.K, STG.K, ESAF.LGT,
             M1.MEAN, M2.MEAN, A, B, C7, C28, C29
          AS REAL VARIABLES
      DEFINE A.REPAIR.COST, B.REPAIR.COST,
             C.REPAIR.COST, D.REPAIR.COST, S.REPAIR.COST,
             COST.OF.REPAIRS, FIXIT.COST, 1ST.MD.COST, AD.MD.COST, 1ST.TOOLING,
             AD.TOOLING, I.FREQ.CHG, S.FREQ.CHG, CHG.FREQ.TIME
          AS REAL VARIABLES
      DEFINE I.PROB, C.PROB, ICRKT, ICONT, ISPT, ACRAL, BCRAL,
             CCRAL, DCRAL, SCRAL, ACA, BCA, CCA, DCA, SCA
          AS REAL VARIABLES
      DEFINE 1.CON.OCCURRENCE.RATE, 2.CON.OCCURRENCE.RATE, CON.RATE.CHANGE,
             FREQ.DECREASE, 2.PRODUCTION.TIME, PRCHG, AIRFRAME.TIME
          AS REAL VARIABLES
      DEFINE GICRK, GICOR, GISO, GACRK, GBCRK, GCCRK, GDCRK, GSCRK, GACA, GBCA,
             GCCA, GDCA, GSCA, CINSL, RINSL, FCLI, KSMP
          AS REAL VARIABLES
''
'' GLOBAL INTEGER VARIABLES
''
      DEFINE ID, IDCK, I, SIZE.OF.FLEET, COUNT.FLEMENT, NICHG, LHTA,
             1.NUM.OF.RETIRE, 2.NUM.OF.CRASH, IIRNL, EXT.INSP.LEVEL,
             LIL, LFL, TO.BE.MODIFIED, BEEN.MODIFIED, FDCK, CRR
          AS INTEGER VARIABLES
      DEFINE NICR, OCOR, DSOM, NRE, DSCR, DSCO, NSIC, NSMD, NSFL, NMD,
             NRES, SNRES, J, NME, LDX,
             GNICR, GOCOR, GDSOM, GDSCR, GDSCO, GDRP, SNSIC, SNMD, SNSMD, SNSFL
          AS INTEGER VARIABLES
''
'' GLOBAL ALPHA VARIABLES
''
      DEFINE TES.FAILURE, MOD.TESTED, PREVIOUSLY.MODIFIED, IMP.MOD.SCH,
             LONG.LIST, LIMIT,
             DEC.OR.MOD.SCH, SEL1, SEL2, SEL3, INI.LVL.INSP, EXT.LVL.INSP
          AS ALPHA VARIABLES
''
'' REAL ARRAYS
''
      DEFINE C.INTERVAL, D.INTERVAL, ARCD, CARCD, IARCD, CKREP.TIME, CMREP.TIME,
             LAST.SD, DEC.MOD, ASR, MER, SC, SP, XMN, XMOD, CSMI
          AS REAL, 1-DIMENSIONAL ARRAYS
```

```
''
'' INTEGER ARRAYS
''
     DEFINE A1SR, A2SR, A3SR, AF, AIRPLANE, AAL, AHL, ACL, ADL, AC, ATII, ACID,
            NICP, NICO, SACID, GOICP, GOICO, HI.TIME.ACRFT, APID, SAPID, STIM,
            SSTIM, FLTHR, SFLTHR, ARFSL, GOAC, A1E, A2E, A3E
        AS INTEGER, 1-DIMENSIONAL ARRAYS
     DEFINE TLID AS AN INTEGER, 2-DIMENSIONAL ARRAY
''
'' ALPHA ARRAYS
''
     DEFINE MODEL, ELEMENT, 1.CR.EXISTS, 2.CR.EXISTS, 3.CR.EXISTS, CO.EXISTS,
            SD.SCH, SSTAN, SFLNR, AIL, FSH, IE1, IE2, IE3,
            TMOD.PENDING, SMOD.PENDING, INSP.SCH, 1.INT, 2.INT, 3.INT, C.INT
        AS ALPHA, 1-DIMENSIONAL ARRAYS
     DEFINE ELID AS AN ALPHA, 2-DIMENSIONAL ARRAY
''
   TEMPORARY ENTITIES
''
     EVERY AIRCRAFT HAS AN ENTRY.TIME, A TAIL.ID
     AND MAY BELONG TO AN ACTIVE.FLEET, A FLEET.RETIRED AND A CRASHED.FLEET
     DEFINE TAIL.ID AS AN INTEGER VARIABLE
''
     TALLY NICR AS THE MINIMUM, XICR AS THE MAXIMUM, MICR AS THE MEAN OF ICRKT
     TALLY NICO AS THE MINIMUM, XICO AS THE MAXIMUM, MICO AS THE MEAN OF ICORT
     TALLY NISD AS THE MINIMUM, XISD AS THE MAXIMUM, MISD AS THE MEAN OF ISDT
     TALLY NACR AS THE MINIMUM, XACR AS THE MAXIMUM, MACR AS THE MEAN OF ACRKL
     TALLY NHCR AS THE MINIMUM, XHCR AS THE MAXIMUM, MHCR AS THE MEAN OF HCRKL
     TALLY NCCR AS THE MINIMUM, XCCR AS THE MAXIMUM, MCCR AS THE MEAN OF CCRKL
     TALLY NDCR AS THE MINIMUM, XDCR AS THE MAXIMUM, MDCR AS THE MEAN OF DCRKL
     TALLY NSCR AS THE MINIMUM, XSCR AS THE MAXIMUM, MSCR AS THE MEAN OF SCRKL
     TALLY NACA AS THE MINIMUM, XACA AS THE MAXIMUM, MACA AS THE MEAN OF ACA
     TALLY NHCA AS THE MINIMUM, XHCA AS THE MAXIMUM, MHCA AS THE MEAN OF HCA
     TALLY NCCA AS THE MINIMUM, XCCA AS THE MAXIMUM, MCCA AS THE MEAN OF CCA
     TALLY NDCA AS THE MINIMUM, XDCA AS THE MAXIMUM, MDCA AS THE MEAN OF DCA
     TALLY NSCA AS THE MINIMUM, XSCA AS THE MAXIMUM, MSCA AS THE MEAN OF SCA
     TALLY SICR AS THE MINIMUM, LICR AS THE MAXIMUM, AICR AS THE MEAN OF GICRK
     TALLY SICO AS THE MINIMUM, LICO AS THE MAXIMUM, AICO AS THE MEAN OF GICOR
     TALLY SISD AS THE MINIMUM, LISD AS THE MAXIMUM, AISD AS THE MEAN OF GISD
     TALLY SACR AS THE MINIMUM, LACR AS THE MAXIMUM, AACR AS THE MEAN OF GACRK
     TALLY SHCR AS THE MINIMUM, LHCR AS THE MAXIMUM, AHCR AS THE MEAN OF GHCRK
     TALLY SCCR AS THE MINIMUM, LCCR AS THE MAXIMUM, ACCR AS THE MEAN OF GCCRK
     TALLY SDCR AS THE MINIMUM, LDCR AS THE MAXIMUM, ADCR AS THE MEAN OF GDCRK
     TALLY SSCR AS THE MINIMUM, LSCR AS THE MAXIMUM, ASCR AS THE MEAN OF GSCRK
     TALLY SACA AS THE MINIMUM, LACA AS THE MAXIMUM, AACA AS THE MEAN OF GACA
     TALLY SHCA AS THE MINIMUM, LHCA AS THE MAXIMUM, AHCA AS THE MEAN OF GHCA
     TALLY SCCA AS THE MINIMUM, LCCA AS THE MAXIMUM, ACCA AS THE MEAN OF GCCA
     TALLY SDCA AS THE MINIMUM, LDCA AS THE MAXIMUM, ADCA AS THE MEAN OF GDCA
     TALLY SSCA AS THE MINIMUM, LSCA AS THE MAXIMUM, ASCA AS THE MEAN OF GSCA
     TALLY NCINS AS THE MINIMUM, XCINS AS THE MAXIMUM OF CINSL
     TALLY NDINS AS THE MINIMUM, XDINS AS THE MAXIMUM OF DINSL
''
   EVENT NOTICES INCLUDE ENTER.SERVICE, T.IMPLEMENT.MOD, IMPLEMENT.MODIFICATION,
```

```
''
      INCREASE.INSPECTION.FREQUENCY, IMMEDIATE.FLEET.INSPECTION,
      DECISION.ON.MOD
      EVERY IN.SERVICE.DAMAGE HAS AN IDSDM
           DEFINE IDSDM AS AN INTEGER VARIABLE
      EVERY CORROSION HAS AN IDCO
           DEFINE IDCO AS AN INTEGER VARIABLE
      EVERY 1.STRENGTH.REDUCTION HAS AN ID1SR
           DEFINE ID1SR AS AN INTEGER VARIABLE
      EVERY 2.STRENGTH.REDUCTION HAS AN ID2SR
           DEFINE ID2SR AS AN INTEGER VARIABLE
      EVERY 3.STRENGTH.REDUCTION HAS AN ID3SR
           DEFINE ID3SR AS AN INTEGER VARIABLE
      EVERY 1.ITE HAS AN ID1E
           DEFINE ID1E AS AN INTEGER VARIABLE
      EVERY 2.ITE HAS AN ID2E
           DEFINE ID2E AS AN INTEGER VARIABLE
      EVERY 3.ITE HAS AN ID3E
           DEFINE ID3E AS AN INTEGER VARIABLE
      EVERY A.LEVEL.INSPECTION HAS AN IDA
           DEFINE IDA AS AN INTEGER VARIABLE
      EVERY B.LEVEL.INSPECTION HAS AN IDB
           DEFINE IDB AS AN INTEGER VARIABLE
      EVERY C.LEVEL.INSPECTION HAS AN IDC
           DEFINE IDC AS AN INTEGER VARIABLE
      EVERY D.LEVEL.INSPECTION HAS AN IDD
           DEFINE IDD AS AN INTEGER VARIABLE
      EVERY T.INSPECTION.INCREASE HAS AN IDTI
           DEFINE IDTI AS AN INTEGER VARIABLE
      EVERY REPAIR HAS AN IDREP
           DEFINE IDREP AS AN INTEGER VARIABLE
      EVERY FAILURE HAS AN IDFA
           DEFINE IDFA AS AN INTEGER VARIABLE
      EVERY REACH.FAIL.SAFE.LGT HAS AN IDRFS
           DEFINE IDRFS AS AN INTEGER VARIABLE
      EVERY RETIRE.FROM.SERVICE HAS AN IDRET
           DEFINE IDRET AS AN INTEGER VARIABLE
''
   PRIORITY ORDER IS REPAIR, INCREASE.INSPECTION.FREQUENCY,
      IMMEDIATE.FLEET.INSPECTION, D.LEVEL.INSPECTION, C.LEVEL.INSPECTION,
      B.LEVEL.INSPECTION
''
      DEFINE PODD AS A REAL FUNCTION
      DEFINE RATE AS A REAL FUNCTION
''
      END
```

```
MAIN
''
'' SET RANDOM NUMBER SEEDS
''
     LET SEED.V(5) = SEED.V(8)
     LET SEED.V(6) = SEED.V(5)
''
'' RESERVE AIRCRAFT ARRAYS
''
     RESERVE HI.TIME.ACRFT(*), MMOD(*) AS 10
     RESERVE SC(*), SD(*) AS 30
     RESERVE ACID(*), FLTHR(*) AS 10
     RESERVE APID(*), STIM(*) AS 20
     RESERVE SACID(*), SFLTHR(*), SSTAN(*) AS 100
     RESERVE SAPID(*), SSTIM(*), SELNB(*) AS 200
     RESERVE MODEL(*) AS 2 AND FLEMENT(*) AS 4
     RESERVE ARCD(*), IARCD(*), CARCD(*) AS 4
''
'' READ AIRCRAFT INPUT
''
     READ MODEL(1), MODEL(2) AS 2 A 4
     READ SIZE.OF.FLEET, USAGE.LIFE
     READ BEGIN.PRODUCTION, PRODUCTION.TIME, 2.PRODUCTION.TIME, PRCHG
     READ START.TEST, TEST.ACCEL.FACT, C.GROWTH.RATE
     READ C7, C28, C29, MU.R, SIG.R, A, B
     READ IARCD(1), IARCD(2), IARCD(3), IARCD(4)
     READ CARCD(1), CARCD(2), CARCD(3), CARCD(4)
     READ SAMPLING, LONG.LIST, PCCL
   IF LONG.LIST = "YES"
     READ NOE
     RESERVE FLID(*,*) AS 4 BY NOE AND NOAC(*) AS NOE
     RESERVE TLID(*,*) AS NOE BY *
     FOR I = 1 TO NOE
     DO
     START NEW CARD
     READ FLID(1,I), ELID(2,I), FLID(3,I), FLID(4,I) AS 4 A 4
     READ NOAC(I)
     RESERVE TLID(I,*) AS NOAC(I)
     ALSO FOR J = 1 TO NOAC(I)
     DO
     READ TLID(I,J)
     LOOP
   ALWAYS
''
'' RESERVE FLEMENT ARRAYS
''
  RESERVE BICR(*), BICD(*), GOICR(*), GOICD(*) AS 4
  RESERVE AIRPLANE(*), TMOD.PENDING(*), SMOD.PENDING(*) AS SIZE.OF.FLEET
  RESERVE C.INTERVAL(*), AIL(*), ARESL(*), ESH(*) AS SIZE.OF.FLEET
  RESERVE D.INTERVAL(*), OCCUR.MOD(*), CKREP.TIME(*) AS SIZE.OF.FLEET
  RESERVE CDREP.TIME(*), 1.CR.EXISTS(*), 2.CR.EXISTS(*) AS SIZE.OF.FLEET
  RESERVE 3.CR.EXISTS(*), CD.EXISTS(*), INSP.SCH(*), SD.SCH(*) AS SIZE.OF.FLEET
  RESERVE A1SR(*), A2SR(*), A3SR(*), AF(*), AC(*), ATII(*) AS SIZE.OF.FLEET
```

```
  RESERVE AAL(*), ABL(*), ACL(*), ADL(*) AS SIZE.OF.FLEET
  RESERVE 1.INT(*), 2.INT(*), 3.INT(*), C.INT(*) AS SIZE.OF.FLEET
  RESERVE MSR(*), MFR(*), LAST.SD(*) AS SIZE.OF.FLEET
  RESERVE XRR(*), CGRI(*) AS SIZE.OF.FLEET
  RESERVE TE1(*), TE2(*), TE3(*) AS SIZE.OF.FLEET
  RESERVE A1E, A2E, A3E AS SIZE.OF.FLEET
''
'' READ ELEMENT INPUT
''
'READ' ADD 1 TO COUNT.ELEMENT
       START NEW CARD
       READ ELEMENT(1), ELEMENT(2), ELEMENT(3), ELEMENT(4) AS A A A
     IF ELEMENT(1) = "END "
       GO TO EOJ
     OTHERWISE
       READ PREDICTED.LIFE, ACTUAL.AVG.FAT.LIFE, M1.MEAN, M2.MEAN
       READ LGHT.1).FAILURE, CRIT.CRK.LGT, FSAF.LGT, BIRTH.DEFECT.PROBABILITY
       READ CRR, STR.OCCURRENCE.RATE, LEAD.TIME, 1.FREQ.CHG, S.FREQ.CHG
       READ FREQ.DECREASE, 1.PROB, C.PROB, INT.LVL.INSP, EXT.LVL.INSP
       READ A.REPAIR.COST, B.REPAIR.COST, C.REPAIR.COST, D.REPAIR.COST
       READ MOD.TESTED, 1ST.TOOLING, AD.TOOLING, 1ST.MD.COST, AD.MD.COST
       READ S.REPAIR.COST, LOCATED.IN.STRESS.CCA
       READ 1.COR.OCCURRENCE.RATE, 2.COR.OCCURRENCE.RATE, COR.RATE.CHANGE
''
'' INITIALIZE GLOBAL VARIABLES
''
    IF SEL1 NE ELEMENT(1) OR SEL2 NE ELEMENT(2) OR SEL3 NE ELEMENT(3)
     IF COUNT.ELEMENT GT 1
      IF LONG.LIST = "NO"
       CALL SUMMARY
      ALWAYS
     REGARDLESS
       LET SEL1 = ELEMENT(1)
       LET SEL2 = ELEMENT(2)
       LET SEL3 = ELEMENT(3)
       CALL SUM.INITIALIZE
    REGARDLESS
''
       CALL INITIALIZATION
''
     IF LONG.LIST = "YES"
       FOR I = 1 TO NOF
       DO
      IF ELEMENT(1) = ELID(1,I) AND ELEMENT(2) = ELID(2,I) AND ELEMENT(3) =
       ELID(3,I) AND ELEMENT(4) = ELID(4,I)
       LET LTMP = "YES"
       LET LOC = I
       LEAVE
      ELSE
       LOOP
     ALWAYS
     IF ACTUAL.AVG.FAT.LIFE = 0.0
       CALL REAL.LIFE(MU.R,SIG.R,PREDICTED.LIFE) YIELDING ACTUAL.AVG.FAT.LIFE
```

```
      REGARDLESS
        LET IAAFL = ACTUAL.AVG.FAT.LIFE
        LET NFTS = (SIZE.OF.FLEET + 1 - TRUNC.F(PRCHG/PRODUCTION.TIME)) *
        2.PRODUCTION.TIME
        LET SATL = START.TEST + IAAFL/TEST.ACCEL.FACT + LEAD.TIME
     IF SATL LT BEGIN.PRODUCTION + PRCHG + NFTS + USAGE.LIFE
      IF PREDICTED.LIFE LT 2.0 * USAGE.LIFE AND IAAFL LT PREDICTED.LIFE OR
        PREDICTED.LIFE GE 2.0 * USAGE.LIFE AND IAAFL LT 2.0 * USAGE.LIFE
        SCHEDULE A T.IMPLEMENT.MOD AT SATL
        LET TFS.FAILURE = "YES"
      REGARDLESS
     REGARDLESS
      IF LIMO = "YES"
        START NEW PAGE
        WRITE MODEL(1), MODEL(2) AS S 50, "AIRCRAFT TYPE: ", 2 A 4
        SKIP 2 OUTPUT LINES
        PRINT 1 DOUBLE LINE WITH SIZE.OF.FLEET, USAGE.LIFE AS FOLLOWS
              NUMBER OF AIRCRAFT IN FLEET: *****                        AIRCRAFT SERVICE LIFE: ******* HOURS
        SKIP 1 OUTPUT LINE
        WRITE ELEMENT(1), ELEMENT(2), ELEMENT(3), ELEMENT(4)
        AS S 45, "STRUCTURAL ELEMENT: ", 4 A 4
        SKIP 2 OUTPUT LINES
       IF PREDICTED.LIFE = 0.0
        PRINT 1 DOUBLE LINE WITH IAAFL AS FOLLOWS
  ELEMENT DESIGN FATIGUE TESTED PRIOR TO PRODUCTION                  ACTUAL AVERAGE FATIGUE LIFE: ******* HOURS
        JUMP AHEAD
       ELSE
        PRINT 1 DOUBLE LINE WITH PREDICTED.LIFE, IAAFL AS FOLLOWS
          PREDICTED AVERAGE FATIGUE LIFE: ****** HOURS               ACTUAL AVERAGE FATIGUE LIFE: ******* HOURS
       HERE
        SKIP 1 OUTPUT LINE
        PRINT 1 LINE AS FOLLOWS
                                        INITIAL INSPECTION INTERVALS
        SKIP 1 OUTPUT LINE
        PRINT 4 LINES WITH IAHCD(1), IAHCD(2), IAHCD(3), IAHCD(4) AS FOLLOWS
                                          A-LEVEL ***** HOURS
                                          B-LEVEL ***** HOURS
                                          C-LEVEL ***** HOURS
                                          D-LEVEL ***** HOURS
      ALWAYS
        SCHEDULE AN ENTER.SERVICE AT BEGIN.PRODUCTION
 ''
        START SIMULATION
       IF LONG.LIST = "NO"
        CALL DISPLAY.OUTPUT
       ALWAYS
        FOR EVERY AIRCRAFT IN CRASHED.FLEET
        DO
        REMOVE AIRPLANE(TAIL.ID) FROM CRASHED.FLEET
        DESTROY THE AIRCRAFT CALLED AIRPLANE(TAIL.ID)
        LOOP
        FOR EVERY AIRCRAFT IN FLEET.RETIRED
        DO
```

```
            REMOVE AIRPLANE(TAIL.ID) FROM FLEET.RETIRED
            DESTROY THE AIRCRAFT CALLED AIRPLANE(TAIL.ID)
            LOOP
      ''
            GO READ
      'EOJ' IF LONG.LIST = "NO"
            CALL SUMMARY
            ALWAYS
            START NEW PAGE
            PRINT 1 LINE AS FOLLOWS
END OF SIMULATION
            STOP
            END
```

LOCAL VARIABLES OF THIS ROUTINE

```
I.1     INTEGER  WORD  3     I.2     INTEGER  WORD  4
I.3     INTEGER  WORD  5     J.1     INTEGER  WORD  6
K.1     INTEGER  WORD  8     K.2     INTEGER  WORD  9
K.3     INTEGER  WORD 10     K.4     INTEGER  WORD 11
L.11    INTEGER  WORD 18     L.13    INTEGER  WORD 19
L.15    INTEGER  WORD 20     L.17    INTEGER  WORD 21
L.22    INTEGER  WORD 22     L.26    INTEGER  WORD 24
L.9     INTEGER  WORD 17     N.1     INTEGER  WORD  7
NETS    DOUBLE   WORD 13     P.1     DOUBLE   WORD  1
SATL    DOUBLE   WORD 15
```

```
ROUTINE INITIALIZATION
''
'' CHANGE  INSPECTION LEVEL CODE TO NUMERIC VALUE
''
      IF INT.LVL.INSP = "A"   LET ITRNL = 1        JUMP AHEAD
      OTHERWISE
      IF INT.LVL.INSP = "B"   LET ITRNL = 2        JUMP AHEAD
      OTHERWISE
      IF INT.LVL.INSP = "C"   LET ITRNL = 3        JUMP AHEAD
      OTHERWISE
                              LET ITRNL = 4
    HERE
''
      IF EXT.LVL.INSP = "A"   LET EXT.INSP.LEVEL = 1   JUMP AHEAD
      OTHERWISE
      IF EXT.LVL.INSP = "B"   LET EXT.INSP.LEVEL = 2   JUMP AHEAD
      OTHERWISE
      IF EXT.LVL.INSP = "C"   LET EXT.INSP.LEVEL = 3   JUMP AHEAD
      OTHERWISE
                              LET EXT.INSP.LEVEL = 4
    HERE
''
'' CHANGE CORROSION RESISTANCE RATING TO MULTIPLYING FACTOR
''
      IF CRR = 1    LET CRRF = 1.50     JUMP AHEAD
      OTHERWISE
      IF CRR = 2    LET CRRF = 1.25     JUMP AHEAD
      OTHERWISE
      IF CRR = 3    LET CRRF = 1.00     JUMP AHEAD
      OTHERWISE
                    LET CRRF = 0.75
    HERE
      FOR I = 1 TO 4
      DO
      LET ARCD(I) = 1ARCD(I)
      LET UICR(I) = 0
      LET OICO(I) = 0
      LOOP
      FOR I = 1 TO 10
      DO
      LET HI.TIME.ACRFT(I) = I
      LET MRDD(I) = 0.0
      LOOP
''
      LET FOCK = 0
      LET LHTA = 10
      LET NICHG = 1
      LET OICR = 0
      LET OCOM = 0
      LET OSOM = 0
      LET OSCR = 0
      LET OSCO = 0
      LET OPD = 0
```

```
        LET NSEL = 0
        LET NRES = 0
        LET NMD = 0
        LET NSMD = 0
        LET NSIC = 0
        LET 1.NUM.OF.RETIRE = 0
        LET 2.NUM.OF.CRASH = 0
        LET IOCK = 0
        LET TIME.V = 0.0
        LET AIRFRAME.TIME = 0.0
        LET COST.OF.REPAIRS = 0.0
        LET CINSL = IARCD(3)
        LET OINSL = IARCD(4)
        LET LIL = ITRNL
        LET LEL = EXT.INSP.LEVEL
      IF LEL = 1 OR LEL = 2
       IF LIL = 1 OR LIL = 2
        LET LIL = 3
       ALWAYS
        LET LEL = 3
      REGARDLESS
        LET T.FREQ.CHG = 1.0 - T.FREQ.CHG
        LET S.FREQ.CHG = 1.0 - S.FREQ.CHG
        LET FREQ.DECREASE = 1.0 + FREQ.DECREASE
        LET LTMD = "NO"
        LET TES.FAILURE = "NO"
        LET MOD.TESTED = "NO"
        LET DEC.ON.MOD.SCH = "NO"
        LET IMP.MOD.SCH = "NO"
        LET PREVIOUSLY.MODIFIED = "NO"
  ''
        FOR I = 1 TO SIZE.OF.FLEET
        DO
        LET IE1(I) = "NO"
        LET IE2(I) = "NO"
        LET IE3(I) = "NO"
        LET CGKI(I) = 1.0
        LET OCCUR.MOD(I) = 0.0
        LET AIL(I) = "NO"
        LET FSH(I) = "NO"
        LET INSP.SCH(I) = "NO"
        LET TMOD.PENDING(I) = "NO"
        LET C.INTERVAL(I) = IARCD(3)
        LET D.INTERVAL(I) = IARCD(4)
        LET SMOD.PENDING(I) = "NO"
        LET 1.CR.EXISTS(I) = "NO"
        LET 2.CR.EXISTS(I) = "NO"
        LET 3.CR.EXISTS(I) = "NO"
        LET CO.EXISTS(I) = "NO"
        LET SD.SCH(I) = "NO"
        LOOP
  ''
  '' RESET TALLY COUNTERS
```

```
''
      RESET TOTALS OF ICRKT
      RESET TOTALS OF ICORT
      RESET TOTALS OF ISDT
      RESET TOTALS OF ACRKL
      RESET TOTALS OF HCRKL
      RESET TOTALS OF CCRKL
      RESET TOTALS OF DCRKL
      RESET TOTALS OF SCRKL
      RESET TOTALS OF ACA
      RESET TOTALS OF HCA
      RESET TOTALS OF CCA
      RESET TOTALS OF DCA
      RESET TOTALS OF SCA
      RETURN
      END
```

```
ROUTINE SUM.INITIALIZE
        FOR I = 1 TO 4
        DO
        LET GUICH(I) = 0
        LET GUICW(I) = 0
        LOOP
        LET SNSTC = 0
        LET SNMD = 0
        LET SNSMC = 0
        LET SNSFL = 0
        LET SNMFS = 0
        LET GUICH = 0
        LET GOPO = 0
        LET GUCOW = 0
        LET GOSDW = 0
        LET GUSCR = 0
        LET GOSCO = 0
   ''
        RESET TOTALS OF GICHK
        RESET TOTALS OF GICHW
        RESET TOTALS OF GISO
        RESET TOTALS OF GACHK
        RESET TOTALS OF GMCHK
        RESET TOTALS OF GCCHK
        RESET TOTALS OF GOCHK
        RESET TOTALS OF GSCHK
        RESET TOTALS OF GACA
        RESET TOTALS OF GMCA
        RESET TOTALS OF GCCA
        RESET TOTALS OF GOCA
        RESET TOTALS OF GSCA
        RESET TOTALS OF CINSL
        RESET TOTALS OF OINSL
   ''
        RETURN
        END
```

```
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ROUTINE REAL.LIFE(MEAN,STD.DEV,POL) YIELDING RFL
''
'' POL = PREDICTED AVERAGE FATIGUE LIFE OF ELEMENT DESIGN
'' RFL = ACTUAL AVERAGE FATIGUE LIFE OF ELEMENT DESIGN
'' RATIO = RATIO OF ACTUAL LIFE / PREDICTED LIFE
'' IF RATIO > 10, RATIO IS SET TO 10
'' IF RATIO < .1, RATIO IS SET TO .1
'' DISTRIBUTION OF RATIOS IS REPRESENTED AS LOG NORMAL
''    MEAN = MEAN OF DISTRIBUTION OF RATIOS
''    STD.DEV = STANDARD DEVIATION OF DISTRIBUTION OF RATIOS

      LET RATIO = LOG.NORMAL.F(MEAN,STD.DEV,3)
      IF RATIO > 10.0          LET RATIO = 10.0              REGARDLESS
      IF RATIO < 0.1           LET RATIO =  0.1              REGARDLESS
      LET RFL = RATIO * POL
      RETURN
      END

          LOCAL VARIABLES OF THIS ROUTINE

MEAN       DOUBLE   WORD  1     POL        DOUBLE   WORD  5
RATIO      DOUBLE   WORD  9     RFL        DOUBLE   WORD  7
STD.DEV    DOUBLE   WORD  3
```

```
EVENT ENTER.SERVICE
      LET IDCK = IDCK + 1
      LET ID = IDCK
      CREATE AN AIRCRAFT CALLED AIRPLANE(ID)
      LET TAIL.ID(AIRPLANE(ID)) = ID
      LET ENTRY.TIME(AIRPLANE(ID)) = TIME.V
      FILE AIRPLANE(ID) IN ACTIVE.FLEET
      CALL FATIGUE.LIFE.SCATTER(ACTUAL.AVG.FAT.LIFE,A) YIELDING FIRST.LIFE,
      SECOND.LIFE AND THIRD.LIFE
      LET STD.FAST = M2.MEAN * .15
      LET STD.SLOW = M1.MEAN * .15
      LET MSR(ID) = RATE(M1.MEAN,STD.SLOW,5)
      LET MFR(ID) = RATE(M2.MEAN,STD.FAST,6)
      CALL PREDICT.CORROSION YIELDING HOURS.TO.CORROSION
      CALL PREDICT.SERVICE.DAMAGE YIELDING OURS.TO.SERVICE.DAMAGE
     IF HOURS.TO.CORROSION LT USAGE.LIFE
      SCHEDULE A CORROSION(ID) AT TIME.V + HOURS.TO.CORROSION
      LET AC(ID) = CORROSION
      LET COREP.TIME(ID) = TIME.V
      LET CO.EXISTS(ID) = "NS"
    REGARDLESS
''
    IF OURS.TO.SERVICE.DAMAGE LT USAGE.LIFE
      SCHEDULE AN IN.SERVICE.DAMAGE(ID) AT TIME.V + OURS.TO.SERVICE.DAMAGE
      LET LAST.SD(ID) = TIME.V
      LET SD.SCH(ID) = "YES"
    REGARDLESS
    IF RANDOM.F(7) LE BIRTH.DEFECT.PROBABILITY
      LET RN = RANDOM.F(3)
      LET DEFECT.LIFE = (-4042.6 * LOG.E.F(RN))**1.0132
      ADD 1 TO OPD
      ADD 1 TO SOPD
     IF DEFECT.LIFE LT FIRST.LIFE
      LET FIRST.LIFE = DEFECT.LIFE
     REGARDLESS
    REGARDLESS
   IF LTHO = "YES"
      FOR I = 1 TO NOAC(LOX)
      DO
    IF ID = TLID(LOX,I)
      LET LIST = 1.0
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V AS FOLLOWS
        A/C NO. *** ENTERS SERVICE ****** HOURS FROM START OF SIMULATION
     IF DEFECT.LIFE GT 0.0
      PRINT 1 LINE AS FOLLOWS
            PRODUCTION DEFECT PRESENT
     ALWAYS
      SKIP 1 OUTPUT LINE
      PRINT 3 LINES WITH FIRST.LIFE, SECOND.LIFE, THIRD.LIFE AS FOLLOWS
            1ST CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
            2ND CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
            3RD CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
```

```
        PRINT 2 LINES WITH MSR(ID), MFR(ID) AS FOLLOWS
              SLOW CRACK GROWTH RATE = .****** INCHES/HOUR
              FAST CRACK GROWTH RATE = .****** INCHES/HOUR
        LEAVE
      ELSE
        LOOP
     ALWAYS
  ''
     IF FIRST.LIFE LT USAGE.LIFE OR CO.EXISTS(ID)="NS" OR SD.SCH(ID)="YES"
        SCHEDULE A 1.STRENGTH.REDUCTION(ID) AT TIME.V + FIRST.LIFE
        LET A1SR(ID) = 1.STRENGTH.REDUCTION
        LET CKREP.TIME(ID) = TIME.V
        LET 1.CR.EXISTS(ID) = "NS"
      IF SECOND.LIFE LT USAGE.LIFE OR CO.EXISTS(ID)="NS" OR SD.SCH(ID)="YES"
        SCHEDULE A 2.STRENGTH.REDUCTION(ID) AT TIME.V + SECOND.LIFE
        LET A2SR(ID) = 2.STRENGTH.REDUCTION
        LET 2.CR.EXISTS(ID) = "NS"
       IF THIRD.LIFE LT USAGE.LIFE OR CO.EXISTS(ID)="NS" OR SD.SCH(ID)="YES"
        SCHEDULE A 3.STRENGTH.REDUCTION(ID) AT TIME.V + THIRD.LIFE
        LET A3SR(ID) = 3.STRENGTH.REDUCTION
        LET 3.CR.EXISTS(ID) = "NS"
       REGARDLESS
      REGARDLESS
     REGARDLESS
        SCHEDULE A D.LEVEL.INSPECTION(ID) AT TIME.V + D.INTERVAL(ID)
        LET ADL(ID) = D.LEVEL.INSPECTION
        SCHEDULE A RETIRE.FROM.SERVICE(ID) AT TIME.V + USAGE.LIFE
      IF IOCK EQ SIZE.OF.FLEET
        RETURN
      OTHERWISE
      IF TIME.V - BEGIN.PRODUCTION GE PRCHG
        SCHEDULE AN ENTER.SERVICE AT TIME.V + 2.PRODUCTION.TIME
        RETURN
      OTHERWISE
        SCHEDULE AN ENTER.SERVICE AT TIME.V + PRODUCTION.TIME
        RETURN
        END
```

LOCAL VARIABLES OF THIS ROUTINE

DEFECT.LIF	DOUBLE	WORD 17	FIRST.LIFE	DOUBLE	WORD 1
HOURS.TO.C	DOUBLE	WORD 11	I.1	INTEGER	WORD 25
I.2	INTEGER	WORD 26	I.3	INTEGER	WORD 27
J.1	INTEGER	WORD 28	K.1	INTEGER	WORD 30
K.2	INTEGER	WORD 31	K.3	INTEGER	WORD 32
K.4	INTEGER	WORD 33	L.4	INTEGER	WORD 21
L.6	INTEGER	WORD 34	LIST	DOUBLE	WORD 19
N.1	INTEGER	WORD 29	OURS.TO.SF	DOUBLE	WORD 13
R.1	DOUBLE	WORD 23	RN	DOUBLE	WORD 15
SECOND.LIF	DOUBLE	WORD 3	STD.FAST	DOUBLE	WORD 7
STD.SLOW	DOUBLE	WORD 9	THIRD.LIFE	DOUBLE	WORD 5

```
ROUTINE FATIGUE.LIFE.SCATTER(REL,N) YIELDING FIRST.LIFE, SECOND.LIFE AND
      THIRD.LIFE
''
'' GENERATES ELEMENT FATIGUE LIVES REFLECTING BASIC FATIGUE SCATTER AND LOAD
''    ENVIRONMENT VARIATION
''
'' DISTRIBUTION OF FATIGUE LIVES IS REPRESENTED AS TWO PARAMETER WEIBULL
''    ALPHA = SHAPE PARAMETER
''    BETA  = SCALE PARAMETER (CHARACTERISTIC VALUE)
''    N = RANDOM NUMBER STREAM
''
      DEFINE N AS AN INTEGER VARIABLE
      DEFINE LIFE AS A REAL, 1-DIMENSIONAL ARRAY
      RESERVE LIFE(*) AS 3
      LET ALPHA = 2.78
      LET BETA = REL/.89018
      LET RN = RANDOM.F(N)
      FOR I = 1 TO 3, DO
      LET LIFE(I) = BETA * (LOG.E.F(1/RN))**(1/ALPHA)
      LET RN = UNIFORM.F(0.0,RN,3)
      LOOP
      LET FIRST.LIFE = LIFE(1)
      LET SECOND.LIFE = LIFE(2)
      LET THIRD.LIFE = LIFE(3)
      RELEASE LIFE(*)
      RETURN
      END
```

LOCAL VARIABLES OF THIS ROUTINE

ALPHA	DOUBLE	WORD 13	BETA	DOUBLE	WORD 15
FIRST.LIFE	DOUBLE	WORD 5	LIFE	REAL	WORD 11
N	INTEGER	WORD 3	REL	DOUBLE	WORD 1
RN	DOUBLE	WORD 17	SECOND.LIF	DOUBLE	WORD 7
THIRD.LIFE	DOUBLE	WORD 9			

```
ROUTINE INSTALL.MODIFICATION
''
'' THIS ROUTINE REPRESENTS THE INSTALLATION OF A STRUCTURAL MODIFICATION CAUSED
''    BY A FATIGUE TEST FAILURE OR BY A SERVICE DEFECT FOUND IN THE ELEMENT
''
     LET NSMD = NSMD + 1
     LET BEEN.MODIFIED = BEEN.MODIFIED + 1
     LET C.INTERVAL(ID) = IARCD(3)
     LET D.INTERVAL(ID) = IARCD(4)
     LET OCCUR.MOD(ID) = TIME.V
''
'' CANCEL SCHEDULED INSPECTIONS
''
    IF INSP.SCH(ID) = "YES"
      CALL CANCEL.SCHEDULED.INSPECTIONS
    REGARDLESS
''
    IF FSH(ID) = "YES"
      LET FSH(ID) = "NO"
      LET FAILURE = AF(ID)
      CANCEL THE FAILURE
      DESTROY THE FAILURE
    ALWAYS
      CALL FATIGUE.LIFE.SCATTER(ACTUAL.AVG.FAT.LIFE,K) YIELDING FIRST.LIFE,
      SECOND.LIFE AND THIRD.LIFE
      LET STD.SLOW = M1.MEAN * .15
      LET STD.FAST = M2.MEAN * .15
      LET MSR(ID) = RATE(M1.MEAN,STD.SLOW,S)
      LET MFR(ID) = RATE(M2.MEAN,STD.FAST,K)
      LET RST = USAGE.LIFE - TIME.V + ENTRY.TIME(AIRPLANE(ID))
''
'' CANCEL PREVIOUSLY SCHEDULED CRACK AND CORROSION INITIATIONS, RESCHEDULE
''    THESE EVENTS IF THEY OCCUR WITHIN THE REMAINING SERVICE LIFE (RST) OF THE
''    AIRCRAFT
''
     IF CO.EXISTS(ID) NE "NN"
      LET CORROSION = AC(ID)
     IF CO.EXISTS(ID) = "NS"
      CANCEL THE CORROSION
     ALWAYS
      DESTROY THE CORROSION
      LET CO.EXISTS(ID) = "NN"
      LET CGRI(ID) = 1.0
     REGARDLESS
      CALL PREDICT.CORROSION YIELDING HOURS.TO.CORROSION
     IF HOURS.TO.CORROSION LT RST
      SCHEDULE A CORROSION(ID) AT TIME.V + HOURS.TO.CORROSION
      LET AC(ID) = CORROSION
      LET CORR.TIME(ID) = TIME.V
      LET CO.EXISTS(ID) = "NS"
     REGARDLESS
''
     IF RANDOM.F(7) LE BIRTH.DEFECT.PROBABILITY
```

```
        LET OPD = OPD + 1
        LET RN = RANDOM.F(3)
        LET DEFECT.LIFE = (-4042.6 * LOG.E.F(RN))**1.0132
       IF DEFECT.LIFE LT FIRST.LIFE
        LET FIRST.LIFE = DEFECT.LIFE
       REGARDLESS
      REGARDLESS
  ''
   IF 1.CR.EXISTS(ID) NE "NN"
        LET 1.STRENGTH.REDUCTION = A1SR(ID)
      IF 1.CR.EXISTS(ID) = "NS"
        CANCEL THE 1.STRENGTH.REDUCTION
      REGARDLESS
        DESTROY THE 1.STRENGTH.REDUCTION
        LET 1.CR.EXISTS(ID) = "NN"
     IF 2.CR.EXISTS(ID) NE "NN"
        LET 2.STRENGTH.REDUCTION = A2SR(ID)
      IF 2.CR.EXISTS(ID) = "NS"
        CANCEL THE 2.STRENGTH.REDUCTION
      REGARDLESS
        DESTROY THE 2.STRENGTH.REDUCTION
        LET 2.CR.EXISTS(ID) = "NN"
      IF 3.CR.EXISTS(ID) NE "NN"
        LET 3.STRENGTH.REDUCTION = A3SR(ID)
       IF 3.CR.EXISTS(ID) = "NS"
        CANCEL THE 3.STRENGTH.REDUCTION
       REGARDLESS
        DESTROY THE 3.STRENGTH.REDUCTION
        LET 3.CR.EXISTS(ID) = "NN"
      REGARDLESS
     REGARDLESS
    REGARDLESS
     IF IE1(ID) = "YES"
        LET 1.ITE = A1E(ID)
        LET IE1(ID) = "NO"
        CANCEL THE 1.ITE
        DESTROY THE 1.ITE
      IF IE2(ID) = "YES"
        LET 2.ITE = A2E(ID)
        LET IE2(ID) = "NO"
        CANCEL THE 2.ITE
        DESTROY THE 2.ITE
       IF IE3(ID) = "YES"
        LET 3.ITE = A3E(ID)
        LET IE3(ID) = "NO"
        CANCEL THE 3.ITE
        DESTROY THE 3.ITE
       ALWAYS
      ALWAYS
     ALWAYS
      IF AIL(ID) = "YES"
        LET REACH.FAIL.SAFE.LGT = ARFSL(ID)
        CANCEL THE REACH.FAIL.SAFE.LGT
```

```
        DESTROY THE REACH.FAIL.SAFE.LGT
        LET AIL(ID) = "NO"
      REGARDLESS
  ''
    IF FIRST.LIFE LT RST OR CO.EXISTS(ID) = "NS" OR SD.SCH(ID) = "YES"
        SCHEDULE A 1.STRENGTH.REDUCTION(ID) AT TIME.V + FIRST.LIFE
        LET A1SR(ID) = 1.STRENGTH.REDUCTION
        LET CKREP.TIME(ID) = TIME.V
        LET 1.CR.EXISTS(ID) = "NS"
     IF SECOND.LIFE LT RST OR CO.EXISTS(ID) = "NS" OR SD.SCH(ID) = "YES"
        SCHEDULE A 2.STRENGTH.REDUCTION(ID) AT TIME.V + SECOND.LIFE
        LET A2SR(ID) = 2.STRENGTH.REDUCTION
        LET 2.CR.EXISTS(ID) = "NS"
      IF THIRD.LIFE LT RST OR CO.EXISTS(ID) = "NS" OR SD.SCH(ID) = "YES"
        SCHEDULE A 3.STRENGTH.REDUCTION(ID) AT TIME.V + THIRD.LIFE
        LET A3SR(ID) = 3.STRENGTH.REDUCTION
        LET 3.CR.EXISTS(ID) = "NS"
      REGARDLESS
     REGARDLESS
    REGARDLESS
  ''
     IF LTHO = "YES"
        FOR I = 1 TO NOAC(LOX)
        DO
      IF ID = TLID(LOX,I)
        SKIP 1 OUTPUT LINE
        PRINT 6 LINES WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)), FIRST.LIFE,
        SECOND.LIFE, THIRD.LIFE, MSR(ID), MFR(ID) AS FOLLOWS
          MODIFICATION INSTALLED ON A/C NO. *** AT ****** FLIGHT HOURS
               1ST CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
               2ND CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
               3RD CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
               SLOW CRACK GROWTH RATE = .****** INCHES/HOUR
               FAST CRACK GROWTH RATE = .****** INCHES/HOUR
        LEAVE
      ELSE
        LOOP
     ALWAYS
        RETURN
        END
```

LOCAL VARIABLES OF THIS ROUTINE

DEFECT.LIF	DOUBLE	WORD 17	FIRST.LIFE	DOUBLE	WORD 1
HOURS.TO.C	DOUBLE	WORD 13	I.1	INTEGER	WORD 23
I.2	INTEGER	WORD 24	I.3	INTEGER	WORD 25
J.1	INTEGER	WORD 26	K.1	INTEGER	WORD 28
K.2	INTEGER	WORD 29	K.3	INTEGER	WORD 30
K.4	INTEGER	WORD 31	L.4	INTEGER	WORD 19
N.1	INTEGER	WORD 27	R.1	DOUBLE	WORD 21
RN	DOUBLE	WORD 15	RST	DOUBLE	WORD 11
SECOND.LIF	DOUBLE	WORD 3	STD.FAST	DOUBLE	WORD 9

```
 STD.SLOW   DOUBLE   WORD  7      THIRD.LIFE DOUBLE   WORD  5
```

```
EVENT IN.SERVICE.DAMAGE(IDSDM)
''
'' REPRESENTS THE OCCURRENCE OF A SERVICE DAMAGE DEFECT; RESULTS IN IMMEDIATE
''     INITIATION OF NEXT SCHEDULED CRACK
''
        DEFINE IDSDM AS AN INTEGER VARIABLE
        LET ID = IDSDM
     IF LTHU = "YES"
        FOR I = 1 TO NOAC(LOX)
        DO
      IF ID = ILID(LOX,I)
        LET LIST = 1.0
        SKIP 1 OUTPUT LINE
        PRINT 2 LINES WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
          A/C N.I. *** EXPERIENCES SERVICE DAMAGE AT ****** FLIGHT HOURS
              CAUSES IMMEDIATE INITIATION OF NEXT SCHEDULED CRACK
        LEAVE
      ELSE
        LOOP
     ALWAYS
        LET OSDM = OSDM + 1
        LET GOSDM = GOSDM + 1
        LET ISDT = TIME.V - LAST.SD(ID)
        LET GISD = TIME.V - LAST.SD(ID)
        CALL PREDICT.SERVICE.DAMAGE YIELDING OURS.TO.SERVICE.DAMAGE
        LET RST = USAGE.LIFE - TIME.V + ENTRY.TIME(AIRPLANE(ID))
        LET SD.SCH(ID) = "NO"
      IF OURS.TO.SERVICE.DAMAGE LT RST
        SCHEDULE AN IN.SERVICE.DAMAGE(ID) AT TIME.V + OURS.TO.SERVICE.DAMAGE
        LET LAST.SD(ID) = TIME.V
        LET SD.SCH(ID) = "YES"
      REGARDLESS
''
'' TEST FOR SCHEDULED FIRST CRACK INITIATION
''
        LET 1.STRENGTH.REDUCTION = A1SR(ID)
        LET 2.STRENGTH.REDUCTION = A2SR(ID)
        LET 3.STRENGTH.REDUCTION = A3SR(ID)
      IF 1.CR.EXISTS(ID) = "NS"
        CANCEL THE 1.STRENGTH.REDUCTION
        RESCHEDULE THE 1.STRENGTH.REDUCTION(ID) NOW
       IF SD.SCH(ID) = "NO" AND TIME.A(2.STRENGTH.REDUCTION) GE RST + TIME.V
        AND CO.EXISTS(ID) NE "NS"
        CANCEL THE 2.STRENGTH.REDUCTION
        DESTROY THE 2.STRENGTH.REDUCTION
        CANCEL THE 3.STRENGTH.REDUCTION
        DESTROY THE 3.STRENGTH.REDUCTION
        LET 2.CR.EXISTS(ID) = "NN"
        LET 3.CR.EXISTS(ID) = "NN"
       ALWAYS
        RETURN
      OTHERWISE
''
```

```
'' TEST FOR SCHEDULED SECOND CRACK INITIATION
''
    IF 2.CR.EXISTS(ID) = "NS"
      CANCEL THE 2.STRENGTH.REDUCTION
      RESCHEDULE THE 2.STRENGTH.REDUCTION(ID) NOW
     IF S3.SCH(ID) = "NO" AND TIME.A(3.STRENGTH.REDUCTION) GE RST + TIME.V
      AND CO.EXISTS(ID) NE "NS"
      CANCEL THE 3.STRENGTH.REDUCTION
      DESTROY THE 3.STRENGTH.REDUCTION
      LET 3.CR.EXISTS(ID) = "NN"
     ALWAYS
      RETURN
    OTHERWISE
''
'' TEST FOR SCHEDULED THIRD CRACK INITIATION
''
     IF 3.CR.EXISTS(ID) = "NS"
       CANCEL THE 3.STRENGTH.REDUCTION
       RESCHEDULE THE 3.STRENGTH.REDUCTION(ID) NOW
       RETURN
     OTHERWISE
       RETURN
       END
```

LOCAL VARIABLES OF THIS ROUTINE

I.1	INTEGER	WORD 9	I.2	INTEGER	WORD 10
I.3	INTEGER	WORD 11	IDSDM	INTEGER	WORD 1
J.1	INTEGER	WORD 12	K.1	INTEGER	WORD 14
K.2	INTEGER	WORD 15	K.5	INTEGER	WORD 16
K.3	INTEGER	WORD 17	L.4	INTEGER	WORD 5
LIST	DOUBLE	WORD 3	N.1	INTEGER	WORD 13
OURS.TO.SH	DOUBLE	WORD 19	R.1	DOUBLE	WORD 7
RST	DOUBLE	WORD 21			

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```
EVENT T.IMPLEMENT.MOD
''
'' REPRESENTS DEVELOPMENT OF MODIFICATION BECAUSE OF FATIGUE TEST FAILURE
''
      LET NMD = NMD + 1
      LET FOCK = IOCK
      LET BEEN.MODIFIED = 0
      LET TO.BE.MODIFIED = IOCK
      LET COST.OF.REPAIRS = 0.0
      LET AIRFRAME.TIME = 0.0
      LET ACTUAL.AVG.FAT.LIFE = PREDICTED.LIFE
    IF MOD.TESTED = "NO"
      LET NMU = MU.R + ((1.0-MU.R)*.15)
      LET NSIG = SIG.R * .85
      CALL REAL.LIFE(NMU,NSIG,PREDICTED.LIFE) YIELDING ACTUAL.AVG.FAT.LIFE
    REGARDLESS
      FOR EVERY AIRCRAFT IN ACTIVE.FLEET
      DO
      LET ID = TAIL.ID
    IF IAAFL LT USAGE.LIFE
      LET TMOD.PENDING(ID) = "YES"
     IF ENTRY.TIME(AIRPLANE(ID)) + C7*IAAFL GT TIME.V
      SCHEDULE A T.INSPECTION.INCREASE(ID) AT ENTRY.TIME(AIRPLANE(ID)) + C7 *
      IAAFL
      LET ATII(ID) = T.INSPECTION.INCREASE
     ALWAYS
    REGARDLESS
      LOOP
      RETURN
      END


          LOCAL VARIABLES OF THIS ROUTINE

L.4         INTEGER  WORD  5      NMU         DOUBLE   WORD  1
NSIG        DOUBLE   WORD  4
```

```
ROUTINE PREDICT.SERVICE.DAMAGE YIELDING HOURS.TO.SERVICE.DAMAGE
''
'' GENERATES TIME TO SERVICE DAMAGE OCCURRENCE FOR A GIVEN AIRCRAFT FROM A
''    CONSTANT SERVICE DAMAGE OCCURRENCE RATE
''
   IF SDM.OCCURRENCE.RATE LE 0.0
     LET HOURS.TO.SERVICE.DAMAGE = 2.0 * USAGE.LIFE
     RETURN
   ELSE
     LET RN = RANDOM.F(2)
     LET HOURS.TO.SERVICE.DAMAGE = -LOG.E.F(RN) / SDM.OCCURRENCE.RATE
     RETURN
     END

          LOCAL VARIABLES OF THIS ROUTINE

HOURS.TO.SE DOUBLE    WORD  1       RN          DOUBLE    WORD  3
```

```
ROUTINE PREDICT.CORROSION YIELDING HOURS.TO.CORROSION
''
'' GENERATES TIME TO CORROSION INITIATION FROM ELEMENT HAZARD RATE WHICH IS
''    APPROXIMATED BY TWO CONSTANT OCCURRENCE RATES
''
''    1.COM.OCCURRENCE.RATE = FIRST CONSTANT OCCURRENCE RATE
''    2.COM.OCCURRENCE.RATE = SECOND CONSTANT OCCURRENCE RATE
''    COM.RATE.CHANGE = TIME ON AIRFRAME AT WHICH SECOND RATE IS USED
''
       LET RN = RANDOM.F(4)
       LET CRCT = COM.RATE.CHANGE - TIME.V + ENTRY.TIME(AIRPLANE(ID))
     IF CRCT LE 0.0
      IF 2.COM.OCCURRENCE.RATE LE 0.0
       LET HOURS.TO.CORROSION = 2.0 * USAGE.LIFE
       RETURN
      ELSE
       LET HOURS.TO.CORROSION = LOG.E.F(RN) / (-2.COM.OCCURRENCE.RATE)
       RETURN
     OTHERWISE
''
     IF RN GE EXP.F(-CRCT * 1.COM.OCCURRENCE.RATE)
      IF 1.COM.OCCURRENCE.RATE LE 0.0
       LET HOURS.TO.CORROSION = 2.0 * USAGE.LIFE
       RETURN
      ELSE
       LET HOURS.TO.CORROSION = LOG.E.F(RN) / (-1.COM.OCCURRENCE.RATE)
       RETURN
     OTHERWISE
      IF 2.COM.OCCURRENCE.RATE LE 0.0
       LET HOURS.TO.CORROSION = 2.0 * USAGE.LIFE
       RETURN
      ELSE
       LET LD = (2.COM.OCCURRENCE.RATE - 1.COM.OCCURRENCE.RATE) * CRCT
       LET HOURS.TO.CORROSION = LOG.E.F(RN/EXP.F(LD)) / (-2.COM.OCCURRENCE.RATE)
       RETURN
       END

           LOCAL VARIABLES OF THIS ROUTINE

CRCT       DOUBLE   WORD  5      HOURS.TO.C DOUBLE   WORD  1
LD         DOUBLE   WORD  7      RN         DOUBLE   WORD  5
```

```
EVENT CORROSION(IOCO) SAVING THE EVENT NOTICE
''
'' REPRESENTS THE INITIATION OF CORROSION; REMAINING TIME TO CRACK INITIATION OF
''    ALL SCHEDULED CRACKS IS REDUCED BY COR.MULTIPLYING.FACTOR
''
       DEFINE IOCO AS AN INTEGER VARIABLE
       LET ID = IOCO
       LET RST = USAGE.LIFE - TIME.V + ENTRY.TIME(AIRPLANE(ID))
       LET ICOMT = TIME.V - COREP.TIME(ID)
       LET GICOM = TIME.V - COREP.TIME(ID)
       LET ICOM = ICOM + 1
       LET GICOM = GICOM + 1
       LET C.INIT(ID) = "NO"
     IF RANDOM.F(10) LE C.PROB
       LET C.INIT(ID) = "YES"
     REGARDLESS
       LET CO.EXISTS(ID) = "YES"
     IF INSP.SCH(ID) = "NO"
       CALL INSPECTION.SCHEDULER(2)
     REGARDLESS
       LET COR.MULTIPLYING.FACTOR = 1.0 - C29
     IF RANDOM.F(1) LE LOCATED.IN.STRESS.COR
       LET COR.MULTIPLYING.FACTOR = 1.0 - C28
     REGARDLESS
       LET CGRI(ID) = 2.0 - COR.MULTIPLYING.FACTOR
    IF LTHU = "YES"
       FOR I = 1 TO NNAC(LOX)
       DO
     IF ID = ILID(LOX,I)
       LET LIST = 1.0
       SKIP 1 OUTPUT LINE
       PRINT 1 LINE WITH ID, TIME.V+ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
         A/C **, *** EXPERIENCES CORROSION INITIATION AT ****** HOURS
       SKIP 1 OUTPUT LINE
       PRINT 2 LINES WITH WSK(ID)*CGRI(ID), WFR(ID)*CGRI(ID) AS FOLLOWS
               SLOW CRACK GROWTH RATE = .****** INCHES/HOUR
               FAST CRACK GROWTH RATE = .****** INCHES/HOUR
       LEAVE
     ELSE
       LOOP
    ALWAYS
   IF IE1(ID) = "YES"
       LET I.ITE = AIE(ID)
       LET TRT = (TIME.A(I.ITE)-TIME.V) / CGRI(ID)
       CANCEL THE I.ITE
      IF TRT LT RST
       RESCHEDULE THE I.ITE(ID) AT TIME.V + TRT
       JUMP AHEAD
      ELSE
       DESTROY THE I.ITE
       LET IE1(ID) = "NO"
      HERE
    IF IE2(ID) = "YES"
```

```
        LET 2.ITE = A2E(ID)
        LET TRT = (TIME.A(2.ITE)-TIME.V) / CGRI(ID)
        CANCEL THE 2.ITE
        IF TRT LT RST
        RESCHEDULE THE 2.ITE(ID) AT TIME.V + TRT
        JUMP AHEAD
        ELSE
        DESTROY THE 2.ITE
        LET IE2(ID) = "NO"
        HERE
      IF IE3(ID) = "YES"
        LET 3.ITE = A3E(ID)
        LET TRT = (TIME.A(3.ITE)-TIME.V) / CGRI(ID)
        CANCEL THE 3.ITE
      IF TRT LT RST
        RESCHEDULE THE 3.ITE(ID) AT TIME.V + TRT
        JUMP AHEAD
      ELSE
        DESTROY THE 3.ITE
        LET IE3(ID) = "NO"
      HERE
     ALWAYS
    ALWAYS
   ALWAYS
    IF AIL(ID) = "YES"
      LET REACH.FAIL.SAFE.LGT = ANFSL(ID)
      LET TRT = (TIME.A(REACH.FAIL.SAFE.LGT) - TIME.V) / CGRI(ID)
      CANCEL THE REACH.FAIL.SAFE.LGT
    IF TRT LT RST
      RESCHEDULE THE REACH.FAIL.SAFE.LGT(ID) AT TIME.V + TRT
      JUMP AHEAD
    ELSE
      DESTROY THE REACH.FAIL.SAFE.LGT
      LET AIL(ID) = "NO"
    HERE
   REGARDLESS
   IF FSH(ID) = "YES"
     LET FAILURE = AF(ID)
     LET NFTM = TIME.A(FAILURE) - TIME.V
   IF LIST = 1.0
     PRINT 1 LINE WITH TIME.V+NFTM*CON.MULTIPLYING.FACTOR-
     ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
          ELEMENT FAILURE PROJECTED AT ****** FLIGHT HOURS
   ALWAYS
     CANCEL THE FAILURE
   IF NFTM LT RST
     RESCHEDULE THE FAILURE(ID) AT TIME.V + NFTM / CGRI(ID)
     JUMP AHEAD
   ELSE
     DESTROY THE FAILURE
     LET FSH(ID) = "NO"
   HERE
  REGARDLESS
```

```
''
'' TEST FOR SCHEDULED FIRST CRACK INITIATION
''
    IF 1.CR.EXISTS(ID) = "NS"
      LET 1.STRENGTH.REDUCTION = A1SR(ID)
      LET REMAINING.LIFE = TIME.A(1.STRENGTH.REDUCTION) - TIME.V
      LET REDUCED.REMAINING.LIFE = REMAINING.LIFE * CDR.MULTIPLYING.FACTOR
     IF LIST = 1.0
      PRINT 1 LINE WITH TIME.V+REDUCED.REMAINING.LIFE-ENTRY.TIME(AIRPLANE(ID))
      AS FOLLOWS
           1ST CRACK INITIATION PROJECTED AT ****** FLIGHT HOURS
     ALWAYS
      CANCEL THE 1.STRENGTH.REDUCTION
      DESTROY THE 1.STRENGTH.REDUCTION
      LET 1.CR.EXISTS(ID) = "NY"
     IF REDUCED.REMAINING.LIFE LT RST OR SP.SCH(ID) = "YES"
      SCHEDULE A 1.STRENGTH.REDUCTION(ID) AT TIME.V + REDUCED.REMAINING.LIFE
      LET A1SR(ID) = 1.STRENGTH.REDUCTION
      LET 1.CR.EXISTS(ID) = "NS"
     ALWAYS
    REGARDLESS
''
'' TEST FOR SCHEDULED SECOND CRACK INITIATION
''
    IF 2.CR.EXISTS(ID) = "NS"
      LET 2.STRENGTH.REDUCTION = A2SR(ID)
      LET REMAINING.LIFE = TIME.A(2.STRENGTH.REDUCTION) - TIME.V
      LET REDUCED.REMAINING.LIFE = REMAINING.LIFE * CDR.MULTIPLYING.FACTOR
     IF LIST = 1.0
      PRINT 1 LINE WITH TIME.V+REDUCED.REMAINING.LIFE-ENTRY.TIME(AIRPLANE(ID))
      AS FOLLOWS
           2ND CRACK INITIATION PROJECTED AT ****** FLIGHT HOURS
     ALWAYS
      CANCEL THE 2.STRENGTH.REDUCTION
      DESTROY THE 2.STRENGTH.REDUCTION
      LET 2.CR.EXISTS(ID) = "  "
     IF REDUCED.REMAINING.LIFE LT RST OR SP.SCH(ID) = "YES"
      SCHEDULE A 2.STRENGTH.REDUCTION(ID) AT TIME.V + REDUCED.REMAINING.LIFE
      LET A2SR(ID) = 2.STRENGTH.REDUCTION
      LET 2.CR.EXISTS(ID) = "NS"
     ALWAYS
    REGARDLESS
''
'' TEST FOR SCHEDULED THIRD CRACK INITIATION
''
    IF 3.CR.EXISTS(ID) = "NS"
      LET 3.STRENGTH.REDUCTION = A3SR(ID)
      LET REMAINING.LIFE = TIME.A(3.STRENGTH.REDUCTION) - TIME.V
      LET REDUCED.REMAINING.LIFE = REMAINING.LIFE * CDR.MULTIPLYING.FACTOR
     IF LIST = 1.0
      PRINT 1 LINE WITH TIME.V+REDUCED.REMAINING.LIFE-ENTRY.TIME(AIRPLANE(ID))
      AS FOLLOWS
           3RD CRACK INITIATION PROJECTED AT ****** FLIGHT HOURS
```

```
      ALWAYS
       CANCEL THE 3.STRENGTH.REDUCTION
       DESTROY THE 3.STRENGTH.REDUCTION
       LET 3.CM.EXISTS(ID) = "NO"
      IF REDUCED.REMAINING.LIFE LT RST OR SM.SCM(ID) = "YES"
       SCHEDULE A 3.STRENGTH.REDUCTION(ID) AT TIME.V + REDUCED.REMAINING.LIFE
       LET ASSM(ID) = 3.STRENGTH.REDUCTION
       LET 3.CM.EXISTS(ID) = "YES"
      ALWAYS
     REGARDLESS
      RETURN
      END
```

LOCAL VARIABLES OF THIS ROUTINE

COM.MULTIP	DOUBLE	WORD 5			
I.2	INTEGER	WORD 14	I.1	INTEGER	WORD 13
IOCO	INTEGER	WORD 1	I.3	INTEGER	WORD 15
K.1	INTEGER	WORD 18	J.1	INTEGER	WORD 16
K.3	INTEGER	WORD 20	K.2	INTEGER	WORD 19
L.4	INTEGER	WORD 9	K.4	INTEGER	WORD 21
LIST	DOUBLE	WORD 7	L.6	INTEGER	WORD 22
NETM	DOUBLE	WORD 25	N.1	INTEGER	WORD 17
REDUCED.RF	DOUBLE	WORD 29	R.1	DOUBLE	WORD 11
RST	DOUBLE	WORD 3	REMAINING.	DOUBLE	WORD 27
			TM1	DOUBLE	WORD 23

```
ROUTINE RATE(M,S,N)
''
'' GENERATES ELEMENT CRACK PROPAGATION RATES REFLECTING VARIATION IN MATERIAL
''    PROPERTIES AND LOAD ENVIRONMENT VARIATION
''
'' DISTRIBUTION OF CRACK PROPAGATION RATES IS REPRESENTED AS NORMAL
''    M= MEAN PROPAGATION RATE
''    S = STANDARD DEVIATION
''    N = RANDOM NUMBER STREAM
''
'' METHOD BASED ON APPROXIMATIONS IN C. HASTINGS, APPROXIMATIONS FOR DIGITAL
''    COMPUTERS
''
'' IF PROCEDURE YIELDS NEGATIVE RATE, RATE IS SET EQUAL TO MEAN MINUS FOUR
''    STANDARD DEVIATIONS
''
      DEFINE N AS AN INTEGER VARIABLE
      LET RN = 1.0 - RANDOM.F(N)
      LET RN1 = RN
   IF RN GT 0.5
      LET RN = 1.0 - RN
   REGARDLESS
      LET W = SQRT.F(LOG.E.F(1.0/RN**2))
      LET G1 = 2.515517 + .802853*W + .010328*W**2
      LET G2 = 1.0 + 1.432788*W + .189269*W**2 + .001308*W**3
      LET Z = W - G1/G2
   IF RN1 GT 0.5
      LET Z = -Z
   REGARDLESS
      LET Z = Z * S + M
   IF Z LE 0
      LET Z = M - (4 * S)
   REGARDLESS
      RETURN WITH Z
      END
```

LOCAL VARIABLES OF THIS ROUTINE

G1	DOUBLE	WORD 13	G2	DOUBLE	WORD 15
M	DOUBLE	WORD 1	N	INTEGER	WORD 5
RN	DOUBLE	WORD 7	RN1	DOUBLE	WORD 9
S	DOUBLE	WORD 3	W	DOUBLE	WORD 11
Z	DOUBLE	WORD 17			

```
EVENT 1.STRENGTH.REDUCTION(IDISR) SAVING THE EVENT NOTICE
''
'' REPRESENTS FIRST CRACK INITIATION
''
      DEFINE IDISR AS AN INTEGER VARIABLE
      LET ID = IDISR
      LET TAR = ENTRY.TIME(AIRPLANE(ID)) + USAGE.LIFE
   IF LTHO = "YES"
      FOR I = 1 TO MOAC(LOX)
      DO
    IF ID = TLID(LOX,I)
      LET LIST = 1.0
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
        A/C NO. *** EXPERIENCES 1ST CRACK INITIATION AT ****** HOURS
      LEAVE
    ELSE
      LOOP
   ALWAYS
      LET ICRKT = TIME.V - CRREP.TIME(ID)
      LET GICRK = TIME.V - CRREP.TIME(ID)
      LET OICR = OICR + 1
      LET GOICR = GOICR + 1
      LET 1.INT(ID) = "NO"
    IF RANDOM.F(ID) LE 1.PROB
      LET 1.INT(ID) = "YES"
     IF LIST = 1.0
      PRINT 1 LINE AS FOLLOWS
            CRACK INITATES INTERNALLY
     ALWAYS
      LET T = (CRIT.CRK.LGT*PCCL)/(MSR(ID)*CGRI(ID))
     IF PCCL GT 1.0
      LET T = CRIT.CRK.LGT/(MSR(ID)*CGRI(ID)) + (CRIT.CRK.LGT*(PCCL-1.0))/
      (MSR(ID)*CGRI(ID))
     ALWAYS
     IF TIME.V + T LT TAR OR CO.EXISTS(ID) = "NS"
      SCHEDULE A 1.ITF(ID) AT TIME.V + T
      LET AIE(ID) = 1.ITF
      LET IFI(ID) = "YES"
     ALWAYS
    REGARDLESS
      LET 1.CR.EXISTS(ID) = "YES"
    IF INSP.SCH(ID) = "NO"
      CALL INSPECTION.SCHEDULER(I)
    REGARDLESS
''
'' PREDICT TIME TO FAILURE FROM FIRST CRACK INITIATION
''
      LET SU = 2.75
      LET SF = 1.0
      LET XRN(ID) = RANDOM.F(3)
      LET LG = LOG.E.F(XRN(ID))
      LET GR1 = MSR(ID) * CGRI(ID)
```

```
      LET GR2 = MFR(ID) + CGRI(ID)
      LET T1 = CRIT.CRK.LGT / GR1
      LET T2 = T1 + (FSAF.LGT - CRIT.CRK.LGT) / GR2
      LET R1 = ((SU-SF)*GR1) / FSAF.LGT
      LET R2 = ((SU-SF)*GR2) / FSAF.LGT
      LET R3 = GR2 / (LGHT.TO.FAILURE - FSAF.LGT)
 ''
    IF TIME.V + T2 LT TAR OR CO.EXISTS(ID) = "YES"
      SCHEDULE A REACH.FAIL.SAFE.LGT(ID) AT TIME.V + T2
      LET ARFSL(ID) = REACH.FAIL.SAFE.LGT
      LET AIL(ID) = "YES"
    REGARDLESS
      LET K1 = A * EXP.F(SU * B)
      LET K2 = B * R1
      LET TTF = -LOG.E.F((K2/K1)*LG + 1.0)/K2
     IF TTF LE T1
      JUMP AHEAD
     ELSE
      LET S1 = SU - R1 * T1
      LET K4 = B * R2
      LET LGK5 = LOG.E.F(A) + (B * S1 + B * R2 * T1)
      LET K8 = (A*EXP.F(B*S1))/K4
      LET K9 = (K1/K2)*(EXP.F(-B*R1*T1)-1.0)
      LET TTF = (LGK5 - LOG.E.F(ABS.F(K4)) - LOG.E.F(ABS.F(LG+K8-K9)))/K4
     IF TTF LE T2
      JUMP AHEAD
     ELSE
      LET K10 = B*R3
      LET ARG = B*SF+B*R3*T2
    IF ARG LT -175.0
      LET ARG = -175.0
    ALWAYS
      LET K11 = K10/(A*EXP.F(ARG))
      LET K12 = A*EXP.F(B*SF)/K10
      LET K13 = EXP.F(B*R2*T1 - B*R2*T2) - 1.0
      LET TTF = -LOG.E.F(K11*(LG+K12-(K8*K13)-K9))/K10
    HERE
     IF LIST = 1.0
      PRINT 1 LINE WITH TIME.V+TTF-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
            ELEMENT FAILURE PROJECTED AT ****** FLIGHT HOURS
     ALWAYS
    IF TIME.V + TTF LT TAR OR CO.EXISTS(ID) = "YES"
      SCHEDULE A FAILURE(ID) AT TIME.V + TTF
      LET AF(ID) = FAILURE
      LET FSH(ID) = "YES"
    ALWAYS
      RETURN
      END
```

```
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                LOCAL VARIABLES OF THIS ROUTINE

ARG      DOUBLE    WORD 61      GK1      DOUBLE    WORD 29
GR2      DOUBLE    WORD 31      I.1      INTEGER   WORD 11
I.2      INTEGER   WORD 12      I.3      INTEGER   WORD 13
IDISH    INTEGER   WORD  1      J.1      INTEGER   WORD 14
K.1      INTEGER   WORD 16      K.2      INTEGER   WORD 17
K.3      INTEGER   WORD 18      K.4      INTEGER   WORD 19
K1       DOUBLE    WORD 43      K10      DOUBLE    WORD 59
K11      DOUBLE    WORD 63      K12      DOUBLE    WORD 65
K13      DOUBLE    WORD 67      K2       DOUBLE    WORD 45
K4       DOUBLE    WORD 51      K8       DOUBLE    WORD 55
K9       DOUBLE    WORD 57      L.4      INTEGER   WORD  7
LG       DOUBLE    WORD 27      LGK5     DOUBLE    WORD 53
LIST     DOUBLE    WORD  5      N.1      INTEGER   WORD 15
R.1      DOUBLE    WORD  9      R1       DOUBLE    WORD 37
N2       DOUBLE    WORD 39      R5       DOUBLE    WORD 41
SF       DOUBLE    WORD 25      SU       DOUBLE    WORD 23
S1       DOUBLE    WORD 49      T        DOUBLE    WORD 21
TAR      DOUBLE    WORD  3      TTF      DOUBLE    WORD 47
T1       DOUBLE    WORD 33      T2       DOUBLE    WORD 35
```

```
EVENT 2.STRENGTH.REDUCTION(I02SR) SAVING THE EVENT NOTICE
''
'' REPRESENTS SECOND CRACK INITIATION
''
      DEFINE I02SR AS AN INTEGER VARIABLE
      DEFINE X, Y, W AS REAL, 1-DIMENSIONAL ARRAYS
      RESERVE X(*), Y(*), W(*) AS 5
      LET ID = I02SR
      LET TAR = ENTRY.TIME(AIRPLANE(ID)) + USAGE.LIFE
    IF LTWO = "YES"
      FOR I = 1 TO NOAC(LOK)
      DO
     IF ID = TLID(LOK,I)
      LET LIST = 1.0
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
        A/C NO. *** EXPERIENCES 2ND CRACK INITIATION AT ****** HOURS
      LEAVE
     ELSE
      LOOP
    ALWAYS
      LET 2.INT(ID) = "NO"
     IF RANDOM.F(10) LE 1.PROB
      LET 2.INT(ID) = "YES"
     IF LIST = 1.0
      PRINT 1 LINE AS FOLLOWS
            CRACK INITIATES INTERNALLY
     ALWAYS
      LET T = (CRIT.CRK.LGT*PCCL)/(MSR(ID)*CGRI(ID))
     IF PCCL GT 1.0
      LET T = CRIT.CRK.LGT/(MSR(ID)*CGRI(ID)) + (CRIT.CRK.LGT*(PCCL-1.0))/
     (MSR(ID)*CGRI(ID))
     ALWAYS
     IF TIME.V + T LT TAR OR CO.EXISTS(ID) = "NS"
      SCHEDULE A 2.ITF(ID) AT TIME.V + T
      LET A2E(ID) = 2.ITF
      LET IF2(ID) = "YES"
     ALWAYS
    REGARDLESS
      LET 2.CR.EXISTS(ID) = "YES"
      LET 1.STRENGTH.REDUCTION = A1SR(ID)
      LET CCL = CRIT.CRK.LGT
      LET TA1 = TIME.A(1.STRENGTH.REDUCTION)
      LET TCL = CCL/(MSR(ID)*CGRI(ID))
''
'' DETERMINE RESIDUAL STRENGTH REDUCTION BECAUSE OF FIRST CRACK
''
    IF CO.EXISTS(ID) = "YES"
      LET CORROSION = AC(ID)
      LET TAC = TIME.A(CORROSION)
     IF TAC LE TA1
      LET CL = (TIME.V-TA1) * MSR(ID) * CGRI(ID)
     IF CL GT CCL
```

```
        LET CL = CCL + ((CL-CCL)/MSR(ID))*MFR(ID)
        JUMP AHEAD
       OTHERWISE
        JUMP AHEAD
      OTHERWISE
        LET DL = (TAC-TA1) * MSR(ID)
       IF CCL LT DL
        LET CL = CCL + ((DL-CCL)/MSR(ID))*MFR(ID) + (TIME.V-TAC)*MFR(ID)*CGRI(ID)
        JUMP AHEAD
       OTHERWISE
        LET CL = DL + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
       IF CCL LT CL
        LET CL = CCL + ((CL-CCL)/MSR(ID))*MFR(ID)
       REGARDLESS
        JUMP AHEAD
      OTHERWISE
        LET CL = (TIME.V-TA1) * MSR(ID)
       IF CL GT CCL
        LET CL = CCL + ((CL-CCL)/MSR(ID))*MFR(ID)
       REGARDLESS
       HERE
        LET SU = 2.75 - (1.75 * CL) / FSAF.LGT
       IF CL GT FSAF.LGT
        LET SU = 1.0 - (CL-FSAF.LGT)/(LGHT.TO.FAILURE-FSAF.LGT)
       REGARDLESS
  ''
  '' PREDICT TIME TO FAILURE FROM SECOND CRACK INITIATION
  ''
         LET T1 = 0.0
        IF CL LT CCL
         LET T1 = (CCL-CL) / (MSR(ID) * CGRI(ID))
         LET GR1 = 2.0 * MSR(ID) * CGRI(ID)
         IF TAR LE TIME.V + TCL
          LET GR2 = (MSR(ID) + MFR(ID)) * CGRI(ID)
          JUMP AHEAD
         OTHERWISE
          LET X(1) = 0.0
          LET Y(1) = 0.0
          LET X(2) = TCL-T1
          LET Y(2) = CCL + X(2) * MFR(ID) * CGRI(ID) - T1 * MSR(ID) * CGRI(ID)
          LET X(3) = TAR - TIME.V - T1
          LET Y(3) = Y(2) + (2.0 * MFR(ID) * CGRI(ID))
          LET N = 3
          JUMP AHEAD
        REGARDLESS
         IF TAR LE TIME.V + TCL
          LET GR1 = (MSR(ID) + MFR(ID)) * CGRI(ID)
          LET GR2 = GR1
          JUMP AHEAD
         OTHERWISE
          LET X(1) = 0.0
          LET Y(1) = 0.0
          LET X(2) = TCL
```

```
      LET Y(2) = CCL + TCL*MFR(ID)*CGWI(ID)
      LET X(S) = TAU - TIME.V
      LET Y(S) = Y(2) + (X(S)-TCL) * 2.0 * MFR(ID) * CGWI(ID)
      LET N = S
     HERE
     IF N GE S
      LET W(1) = 100.0
      FOR I = 2 TO N
      DO
      LET W(I) = 1.0
      LOOP
      FOR I = 1 TO N
      DO
      LET WX = WX + W(I) * X(I)
      LET WXY = WXY + W(I) * X(I) * Y(I)
      LET WY = WY + W(I) * Y(I)
      LET WXS = WXS + W(I) * X(I)**2
      LET SW = SW + W(I)
      LOOP
      LET GR2 = (SW*WXY - WY*WX) / (SW*WXS - WX**2)
     REGARDLESS
      LET T2 = T1 + (FSAF.LGT - (GR1*T1))/GR2
     IF CL GE CCL
      LET GR1 = GR2
      LET T2 = (FSAF.LGT-CL)/GR2
     REGARDLESS
      LET SF = 1.0
      LET R1 = ((S1-SF)*GR1) / FSAF.LGT
      LET R2 = ((S1-SF)*GR2) / FSAF.LGT
      LET R3 = GR2 / (LGHT.TO.FAILURE - FSAF.LGT)
     IF CL GE FSAF.LGT
      LET R1 = GR1 / (LGHT.TO.FAILURE - FSAF.LGT)
      LET R2 = GR2 / (LGHT.TO.FAILURE - FSAF.LGT)
      LET R3 = R2
      LET T2 = 0.0
     REGARDLESS
     IF (TIME.V + T2 LT TAU OR CH.EXISTS(ID) = "NS") AND T2 GT 0.0
      IF AIL(ID) = "YES"
       LET REACH.FAIL.SAFE.LGT = ARESL(ID)
       CANCEL THE REACH.FAIL.SAFE.LGT
       RESCHEDULE THE REACH.FAIL.SAFE.LGT(ID) AT TIME.V + T2
       JUMP AHEAD
      ELSE
       SCHEDULE A REACH.FAIL.SAFE.LGT(ID) AT TIME.V + T2
       LET ARESL(ID) = REACH.FAIL.SAFE.LGT
       LET AIL(ID) = "YES"
      HERE
     REGARDLESS
      LET LG = LOG.E.F(KEW(ID))
      LET K1 = A + EXP.F(S1 * W)
      LET K2 = W + R1
      LET TTF = -LOG.E.F((K2/K1)*LG + 1.0)/K2
     IF TTF LE T1
```

```
      JUMP AHEAD
     ELSE
      LET S1 = SU - R1 * T1
      LET K4 = B * R2
      LET LGK5 = LOG.E.F(A) + (B * S1 + B * R2 * T1)
      LET K8 = (A*EXP.F(B*S1))/K4
      LET K9 = (K1/K2)*(EXP.F(-B*R1*T1)-1.0)
      LET TTF = (LGK5 - LOG.E.F(ABS.F(K4)) - LOG.E.F(ABS.F(LG+K8-K9)))/K4
     IF TTF LE T2
      JUMP AHEAD
     ELSE
      LET K10 = B*R3
      LET ARG = B*SF+B*R3*T2
    IF ARG LT -175.0
      LET ARG = -175.0
    ALWAYS
      LET K11 = K10/(A*EXP.F(ARG))
      LET K12 = A*EXP.F(B*SF)/K10
      LET K13 = EXP.F(B*R2*T1 - B*R2*T2) - 1.0
      LET TTF = -LOG.E.F(K11*(LG+K12-(K8*K13)-K9))/K10
    HERE
     IF LIST = 1.0
      PRINT 1 LINE WITH TIME.V+TTF-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
            ELEMENT FAILURE PROJECTED AT ****** FLIGHT HOURS
     ALWAYS
    IF TIME.V + TTF LT IAR OR CO.EXISTS(ID) = "NS"
     IF FSM(ID) = "YES"
      LET FAILURE = AF(ID)
      CANCEL THE FAILURE
      RESCHEDULE THE FAILURE(ID) AT TIME.V + TTF
      JUMP AHEAD
     ELSE
      SCHEDULE A FAILURE(ID) AT TIME.V + TTF
      LET AF(ID) = FAILURE
      LET FSM(ID) = "YES"
     HERE
    ALWAYS
      RELEASE X(*), Y(*), W(*)
      RETURN
      END
```

LOCAL VARIABLES OF THIS ROUTINE

ARG	DOUBLE	WORD 89	CCL	DOUBLE	WORD 27
CL	DOUBLE	WORD 35	PL	DOUBLE	WORD 37
GR1	DOUBLE	WORD 43	GR2	DOUBLE	WORD 45
I.1	INTEGER	WORD 15	I.2	INTEGER	WORD 16
I.3	INTEGER	WORD 17	ID2SR	INTEGER	WORD 1
J.1	INTEGER	WORD 18	K.1	INTEGER	WORD 20
K.2	INTEGER	WORD 21	K.3	INTEGER	WORD 22
K.4	INTEGER	WORD 23	K1	DOUBLE	WORD 71
K10	DOUBLE	WORD 87	K11	DOUBLE	WORD 91

K12	DOUBLE	WORD 93	K13	DOUBLE	WORD 95
K2	DOUBLE	WORD 73	K4	DOUBLE	WORD 79
K8	DOUBLE	WORD 83	K9	DOUBLE	WORD 85
L.9	INTEGER	WORD 11	L6	DOUBLE	WORD 69
LGKS	DOUBLE	WORD 81	LIST	DOUBLE	WORD 9
N	DOUBLE	WORD 47	R.1	INTEGER	WORD 19
R.1	DOUBLE	WORD 15	R1	DOUBLE	WORD 63
R2	DOUBLE	WORD 65	R3	DOUBLE	WORD 67
SF	DOUBLE	WORD 61	SM	DOUBLE	WORD 57
S4	DOUBLE	WORD 39	S1	DOUBLE	WORD 77
T	DOUBLE	WORD 25	TAC	DOUBLE	WORD 33
TAR	DOUBLE	WORD 7	TA1	DOUBLE	WORD 29
TCL	DOUBLE	WORD 31	TIF	DOUBLE	WORD 75
T1	DOUBLE	WORD 41	T2	DOUBLE	WORD 59
W	REAL	WORD 5	WX	DOUBLE	WORD 49
WRS	DOUBLE	WORD 55	WRY	DOUBLE	WORD 51
WY	DOUBLE	WORD 53	X	REAL	WORD 3
Y	REAL	WORD 4			

```
EVENT 3.STRENGTH.REDUCTION(ID3SR) SAVING THE EVENT NOTICE
''
'' REPRESENTS THIRD CRACK INITIATION
''
      DEFINE ID3SR AS AN INTEGER VARIABLE
      DEFINE X, Y, W AS REAL, 1-DIMENSIONAL ARRAYS
      RESERVE X(*), Y(*), W(*) AS 5
      LET ID = ID3SR
      LET TAR = ENTRY.TIME(AIRPLANE(ID)) + USAGE.LIFE
   IF LTHO = "YES"
      FOR I = 1 TO NOAC(LOX)
      DO
    IF ID = TLID(LOX,I)
      LET LIST = 1.0
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
        A/C NO. *** EXPERIENCES 3RD CRACK INITIATION AT ****** HOURS
      LEAVE
    ELSE
      LOOP
   ALWAYS
      LET 3.INT(ID) = "NO"
    IF RANDOM.F(10) LE 1.PRO-
      LET 3.INT(ID) = "YES"
     IF LIST = 1.0
      PRINT 1 LINE AS FOLLOWS
            CRACK INITATES INTERNALLY
     ALWAYS
      LET T = (CRIT.CRK.LGT*PCCL)/(MSR(ID)*CGRI(ID))
     IF PCCL GT 1.0
      LET T = CRIT.CRK.LGT/(MSR(ID)*CGRI(ID)) + (CRIT.CRK.LGT*(PCCL-1.0))/
      (MFR(ID)*CGRT(ID))
     ALWAYS
     IF TIME.V + T LT TAR OR CO.EXISTS(ID) = "NS"
      SCHEDULE A 3.ITF(ID) AT TIME.V + T
      LET ASE(ID) = 3.ITF
      LET IE3(ID) = "YES"
     ALWAYS
    REGARDLESS
      LET 3.CR.EXISTS(ID) = "YES"
      LET 1.STRENGTH.REDUCTION = A1SR(ID)
      LET 2.STRENGTH.REDUCTION = A2SR(ID)
      LET CCL = CRIT.CRK.LGT
      LET TCL = CCL/(MSR(ID)*CGRI(ID))
      LET TA1 = TIME.A(1.STRENGTH.REDUCTION)
      LET TA2 = TIME.A(2.STRENGTH.REDUCTION)
''
'' DETERMINE RESIDUAL STRENGTH REDUCTION BECAUSE OF FIRST AND SECOND CRACKS
''
   IF CO.EXISTS(ID)= "YES"
      LET COROSION= AC(ID)
      LET TAC = TIME.A(CORROSION)
    IF TAC LE TA1
```

```
      LET 1CL = (TIME.V-TA1) * MSR(ID) * CGRI(ID)
      LET 2CL = (TIME.V-TA2) * MSR(ID) * CGRI(ID)
     IF 1CL GT CCL
      LET 1CL = CCL + ((1CL-CCL)/MSR(ID))*MFR(ID)
    REGARDLESS
     IF 2CL GT CCL
      LET 2CL = CCL + ((2CL-CCL)/MSR(ID))*MFR(ID)
    REGARDLESS
      LET CL = 1CL + 2CL
      JUMP AHEAD
   OTHERWISE
   IF TAC LE TA2
     LET OL = (TAC-TA1) * ASR(ID)
     LET 1CL = OL + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
     LET 2CL = (TIME.V-TA2) * MSR(ID) * CGRI(ID)
    IF CCL LT OL
     LET 2CL = (TIME.V-TA2) * MSR(ID) * CGRI(ID)
    REGARDLESS
    IF 2CL GT CCL
     LET 2CL = CCL + ((2CL-CCL)/MSR(ID))*MFR(ID)
    REGARDLESS
   REGARDLESS
   IF TAC LE TA1
     LET 1CL = (TIME.V-TA1) * MSR(ID) * CGRI(ID)
    IF 1CL GT CCL
     LET 1CL = CCL + ((1CL-CCL)/MSR(ID))*MFR(ID)
    REGARDLESS
   REGARDLESS
     JUMP AHEAD
  OTHERWISE
     LET 1CL = (TIME.V-TA1) * MSR(ID)
   IF 1CL GT CCL
     LET 1CL = CCL + ((1CL-CCL)/MSR(ID))*MFR(ID)
   REGARDLESS
     LET 2CL = (TIME.V-TA2) * MSR(ID)
   IF 2CL GT CCL
     LET 2CL = CCL + ((2CL-CCL)/MSR(ID))*MFR(ID)
   REGARDLESS
   HERE
     LET CL = 1CL + 2CL
     LET SU = 2.75 - (1.75 * CL) / FSAF.LGT
   IF CL GT FSAF.LGT
     LET SU = 1.0 - (CL-FSAF.LGT)/(LGHT.TO.FAILURE-FSAF.LGT)
   REGARDLESS
 ''
 '' PREDICT TIME TO FAILURE FROM THIRD CRACK INITIATION
 ''
     LET T1 = 0.0
   IF 1CL LT CCL
     LET T1 = (CCL-1CL) / (MSR(ID)*CGRI(ID))
     LET GR1 = 3.0 * MSR(ID) * CGRI(ID)
     LET T2 = (CCL-2CL)/ (MSR(ID)*CGRI(ID))
    IF TA3 LE TIME.V + T2
```

```
      LET GR2 = (MFR(ID) + 2.0*MSR(ID)) * CGRI(ID)
       JUMP AHEAD
      OTHERWISE
       LET X(1) = 0.0
       LET Y(1) = 0.0
       LET X(2) = T2-T1
       LET Y(2) = X(2) * (MFR(ID) + 2.0*MSR(ID)) * CGRI(ID)
      IF TAR LE TIME.V + TCL
       LET X(3) = TAR - TIME.V - T1
       LET Y(3) = Y(2) + (X(3)-X(2)) * (2.0*MFR(ID) + MSR(ID)) * CGRI(ID)
       LET N = 3
       JUMP AHEAD
      OTHERWISE
       LET X(3) = TCL - T1
       LET XK = X(3) - T2 + T1
       LET Y(3) = (X(3)+XK)*MFR(ID)*CGRI(ID) + (T2-T1+X(3))*MSR(ID)*CGRI(ID)
       LET X(4) = TAR - TIME.V - T1
       LET Y(4) = (X(4)-X(3)) * 3.0 * MFR(ID) * CGRI(ID)
       LET N = 4
       JUMP AHEAD
     OTHERWISE
       LET X(1) = 0.0
       LET Y(1) = 0.0
     IF ZCL LT CCL
       LET T2 = (CCL-ZCL)/(MSR(ID)*CGRI(ID))
      IF TAR LE TIME.V + T2
       LET GR2 = (2.0 * MSR(ID) + MFR(ID)) * CGRI(ID)
       LET GR1 = GR2
       JUMP AHEAD
      OTHERWISE
      IF TAR LE TIME.V + TCL
       LET X(2) = T2
       LET Y(2) = T2 * (2.0 * MSR(ID) + MFR(ID)) * CGRI(ID)
       LET X(3) = TAR - TIME.V
       LET Y(3) = Y(2) + (X(3)-X(2)) * (2.0 * MFR(ID) + MSR(ID)) * CGRI(ID)
       LET N = 3
       JUMP AHEAD
      OTHERWISE
       LET X(2) = T2
       LET Y(2) = T2 * (2.0 * MSR(ID) + MFR(ID)) * CGRI(ID)
       LET X(3) = TCL
       LET Y(3) = Y(2) + (TCL-T2) * (2.0 * MFR(ID) + MSR(ID)) * CGRI(ID)
       LET X(4) = TAR - TIME.V
       LET Y(4) = Y(3) + (X(4)-TCL) * (3.0 * MFR(ID)) * CGRI(ID)
       LET N = 4
       JUMP AHEAD
     OTHERWISE
      IF TAR LE TIME.V + TCL
       LET GR2 = (2.0 * MFR(ID) + MSR(ID)) * CGRI(ID)
       LET GR1 = GR2
       JUMP AHEAD
      OTHERWISE
       LET X(2) = TCL
```

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```
        LET Y(2) = TCL * (2.0 * MFR(ID) + MSR(ID)) * CGRI(ID)
        LET X(3) = TAR - TIME.V
        LET Y(3) = Y2 + (X(3)-X(2)) * (3.0 * MFR(ID)) * CGRI(ID)
        LET N = 3
      HERE
      IF N GE 3
        LET W(1) = 100.0
        FOR I = 2 TO N
        DO
        LET W(I) = 1.0
        LOOP
        FOR I = 1 TO N
        DO
        LET SX = SX + W(I) * X(I)
        LET SXY = SXY + W(I) * X(I) * Y(I)
        LET SY = SY + W(I) * Y(I)
        LET SXS = SXS + W(I) * X(I)**2
        LET SWN = SWN + W(I)
        LOOP
        LET GR2 = (SWN*SXY - SY*SX) / (SWN*SXS - SX**2)
      REGARDLESS
        LET T2 = T1 + (FSAF.LGT - (GR1*T1))/GR2
       IF TCL GE CCL
        LET GR1 = GR2
        LET T2 = (FSAF.LGT - CL) / GR2
       REGARDLESS
        LET SF = 1.0
        LET R1 = ((SM-SF)*GR1) / FSAF.LGT
        LET R2 = ((SM-SF)*GR2) / FSAF.LGT
        LET R3 = GR2 / (LGHT.TO.FAILURE - FSAF.LGT)
      IF CL GE FSAF.LGT
        LET R1 = GR1 / (LGHT.TO.FAILURE - FSAF.LGT)
        LET R2 = GR2 / (LGHT.TO.FAILURE - FSAF.LGT)
        LET R3 = R2
        LET T2 = 0.0
      REGARDLESS
      IF (TIME.V + T2 LT TAR OR CO.EXISTS(ID) = "NS") AND T2 GT 0.0
       IF AIL(ID) = "YES"
        LET REACH.FAIL.SAFE.LGT = ARFSL(ID)
        CANCEL THE REACH.FAIL.SAFE.LGT
        RESCHEDULE THE REACH.FAIL.SAFE.LGT(ID) AT TIME.V + T2
        JUMP AHEAD
       ELSE
        SCHEDULE A REACH.FAIL.SAFE.LGT(ID) AT TIME.V + T2
        LET ARFSL(ID) = REACH.FAIL.SAFE.LGT
        LET AIL(ID) = "YES"
       HERE
      REGARDLESS
        LET K1 = A * EXP.F(SU * H)
        LET K2 = H * R1
        LET LG = LOG.E.F(XRN(ID))
        LET TTF = -LOG.E.F((K2/K1)*LG + 1.0)/K2
       IF TTF LE T1
```

```
        JUMP AHEAD
      ELSE
        LET S1 = S0 - R1 * T1
        LET K4 = B * R2
        LET LGK5 = LOG.E.F(A) + (B * S1 + B * R2 * T1)
        LET K8 = (A*EXP.F(B*S1))/K4
        LET K9 = (K1/K2)*(EXP.F(-B*R1*T1)-1.0)
        LET TTF = (LGK5 - LOG.E.F(ABS.F(K4)) - LOG.E.F(ABS.F(LG+K8-K9)))/K4
      IF TTF LE T2
        JUMP AHEAD
      ELSE
        LET K10 = B*R3
        LET ARG = B*SF+B*R3*T2
     IF ARG LT -175.0
        LET ARG = -175.0
     ALWAYS
        LET K11 = K10/(A*EXP.F(ARG))
        LET K12 = A*EXP.F(B*SF)/K10
        LET K13 = EXP.F(B*R2*T1 - B*R2*T2) - 1.0
        LET TTF = -LOG.E.F(K11*(LG+K12-(K8*K13)-K9))/K10
     HERE
      IF LIST = 1.0
        PRINT 1 LINE WITH TIME.V+TTF-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
              ELEMENT FAILURE PROJECTED AT ****** FLIGHT HOURS
      ALWAYS
     IF TIME.V + TTF LT TAR OR CO.EXISTS(ID) = "NS"
      IF FSH(ID) = "YES"
        LET FAILURE = AF(ID)
        CANCEL THE FAILURE
        RESCHEDULE THE FAILURE(ID) AT TIME.V + TTF
        JUMP AHEAD
      ELSE
        SCHEDULE A FAILURE(ID) AT TIME.V + TTF
        LET AF(ID) = FAILURE
        LET FSH(ID) = "YES"
      HERE
     ALWAYS
        RELEASE X(*), Y(*), Z(*)
        RETURN
        END
```

LOCAL VARIABLES OF THIS ROUTINE

ARG	DOUBLE	WORD 99	CCL	DOUBLE	WORD 27
CL	DOUBLE	WORD 41	DL	DOUBLE	WORD 45
GR1	DOUBLE	WORD 49	GR2	DOUBLE	WORD 53
I.1	INTEGER	WORD 15	I.2	INTEGER	WORD 16
I.3	INTEGER	WORD 17	ID.S	INTEGER	WORD 1
J.1	INTEGER	WORD 18	K.1	INTEGER	WORD 20
K.2	INTEGER	WORD 21	K.3	INTEGER	WORD 22
K.4	INTEGER	WORD 23	K1	DOUBLE	WORD 79
K10	DOUBLE	WORD 97	K11	DOUBLE	WORD 101

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K12	DOUBLE	WORD103	K13	DOUBLE	WORD105
K2	DOUBLE	WORD 81	K4	DOUBLE	WORD 89
KA	DOUBLE	WORD 93	K9	DOUBLE	WORD 95
L.4	INTEGER	WORD 11	LG	DOUBLE	WORD 83
LGKS	DOUBLE	WORD 91	LIST	DOUBLE	WORD 9
N	DOUBLE	WORD 55	N.1	INTEGER	WORD 19
R.1	DOUBLE	WORD 13	R1	DOUBLE	WORD 73
R2	DOUBLE	WORD 75	RS	DOUBLE	WORD 77
SF	DOUBLE	WORD 71	SPA	DOUBLE	WORD 69
SU	DOUBLE	WORD 45	S1	DOUBLE	WORD 87
T	DOUBLE	WORD 25	TAC	DOUBLE	WORD 35
TAR	DOUBLE	WORD 7	TA1	DOUBLE	WORD 31
TA2	DOUBLE	WORD 33	TCL	DOUBLE	WORD 29
TTF	DOUBLE	WORD 85	T1	DOUBLE	WORD 47
T2	DOUBLE	WORD 51	W	REAL	WORD 5
AX	DOUBLE	WORD 61	AXS	DOUBLE	WORD 67
AXY	DOUBLE	WORD 63	AY	DOUBLE	WORD 65
X	REAL	WORD 3	XX	DOUBLE	WORD 57
Y	REAL	WORD 4	Y2	DOUBLE	WORD 59
ICL	DOUBLE	WORD 37	ZCL	DOUBLE	WORD 39

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```
LINE  CACI SIMSCRIPT II.5  RELEASE 8F                                   09/01/76  PAGE  46

 EVENT LITE(IDIE)
      DEFINE IDIE AS AN INTEGER VARIABLE
      LET ID = IDIE
      LET L.INT(ID) = "EQ"
      LET IFI(ID) = "NO"
   IF (TMO = "YES"
      FOR I = 1 TO NIAC(LDX)
      DO
    IF ID = TLID(LDX,I)
      SKIP 1 OUTPUT LINE
      PRINT 1 DOUBLE LINE WITH ID, CHIT.CRK.LGT+PCCL, TIME.V-
      ENTRY.TI-F(AIRPLANE(ID)) AS FOLLOWS
        AC    * *** HAS INTERNAL FIRST CRACK BECOME EXTERNAL AT **.** INCHES AND ****** FLIGHT HOURS
      LEAVE
   ELSE
      LOOP
   ALWAYS
      RETURN
      END

         LOCAL VARIABLES OF THIS ROUTINE

I.1      INTEGER  WORD  7      I.2     INTEGER  WORD  8
I.3      INTEGER  WORD  9      IDIE    INTEGER  WORD  1
J.1      INTEGER  WORD 10      K.1     INTEGER  WORD 12
K.2      INTEGER  WORD 13      K.5     INTEGER  WORD 14
K.4      INTEGER  WORD 15      L.4     INTEGER  WORD  5
N.1      INTEGER  WORD 11      N.1     DOUBLE   WORD  5
```

```
LINE  CACI SIMSCRIPT II.5  RELEASE 8F                                  09/01/76  PAGE  45

EVENT 2.ITE(ID2E)
      DEFINE ID2E AS AN INTEGER VARIABLE
      LET ID = ID2E
      LET 2.INT(ID) = "NO"
      LET IP2(ID) = "NO"
    IF LTHR = "YES"
      FOR I = 1 TO NSAC(LOX)
      DO
     IF ID = TLIM(LOX,I)
      SKIP 1 OUTPUT LINE
      PRINT 1 DOUBLE LINE WITH ID, CHIT.LOW.LLT.CIL, TIME.V
      ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
        A/C NO. *** HAS INTERNAL SECOND CHAC HIT -- EXTERNAL AT **.** INCHES AND ****** FLIGHT -- --
      LEAVE
     ELSE
      LOOP
    ALWAYS
      RETURN
      END

                LOCAL VARIABLES OF THIS ROUTINE

I.1        INTEGER  WORD  7       I.2        INTEGER  WORD  6
I.3        INTEGER  WORD  9       ID2E       INTEGER  WORD  1
J.1        INTEGER  WORD 10       K.1        INTEGER  WORD 12
K.2        INTEGER  WORD 13       K.3        INTEGER  WORD 14
K.4        INTEGER  WORD 15       L.3        INTEGER  WORD  3
N.1        INTEGER  WORD 11       R.1        DOUBLE   WORD  5
```

```
LINE  CACI SIMSCRIPT II.5  RELEASE 8F                                  09/01/76  PAGE  46

 EVENT 3.ITE(ID3E)
       DEFINE ID3E AS AN INTEGER VARIABLE
       LET ID = ID3E
       LET 3.INT(ID) = "NO"
       LET IE3(ID) = "YO"
    IF ITHO = "YES"
       FOR I = 1 TO NOAC(LDX)
       DO
     IF ID = TLID(LDX,I)
       SKIP 1 OUTPUT LINE
       PRINT 1 DOUBLE LINE WITH ID, CRIT.CRK.LGT+PCCL, TIME.V-
       ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
         A/C NO. *** HAS INTERNAL THIRD CRACK BECOME EXTERNAL AT **.** INCHES AND ****** FLIGHT HOURS
       LEAVE
    ELSE
       LOOP
   ALWAYS
       RETURN
       END


            LOCAL VARIABLES OF THIS ROUTINE

I.1        INTEGER   WORD  7      I.2          INTEGER   WORD  8
I.3        INTEGER   WORD  9      ID3E         INTEGER   WORD  1
J.1        INTEGER   WORD 10      K.1          INTEGER   WORD 12
K.2        INTEGER   WORD 13      K.3          INTEGER   WORD 14
K.4        INTEGER   WORD 15      L.4          INTEGER   WORD  3
N.1        INTEGER   WORD 11      K.1          DOUBLE    WORD  5
```

```
ROUTINE INSPECTION.SCHEDULER(N)
''
'' SCHEDULES INSPECTIONS REL   OVERHAUL LEVEL ON A GIVEN AIRCRAFT SUCH THAT THE
''    AIRCRAFT IS NOT INSPECTED PRIOR TO CRACK REACHING MINIMUM DETECTABLE LGT
''
      DEFINE N AS AN INTEGER VARIABLE
      LET M1 = MSR(ID) * CSHI(ID)
      LET C1 = C.GROWTH.RATE * CRRF
    IF EXT.INSP.LEVEL LE 1
      LET TML = TIME.V + .551/M1
     IF N = 2
      LET TML = TIME.V + .996/C1
     ALWAYS
      LET S.INSP.AT = ENTRY.TIME(AIRPLANE(ID)) + IAHCO(1)
      * TRUNC.F((TML-ENTRY.TIME(AIRPLANE(ID)))/IAHCO(1) + 1.0)
      SCHEDULE AN A.LEVEL.INSPECTION(ID) AT S.INSP.AT
      LET AAL(ID) = A.LEVEL.INSPECTION
    REGARDLESS
''
    IF EXT.INSP.LEVEL LE 2
      LET TML = TIME.V + .410/M1
     IF N = 2
      LET TML = TIME.V + .635/C1
     ALWAYS
      LET S.INSP.AT = ENTRY.TIME(AIRPLANE(ID)) + IAHCO(2)
      * TRUNC.F((TML-ENTRY.TIME(AIRPLANE(ID)))/IAHCO(2) + 1.0)
      SCHEDULE A B.LEVEL.INSPECTION(ID) AT S.INSP.AT
      LET ABL(ID) = B.LEVEL.INSPECTION
    REGARDLESS
''
    IF EXT.INSP.LEVEL LE 3
      LET TML = TIME.V + .266/M1
     IF N = 2
      LET TML = TIME.V + .563/C1
     ALWAYS
      LET S.INSP.AT = ENTRY.TIME(AIRPLANE(ID)) + C.INTERVAL(ID)
      * TRUNC.F((TML-ENTRY.TIME(AIRPLANE(ID)))/C.INTERVAL(ID) + 1.0)
      SCHEDULE A C.LEVEL.INSPECTION(ID) AT S.INSP.AT
      LET ACL(ID) = C.LEVEL.INSPECTION
    REGARDLESS
''
      LET INSP.SCH(ID) = "YES"
      RETURN
      END
```

```
LINE  CACI SIMSCRIPT II.5  RELEASE 8F

            LOCAL VARIABLES OF THIS ROUTINE                                   09/01/76  PAGE  48
C1          DOUBLE   WORD  5
N           INTEGER  WORD  1        N1            DOUBLE   WORD  3
TML         DOUBLE   WORD  7        S.INSP.AT     DOUBLE   WORD  9
```

```
EVENT A.LEVEL.INSPECTION(IDA)
      DEFINE IDA AS AN INTEGER VARIABLE
      LET ID = IDA
      LET FIXIT.COST = A.REPAIR.COST
      LET RSV = 1.0
  ''
      CALL EXPAIR(1.,.275,.512,.996,.275,.512,.551) YIELDING FLOOD
  ''
      SCHEDULE A. A.LEVEL.INSPECTION(ID) AT TIME.V + TAMCO(1)
      LET LAC(ID) = A.LEVEL.INSPECTION
      RETURN
      END

         LOCAL VARIABLES OF THIS ROUTINE

 FLOOD     DOUBLE   SUBR 3       IDA       INTEGER   SUBR 1
```

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```
LINE  CACI SIMSCRIPT II.5  RELEASE 8F                          09/01/76  PAGE  50

  EVENT R.LEVEL.INSPECTION(IDR)
        DEFINE IDR AS AN INTEGER VARIABLE
        LET ID = IDR
  ''
       IF EXT.INSP.LEVEL LE 1
        LET A.LEVEL.INSPECTION = AAL(ID)
        CANCEL THE A.LEVEL.INSPECTION
        RESCHEDULE THE A.LEVEL.INSPECTION(ID) AT TIME.V + IARCD(1)
        LET AAL(ID) = A.LEVEL.INSPECTION
       ALWAYS
        LET FIXIT.COST = R.REPAIR.COST
        LET RSHP = 1.0
  ''
        CALL EXAMINE(2.,.462,.513,.635,.462,.513,.410) YIELDING FOUND
  ''
        SCHEDULE A R.LEVEL.INSPECTION(ID) AT TIME.V + IARCD(2)
        LET ARL(ID) = R.LEVEL.INSPECTION
        RETURN
        END

           LOCAL VARIABLES OF THIS ROUTINE

 FOUND       DOUBLE    WORD  5       IDR        INTEGER  WORD  1
```

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```
EVENT C.LEVEL.INSPECTION(IDC)
      DEFINE IDC AS AN INTEGER VARIABLE
      LET ID = IDC
''
    IF EXT.INS.LEVEL EQ 2
      LET A.LEVEL.INSPECTION = ACL(ID)
      CANCEL THE A.LEVEL.INSPECTION
      RESCHEDULE THE A.LEVEL.INSPECTION(ID) AT TIME.V + IAHC(ID,2)
''
     IF EXT.INS.LEVEL EQ 1
      LET A.LEVEL.INSPECTION = ACL(ID)
      CANCEL THE A.LEVEL.INSPECTION
      RESCHEDULE THE A.LEVEL.INSPECTION(ID) AT TIME.V + IAHC(ID,1)
      LET ACL(ID) = A.LEVEL.INSPECTION
     ALWAYS
    ALWAYS
      LET FIRST.COST = C.REPAIR.COST
      LET ...  = 1.0
''
      CALL EXAMINE(S...,...,...,...,...,...) YIELDING F...
''
    IF FOUND = 1
      FOR I = 1 TO ...
       ''
     IF ...TIME.ACRFT(I) = 1
      LET ...(I) = TIME.V
      CYCLE
     ELSE
      L...
    REGARDLESS
      SCHEDULE A C.LEVEL.INSPECTION(ID) AT TIME.V + C.INTERVAL(ID)
      LET ACL(ID) = C.LEVEL.INSPECTION
      RETURN
      END

        LOCAL VARIABLES OF THIS ROUTINE

FOUND   ...   ...  4   ...   INTEGER   ...  1
```

```
EVENT D.LEVEL.INSPECTION(IDD)
      DEFINE IDD AS AN INTEGER VARIABLE
      DEFINE I AS AN INTEGER VARIABLE
      LET ID = IDD
   IF LTHU = "YES"
      FOR I = 1 TO NBAC(LDK)
      DO
    IF ID = TLID(LDK,I)
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
        D-LEVEL INSPECTION [illegible] A/C [illegible] , *** AT ****** HOURS
      LEAVE
    ELSE
      LOOP
   ALWAYS
  IF INSP.SCH(ID) = "YES"
   IF EXT.INSP.LEVEL LE 3
      LET C.LEVEL.INSPECTION = ACL(ID)
      CANCEL THE C.LEVEL.INSPECTION
      RESCHEDULE THE C.LEVEL.INSPECTION(ID) AT TIME.V + C.INTERVAL(ID)
''
    IF EXT.INSP.LEVEL LE 2
      LET B.LEVEL.INSPECTION = ABL(ID)
      CANCEL THE B.LEVEL.INSPECTION
      RESCHEDULE THE B.LEVEL.INSPECTION(ID) AT TIME.V + IANCH(2)
''
     IF EXT.INSP.LEVEL LE 1
      LET A.LEVEL.INSPECTION = AAL(ID)
      CANCEL THE A.LEVEL.INSPECTION
      RESCHEDULE THE A.LEVEL.INSPECTION(ID) AT TIME.V + IANCH(1)
     ALWAYS
    ALWAYS
   ALWAYS
  REGARDLESS
      LET [illegible].COST = [illegible].COST
      LET [illegible] = SAVP[illegible]
''
      CALL EXAMINE([illegible],.993,.725,.351,.990,.725,.144) YIELDING [illegible]
''
      LET I = HI.TIME.ACRFT([illegible])
   IF I GE ID AND TIME.V - [illegible].TIME(AIRPLANE(I)) GE ANC (4)
      FOR I = 1 TO [illegible]
      [illegible]
    IF HI.TIME.ACRFT(I) = ID
     IF F[illegible] = 1
      LET [illegible](I) = TIME.V
     ALWAYS
      FOR I = 1 TO [illegible]
      DO
     IF TIME.V - [illegible](I) LT ANCH(4)
      GO TO [illegible]
     ELSE
      LOOP
```

```
        LET AMCD(3) = AMCD(3) + FREQ.DECREASE
        LET AMCD(4) = AMCD(4) + FREQ.DECREASE
       IF LIMD = "YES"
        SKIP 1 OUTPUT LINE
        PRINT 3 LINES WITH AMCD(3), AMCD(4) AS FOLLOWS
          INSPECTION INTERVAL INCREASE IMPLEMENTED
              C-LEVEL INTERVAL NOW ***** HOURS
              D-LEVEL INTERVAL NOW ***** HOURS
       ALWAYS
        LET NICHG = NICHG +1
       IF NICHG GT 50
        JUMP AHEAD
       ELSE
        LET SC(NICHG) = AMCD(3)
        LET SD(NICHG) = AMCD(4)
       HERE
        LET CIASE = AMCD(3)
        LET DIASE = AMCD(4)
        FOR EVERY AIRCRAFT IN ACTIVE.FLEET
        DO
        LET C.INTERVAL(TAIL.ID) = AMCD(3)
        LET D.INTERVAL(TAIL.ID) = AMCD(4)
        LOOP
        FOR J = 1 TO 10
        DO
        LET MROD(J) = TIME.V
        LOOP
'NOCHG' LEAVE
     ELSE
        LOOP
     ALWAYS
''
   IF TMOD.PENDING(ID) = "YES" OR SMOD.PENDING(ID) = "YES"
        SCHEDULE A D.LEVEL.INSPECTION(ID) AT TIME.V + D.INTERVAL(ID)
        LET ADL(ID) = D.LEVEL.INSPECTION
     IF TMOD.PENDING(ID) = "YES"
        CALL INSTALL.MODIFICATION
        LET TMOD.PENDING(ID) = "NO"
      IF TIME.V LT ENTRY.TIME(AIRPLANE(ID)) + C7 * 144FL
        LET I.INSPECTION.INCREASE = ATII(ID)
        CANCEL THE I.INSPECTION.INCREASE
        DESTROY THE I.INSPECTION.INCREASE
      REGARDLESS
        RETURN
     OTHERWISE
        CALL INSTALL.MODIFICATION
        LET SMOD.PENDING(ID) = "NO"
        RETURN
   OTHERWISE
''
      IF FOUND GT 0
        SCHEDULE A REPAIR(ID) NOW
      REGARDLESS
```

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```
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        SCHEDULE A D.LEVEL.INSPECTION(ID) AT TIME.V + D.INTERVAL(ID)
        LET SOL(ID) = D.LEVEL.INSPECTION
        RETURN
        END

          LOCAL VARIABLES OF THIS ROUTINE

[illegible]  DOUBLE    WORD 17     I.1      INTEGER   WORD  7
I.2          INTEGER   WORD  8     I.3      INTEGER   WORD  9
ID           INTEGER   WORD  1     J        INTEGER   WORD  3
J.1          INTEGER   WORD 10     K.1      INTEGER   WORD 12
K.2          INTEGER   WORD 14     K.3      INTEGER   WORD 18
K.4          INTEGER   WORD 15     L.12     INTEGER   WORD 19
L.17         INTEGER   WORD 20     L.4      INTEGER   WORD  6
M.1          INTEGER   WORD 11     N.1      DOUBLE    WORD  5
```

```
ROUTINE EXAMI[illegible](.,XA,YA,ZA,XL,YL,Z.) YIELDING FOUND
      DEFINE . AS AN INTEGER VARIABLE
      DEFINE Z AS AN ALPHA VARIABLE
   IF LT[illegible] = "YES"
      FOR I = 1 TO NOAC(L.A)
      [illegible]
    IF I = IL[illegible](L[illegible].I)
      LET LIST = 1.0
      LEAVE
    ELSE
      LOOP
   ALWAYS
      LET [illegible] = [illegible](ID)
      LET [illegible] = [illegible](ID)
      LET CCL = CRIT.CRK.LGT
  IF C.EXISTS(ID) = "YES"
   IF [illegible] = "[illegible]" [illegible] C.[illegible](ID) = "YES" AND ITH[illegible] LE [illegible]
      LET C[illegible]SI[illegible] = AC(I.)
      LET TAC = TIME.A(C[illegible]SION)
      LET AREA = C.GROWTH.RATE * [illegible] * (TIME.V - TIME.A(CORROSION))
    IF RANDOM.F(1) LE POD(XA,YA,ZA,AREA)
      LET [illegible] = [illegible] + 1
      LET [illegible] = [illegible] + 1
      IF [illegible] = 1          LET ACA = AREA
                                  LET GACA = AREA
                                  LET Z = "A"
                                  JUMP AHEAD          OTHERWISE
      IF [illegible] = 2          LET BCA = AREA
                                  LET GBCA = AREA
                                  LET Z = "B"
                                  JUMP AHEAD          OTHERWISE
      IF [illegible] = 3          LET CCA = AREA
                                  LET GCCA = AREA
                                  LET Z = "C"
                                  JUMP AHEAD          OTHERWISE
                                  LET DCA = AREA
                                  LET GDCA = AREA
                                  LET Z = "[illegible]"
                                                      HERE
     IF LIST = 1.0
      SKIP 1 OUTPUT LINE
      PRINT 1 DOUBLE LINE WITH AREA, Z, ID, TIME.V-ENTRY.TIME(AIRPLANE(I.)) AS
      FOLLOWS
        C[illegible]SI[illegible] OF AREA **.** SQ. INCHES DETECTED DURING *-LEVEL INSPECTION OF A/C [illegible] *** AT ****** FLIGHT HOURS
     ALWAYS
      LET FOUND = 2
    REGARDLESS
   REGARDLESS
  REGARDLESS
 ''
 IF I.CR.EXISTS(ID) = "YES"
    IF I.I[illegible](ID) = "[illegible]" OR I.INT(ID) = "YES" AND ITH[illegible] LE [illegible]
      LET I.STRENGTH.REDUCTION = AIS[illegible](I[illegible])
```

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```
        LET TA1 = TIME.A(1.STRENGTH.REDUCTION)
        LET CL = (TIME.V-TA1) * M1 * CGRI(ID)
       IF TAC GT TA1
        LET CL = (TAC-TA1)*M1 + (TIME.V-TAC)*M1*CGRI(ID)
       REGARDLESS
       IF CL GT CCL
        LET CL = CCL + ((CL-CCL)/M1)**2
       REGARDLESS
 ''
       IF RANDOM.F(1) LE POOD(XL,YL,ZL,CL)
        LET DICH(N) = DICH(N) + 1
        LET GDICH(N) = GDICH(N) + 1
        IF N = 1        LET ACHAL = CL
                        LET GACHK = CL
                        LET Z = "A"
                        JUMP AHEAD          OTHERWISE
        IF N = 2        LET BCHAL = CL
                        LET GBCHK = CL
                        LET Z = "B"
                        JUMP AHEAD          OTHERWISE
        IF N = 3        LET CCHAL = CL
                        LET GCCHK = CL
                        LET Z = "C"
                        JUMP AHEAD          OTHERWISE
                        LET DCHAL = CL
                        LET GDCHK = CL
                        LET Z = "D"
                                            HERE
       IF LIST = 1.0
        SKIP 1 OUTPUT LINE
        PRINT 1 DOUBLE LINE WITH CL, Z, ID, TIME.V-ENTRY,TIME(AIRPLANE(ID)) AS
        FOLLOWS
          CHECK OF LENGTH **.** INCHES DETECTED DURING *-LEVEL INSPECTION OF A/C NO. *** AT ****** FLIGHT HOURS
       ALWAYS
        LET FOUND = 1
       REGARDLESS
      ALWAYS
 ''
    IF Z.CM.EXISTS(ID) = "YES"
     IF Z.LIST(ID) = "NO" OR Z.LIST(ID) = "YES" AND ITEAL LE N
       LET Z.STRENGTH.REDUCTION = AZSR(ID)
       LET TA2 = TIME.A(Z.STRENGTH.REDUCTION)
       LET CL = (TIME.V-TA2) * M1 * CGRI(ID)
      IF TAC GT TA2
       LET CL = (TAC-TA2)*M1 + (TIME.V-TAC)*M1*CGRI(ID)
      REGARDLESS
      IF CL GT CCL
       LET CL = CCL + ((CL-CCL)/M1)**2
      REGARDLESS
 ''
      IF RANDOM.F(1) LE POOD(XL,YL,ZL,CL)
       LET DICH(N) = DICH(N) + 1
       LET GDICH(N) = GDICH(N) + 1
```

```
          IF N = 1          LET ACMAL = CL
                            LET SACMM = CL
                            LET Z = "A"
                            JUMP AHEAD              OTHERWISE
          IF N = 2          LET MCMAL = CL
                            LET GMCMM = CL
                            LET Z = "M"
                            JUMP AHEAD              OTHERWISE
          IF N = 3          LET CCMAL = CL
                            LET GCCMM = CL
                            LET Z = "C"
                            JUMP AHEAD              OTHERWISE
                            LET TCMAL = CL
                            LET GTCMM = CL
                            LET Z = "T"
                                                    HERE
        IF LIST = 2.0
         SKIP 1 OUTPUT LINE
         PRINT 1 DOUBLE LINE WITH CL, Z, ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS
         FOLLOWS
           CRACK OF LENGTH **.** INCHES DETECTED DURING *-LEVEL INSPECTION OF A/C NO. *** AT ****** FLIGHT HOURS
        ALWAYS
         LET FOUND = 1
        REGARDLESS
       ALWAYS
  ..
      IF $.LW.EXISTS(ID) = "YES"
       IF $.INT(ID) = "NO" OR $.INT(ID) = "YES" AND TIME.L LE 3
         LET $.STRENGTH.REDUCTION = ASS-(I)
         LET TAS = TIME.A($.STRENGTH.REDUCTION)
         LET CL = (TIME.V-TAS) * M1 * CGMI(ID)
        IF TAC GT TAS
         LET CL = (TAC-TAS)*M1 + (TIME.V-TAC)*M1*CGMI(ID)
        REGARDLESS
        IF CL GT CCL
         LET CL = CCL + ((CL-CCL)/M1)*M2
        REGARDLESS
  ..
        IF RANDOM.F(1) LE PROB(XL,YL,ZL,CL)
         LET WICH(N) = WICH(N) + 1
         LET QUICH(N) = QUICH(N) + 1
         IF N = 1           LET ACMAL = CL
                            LET SACMM = CL
                            LET Z = "A"
                            JUMP AHEAD              OTHERWISE
         IF N = 2           LET MCMAL = CL
                            LET GMCMM = CL
                            LET Z = "M"
                            JUMP AHEAD              OTHERWISE
         IF N = 3           LET CCMAL = CL
                            LET GCCMM = CL
                            LET Z = "C"
                            JUMP AHEAD              OTHERWISE
```

```
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                        LET OCHAL = CL
                        LET GOCRK = CL
                        LET Z = "D"
        IF LIST = 1.0                          HERE
         SKIP 1 OUTPUT LINE
         PRINT 1 DOUBLE LINE WITH CL, Z, ID, TIME.V-ESTNY.TIME(AIRPLANE(ID)) AS
         FOLLOWS
           CRACK OF LENGTH **.** INCHES DETECTED DURING *-LEVEL INSPECTION OF A/C NO. *** AT ****** FLIGHT HOURS
        ALWAYS
         LET FOUND = 1
        REGARDLESS
       ALWAYS
      ALWAYS
     ALWAYS
    ALWAYS
  ''
       IF K = 4                      RETURN                    OTHERWISE
  ''
       IF FOUND GT 0
         SCHEDULE A REPAIR(ID) NOW
       REGARDLESS
         RETURN
         END

           LOCAL VARIABLES OF THIS ROUTINE

AREA   DOUBLE    WORD 20
CL     DOUBLE    WORD 47    CCL     DOUBLE    WORD 25
I.1    INTEGER   WORD 35    FOUND   DOUBLE    WORD 15
I.3    INTEGER   WORD 37    I.2     INTEGER   WORD 36
K.1    INTEGER   WORD 40    J.1     INTEGER   WORD 38
K.3    INTEGER   WORD 42    K.2     INTEGER   WORD 41
L.10   INTEGER   WORD 57    K.4     INTEGER   WORD 43
L.6    INTEGER   WORD 49    L.4     INTEGER   WORD 51
LIST   DOUBLE    WORD 19    L.8     INTEGER   WORD 53
R2     DOUBLE    WORD 23    R1      DOUBLE    WORD 21
S.1    INTEGER   WORD 39    S       INTEGER   WORD 1
TAC    DOUBLE    WORD 27    R.1     DOUBLE    WORD 33
TA2    DOUBLE    WORD 51    TA1     DOUBLE    WORD 45
XA     DOUBLE    WORD 5     TA5     DOUBLE    WORD 55
YA     DOUBLE    WORD 5     XL      DOUBLE    WORD 9
Z      ALPHA     WORD 17    YL      DOUBLE    WORD 11
ZL     DOUBLE    WORD 13    ZA      DOUBLE    WORD 7
```

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```
ROUTINE PROB(X,Y,Z,L)
''
'' COMPUTES PROBABILITY OF DETECTING A SERVICE DEFECT OF A GIVEN SIZE
''     X = MAXIMUM PROBABILITY OF DETECTION AT A GIVEN INSPECTION LEVEL
''     Y = EXPONENTIAL PARAMETER - CONSTANT FOR EACH LEVEL OF INSPECTION
''     Z = MINIMUM SIZE OF DEFECT DETECTABLE AT EACH INSPECTION LEVEL
''     L = SIZE OF DEFECT BEING TESTED:
''            LENGTH FOR CRACK DEFECTS
''            AREA FOR CORROSION DEFECTS
''
     RETURN WITH X * (1.0 - EXP.F(-Y * (L - Z))) [illegible]
     END
```

LOCAL VARIABLES OF THIS ROUTINE

L	DOUBLE	WORD 7	X	DOUBLE	WORD 1		
Y	DOUBLE	WORD 5	Z	DOUBLE	WORD 5		

```
ROUTINE CANCEL.SCHEDULED.INSPECTIONS
''
'' CANCELS ALL SCHEDULED INSPECTIONS BELOW OVERHAUL LEVEL ON A GIVEN AIRCRAFT
''
  IF EXT.INSP.LEVEL LE 3
    LET C.LEVEL.INSPECTION = ACL(ID)
    CANCEL THE C.LEVEL.INSPECTION
    DESTROY THE C.LEVEL.INSPECTION
''
   IF EXT.INSP.LEVEL LE 2
    LET B.LEVEL.INSPECTION = ABL(ID)
    CANCEL THE B.LEVEL.INSPECTION
    DESTROY THE B.LEVEL.INSPECTION
''
    IF EXT.INSP.LEVEL LE 1
     LET A.LEVEL.INSPECTION = AAL(ID)
     CANCEL THE A.LEVEL.INSPECTION
     DESTROY THE A.LEVEL.INSPECTION
    ALWAYS
   ALWAYS
  ALWAYS
''
    LET INSP.SCH(ID) = "NO"
    RETURN
    END
```

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```
EVENT REACH.FAIL.SAFE.LGT(IDRES)
      DEFINE IDRES AS AN INTEGER VARIABLE
      LET ID = IDRES
   IF LTHD = "YES"
      FOR I = 1 TO MAC(LDX)
      DO
    IF ID = TLID(LDX,I)
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
        A/C NO. *** REACHES FAIL-SAFE STRENGTH AT ****** FLIGHT HOURS
      LEAVE
    ELSE
      LOOP
   ALWAYS
     IF NRES LT 20
      LET NRES = NRES + 1
      LET APID(NRES) = ID
      LET STIV(NRES) = TIME.V - ENTRY.TIME(AIRPLANE(ID))
     REGARDLESS

     IF SNRES LT 200
      LET SNRES = SNRES + 1
      LET SAPID(SNRES) = ID
      LET SSTIM(SNRES) = TIME.V - ENTRY.TIME(AIRPLANE(ID))
      LET SFLNB(SNRES) = ELEME.T(L)
     REGARDLESS
      LET AIL(ID) = "NO"
      RETURN
      END
```

LOCAL VARIABLES OF THIS ROUTINE

I.1	INTEGER	WORD 7	I.2	INTEGER	WORD 6
I.3	INTEGER	WORD 9	IDRES	INTEGER	WORD 1
J.1	INTEGER	WORD 10	K.1	INTEGER	WORD 12
K.2	INTEGER	WORD 13	K.3	INTEGER	WORD 14
K.4	INTEGER	WORD 15	L.4	INTEGER	WORD 3
N.1	INTEGER	WORD 11	R.1	DOUBLE	WORD 5

```
EVENT FAILURE(IDFA)
      DEFINE IDFA AS AN INTEGER VARIABLE
      DEFINE HOLD AS AN INTEGER VARIABLE
      LET ID = IDFA
   IF LTHO = "YES"
      FOR I = 1 TO NOAC(LDX)
      DO
    IF ID = TLID(LDX,I)
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS FOLLOWS
        A/C NO. *** EXPERINCES ELEMENT FAILURE AT ****** FLIGHT HOURS
      LET 1.STRENGTH.REDUCTION = A1SR(ID)
      LET TA1 = TIME.A(1.STRENGTH.REDUCTION)
      LET CCL = CRIT.CRK.LGT
     IF CO.EXISTS(ID) = "YES"
      LET CORROSION = AC(ID)
      LET TAC = TIME.A(CORROSION)
     ALWAYS
      LET 1CL = (TIME.V-TA1)*MSR(ID)*CGRI(ID)
     IF TAC GT TA1
      LET 1CL = (TAC-TA1)*MSR(ID) + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
     ALWAYS
     IF 1CL GT CCL
      LET 1CL = CCL + (1CL-CCL)*(MFR(ID)/MSR(ID))
     ALWAYS
   IF 2.CR.EXISTS(ID) = "YES"
      LET 2.STRENGTH.REDUCTION = A2SR(ID)
      LET TA2 = TIME.A(2.STRENGTH.REDUCTION)
      LET 2CL = (TIME.V-TA2)*MSR(ID)*CGRI(ID)
     IF TAC GT TA2
      LET 2CL = (TAC-TA2)*MSR(ID) + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
     ALWAYS
     IF 2CL GT CCL
      LET 2CL = CCL + (2CL-CCL)*(MFR(ID)/MSR(ID))
     ALWAYS
    IF 3.CR.EXISTS(ID) = "YES"
      LET 3.STRENGTH.REDUCTION = A3SR(ID)
      LET TA3 = TIME.A(3.STRENGTH.REDUCTION)
      LET 3CL = (TIME.V-TA3)*MSR(ID)*CGRI(ID)
     IF TAC GT TA3
      LET 3CL = (TAC-TA3)*MSR(ID) + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
     ALWAYS
     IF 3CL GT CCL
      LET 3CL = CCL + (3CL-CCL)*(MFR(ID)/MSR(ID))
     ALWAYS
    ALWAYS
   ALWAYS
      LET CL = 1CL+2CL+3CL
      LET S = 2.75 - CL*(1.75/FSAF.LGT)
     IF CL GT FSAF.LGT
      LET S = (LGHT.TO.FAILURE-CL)/(LGHT.TO.FAILURE-FSAF.LGT)
     ALWAYS
      PRINT 2 LINES WITH CL, S/2.75 AS FOLLOWS
```

```
              SUM OF CRACK LENGTHS AT FAILURE = **.** INCHES
              RESIDUAL STRENGTH AT FAILURE = .** ULTIMATE
      LEAVE
    ELSE
      LOOP
   ALWAYS
      SCHEDULE AN INCREASE.INSPECTION.FREQUENCY NOW
      SCHEDULE AN IMMEDIATE.FLEET.INSPECTION NOW
      LET FSH(ID) = "NO"
     IF NSFL LT 10
      LET NSFL = NSFL + 1
      LET ACID(NSFL) = ID
      LET FLTHR(NSFL) = TIME.V - ENTRY.TIME(AIRPLANE(ID))
     REGARDLESS
 ''
     IF SNSFL LT 100
      LET SNSFL = SNSFL + 1
      LET SACID(SNSFL) = ID
      LET SFLTHR(SNSFL) = TIME.V - ENTRY.TIME(AIRPLANE(ID))
      LET SSTAN(SNSFL) = ELEMENT(4)
     REGARDLESS
      FOR I = 1 TO 10
      DO
    IF HI.TIME.ACRFT(I) = ID
      ADD 1 TO LHTA
    HERE
     IF LHTA GT SIZE.OF.FLEET
      JUMP AHEAD
     ELSE
      FOR EVERY AIRCRAFT IN CRASHED.FLEET
      DO
     IF LHTA = TAIL.ID
      ADD 1 TO LHTA
      JUMP BACK
     OTHERWISE
      LOOP
     HERE
      LET HOLD = HI.TIME.ACRFT(10)
      LET HI.TIME.ACRFT(10) = LHTA
     IF I GE 10
      LET HI.TIME.ACRFT(I) = HOLD
     REGARDLESS
      LEAVE
    OTHERWISE
      LOOP
   IF SAMP.PENDING(ID) = "NO"
      LET KEEN.MODIFIED = KEEN.MODIFIED + 1
    IF OCCUR.MOD(ID) GT ENTRY.TIME(AIRPLANE(ID))
      LET AIRFRAME.TIME = AIRFRAME.TIME + TIME.V - OCCUR.MOD(ID)
      JUMP AHEAD
    OTHERWISE
      LET AIRFRAME.TIME = AIRFRAME.TIME + TIME.V - ENTRY.TIME(AIRPLANE(ID))
    HERE
```

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```
    REGARDLESS
       REMOVE AIRPLANE(ID) FROM ACTIVE.FLEET
       FILE AIRPLANE(ID) IN CRASHED.FLEET
       ADD 1 TO 2.NUM.OF.CRASH
 ''
 '' CANCEL SCHEDULED EVENTS AND DESTROY EVENT NOTICES
 ''
    IF IE1(ID) = "YES"
       LET 1.ITE = A1E(ID)
       CANCEL THE 1.ITE
       DESTROY THE 1.ITE
     IF IE2(ID) = "YES"
       LET 2.ITE = A2E(ID)
       CANCEL THE 2.ITE
       DESTROY THE 2.ITE
      IF IE3(ID) = "YES"
       LET 3.ITE = A3E(ID)
       CANCEL THE 3.ITE
       DESTROY THE 3.ITE
      ALWAYS
     ALWAYS
    ALWAYS
     IF CO.EXISTS(ID) NE "NO"
       LET CORROSION = AC(ID)
      IF CO.EXISTS(ID) = "NS"
       CANCEL THE CORROSION
      ALWAYS
       DESTROY THE CORROSION
       LET CO.EXISTS(ID) = "NO"
     REGARDLESS
   IF 1.CR.EXISTS(ID) NE "NO"
       LET 1.STRENGTH.REDUCTION = A1SR(ID)
      IF 1.CR.EXISTS(ID) = "NS"
       CANCEL THE 1.STRENGTH.REDUCTION
      ALWAYS
       DESTROY THE 1.STRENGTH.REDUCTION
       LET 1.CR.EXISTS(ID) = "NO"
    IF 2.CR.EXISTS(ID) NE "NO"
       LET 2.STRENGTH.REDUCTION = A2SR(ID)
     IF 2.CR.EXISTS(ID) = "NS"
       CANCEL THE 2.STRENGTH.REDUCTION
      ALWAYS
       DESTROY THE 2.STRENGTH.REDUCTION
       LET 2.CR.EXISTS(ID) = "NO"
     IF 3.CR.EXISTS(ID) NE "NO"
       LET 3.STRENGTH.REDUCTION = A3SR(ID)
      IF 3.CR.EXISTS(ID) = "NS"
       CANCEL THE 3.STRENGTH.REDUCTION
      ALWAYS
       DESTROY THE 3.STRENGTH.REDUCTION
       LET 3.CR.EXISTS(ID) = "NO"
     REGARDLESS
    REGARDLESS
```

```
      REGARDLESS
        IF AIL(ID) = "YES"
          LET REACH.FAIL.SAFE.LGT = ARFSL(ID)
          CANCEL THE REACH.FAIL.SAFE.LGT
          DESTROY THE REACH.FAIL.SAFE.LGT
          LET AIL(ID) = "NO"
        REGARDLESS
          LET D.LEVEL.INSPECTION = ADL(ID)
          CANCEL THE D.LEVEL.INSPECTION
          DESTROY THE D.LEVEL.INSPECTION
        IF INSP.SCH(ID) = "YES"
          CALL CANCEL.SCHEDULED.INSPECTIONS
        REGARDLESS
  ''
          FOR EACH RETIRE.FROM.SERVICE IN EV.S(I.RETIRE.FROM.SERVICE)
          DO
          IF IDRET = ID       CANCEL THE RETIRE.FROM.SERVICE
          DESTROY THE RETIRE.FROM.SERVICE
          LEAVE          ELSE
          LOOP
          FOR EACH IN.SERVICE.DAMAGE IN EV.S(I.IN.SERVICE.DAMAGE)
          DO
          IF IDSD   = ID       CANCEL THE IN.SERVICE.DAMAGE
          DESTROY THE IN.SERVICE.DAMAGE
          LEAVE          ELSE
          LOOP
          FOR EACH T.INSPECTION.INCREASE IN EV.S(I.T.INSPECTION.INCREASE)
          DO
          IF IDTI = ID       CANCEL THE T.INSPECTION.INCREASE
          DESTROY THE T.INSPECTION.INCREASE
          LEAVE    ELSE
          LOOP
          RETURN
          END
```

LOCAL VARIABLES OF THIS ROUTINE

CCL	DOUBLE	WORD 19	CL	DOUBLE	WORD 33
HOLD	INTEGER	WORD 3	I.1	INTEGER	WORD 7
I.2	INTEGER	WORD 8	I.3	INTEGER	WORD 9
IREA	INTEGER	WORD 1	J.1	INTEGER	WORD 10
K.1	INTEGER	WORD 12	K.2	INTEGER	WORD 13
K.3	INTEGER	WORD 14	K.4	INTEGER	WORD 15
L.12	INTEGER	WORD 37	L.16	INTEGER	WORD 38
L.20	INTEGER	WORD 39	L.24	INTEGER	WORD 40
L.4	INTEGER	WORD 4	M.1	INTEGER	WORD 11
R.1	DOUBLE	WORD 5	S	DOUBLE	WORD 35
TAC	DOUBLE	WORD 21	TA1	DOUBLE	WORD 17
TA2	DOUBLE	WORD 25	TA3	DOUBLE	WORD 29
1CL	DOUBLE	WORD 23	2CL	DOUBLE	WORD 27
3CL	DOUBLE	WORD 31			

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```
EVENT RETIRE.FROM.SERVICE(IDRET)
''
'' REPRESENTS RETIREMENT OF THE AIRCRAFT FROM SERVICE
''
      DEFINE IDRET AS AN INTEGER VARIABLE
      DEFINE HOLD AS AN INTEGER VARIABLE
      LET ID = IDRET
   IF [illegible] = "YES"
      FOR I = 1 TO NOAC(LOX)
      DO
    IF ID = TLID(LOX,I)
      SKIP 1 OUTPUT LINE
      PRINT 1 LINE WITH ID, TIME.V-EVENT.TIME(AIRPLANE(ID)) AS FOLLOWS
        A/C [illegible] *** RETIRED FROM SERVICE AT ****** FLIGHT HOURS
      LEAVE
   ELSE
     LOOP
  ALWAYS
     FOR I = 1 TO 10
     DO
   IF HI.TIME.ACRFT(I) = ID
     ADD 1 TO LHTA
   HERE
    IF LHTA GT SIZE.OF.FLEET
     JUMP AHEAD
    ELSE
     FOR EVERY AIRCRAFT I [illegible] CRASHED.FLEET
     DO
    IF LHTA = TAIL.ID
     ADD 1 TO LHTA
     JUMP BACK
    OTHERWISE
     LOOP
    LET HOLD = HI.TIME.ACRFT(10)
    LET HI.TIME.ACRFT(10) = LHTA
   IF I [illegible] 1)
    LET HI.TIME.ACRFT(I) = HOLD
   REGARDLESS
    LEAVE
  OTHERWISE
    LOOP
   HERE
  IF [illegible] = "[illegible]"
    LET [illegible] = [illegible].MODIFIE[illegible] + 1
   IF [illegible](ID) [illegible] E.[illegible].TIME(AIRPLANE(ID))
    LET AIRFRAME.TIME = AIRFRAME.TIME + TIME.V - [illegible](ID)
    JUMP AHEAD
   OTHERWISE
    LET AIRFRAME.TIME = AIRFRAME.TIME + TIME.V - E[illegible].TIME(AIRPLANE(ID))
  HERE
  REGARDLESS
    REMOVE AIRPLANE(ID) FROM ACTIVE.FLEET
    FILE AIRPLANE(ID) IN [illegible].RETIRED
```

```
        ADD 1 TO L.VIC.WF.RETIRE
  ''
  '' CANCEL SCHEDULED EVENTS AND DESTROY EVENT NOTICES
  ''
     IF IE1(ID) = "YES"
        LET 1.ITE = A1E(ID)
        CANCEL THE 1.ITE
        DESTROY THE 1.ITE
       IF IE2(ID) = "YES"
        LET 2.ITE = A2E(ID)
        CANCEL THE 2.ITE
        DESTROY THE 2.ITE
        IF IE3(ID) = "YES"
        LET 3.ITE = A3E(ID)
        CANCEL THE 3.ITE
        DESTROY THE 3.ITE
        ALWAYS
       ALWAYS
     ALWAYS
      IF CO.EXISTS(ID) NE "NO"
        LET CORROSION = AC(ID)
       IF CO.EXISTS(ID) = "YES"
        CANCEL THE CORROSION
       ALWAYS
        DESTROY THE CORROSION
        LET CO.EXISTS(ID) = "NO"
      REGARDLESS
    IF 1.CH.EXISTS(ID) NE "NO"
        LET 1.STRENGTH.REDUCTION = A1SR(ID)
       IF 1.CH.EXISTS(ID) = "YES"
        CANCEL THE 1.STRENGTH.REDUCTION
       ALWAYS
        DESTROY THE 1.STRENGTH.REDUCTION
        LET 1.CH.EXISTS(ID) = "NO"
     IF 2.CH.EXISTS(ID) NE "NO"
        LET 2.STRENGTH.REDUCTION = A2SR(ID)
       IF 2.CH.EXISTS(ID) = "YES"
        CANCEL THE 2.STRENGTH.REDUCTION
       ALWAYS
        DESTROY THE 2.STRENGTH.REDUCTION
        LET 2.CH.EXISTS(ID) = "NO"
      IF 3.CH.EXISTS(ID) NE "NO"
        LET 3.STRENGTH.REDUCTION = A3SR(ID)
       IF 3.CH.EXISTS(ID) = "YES"
        CANCEL THE 3.STRENGTH.REDUCTION
       ALWAYS
        DESTROY THE 3.STRENGTH.REDUCTION
        LET 3.CH.EXISTS(ID) = "NO"
      REGARDLESS
     REGARDLESS
    REGARDLESS
      IF INSP.SCH(ID) = "YES"
        CALL CANCEL.SCHEDULED.INSPECTIONS
```

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```
    REGARDLESS
      LET D.LEVEL.INSPECTION = ADL(ID)
      CANCEL THE D.LEVEL.INSPECTION
      DESTROY THE D.LEVEL.INSPECTION
    IF AIL(ID) = "YES"
      LET REACH.FAIL.SAFE.LGT = ARFSL(ID)
      CANCEL THE REACH.FAIL.SAFE.LGT
      DESTROY THE REACH.FAIL.SAFE.LGT
      LET AIL(ID) = "NO"
    REGARDLESS
    IF FSH(ID) = "YES"
      LET FAILURE = AF(ID)
      CANCEL THE FAILURE
      DESTROY THE FAILURE
      LET FSH(ID) = "NO"
    ALWAYS
 ''
      RETURN
      END
```

LOCAL VARIABLES OF THIS ROUTINE

HOLD	INTEGER	WORD 3	I.1	INTEGER	WORD 7
I.2	INTEGER	WORD 8	I.3	INTEGER	WORD 9
IORET	INTEGER	WORD 1	J.1	INTEGER	WORD 10
K.1	INTEGER	WORD 12	K.2	INTEGER	WORD 13
K.3	INTEGER	WORD 14	K.4	INTEGER	WORD 15
L.12	INTEGER	WORD 16	L.4	INTEGER	WORD 4
N.1	INTEGER	WORD 11	R.1	DOUBLE	WORD 5

```
EVENT REPAIR(IDREP)
      DEFINE IDREP AS AN INTEGER VARIABLE
      LET ID = IDREP
  IF TMOD.PENDING(ID) = "YES" OR SMOD.PENDING(ID) = "YES"
   IF TMOD.PENDING(ID) = "YES"
     CALL INSTALL.MODIFICATION
     LET TMOD.PENDING(ID) = "NO"
    IF TIME.V LT ENTRY.TIME(AIRPLANE(ID)) + C7 * 144FL
     LET T.INSPECTION.INCREASE = ATII(ID)
     CANCEL THE T.INSPECTION.INCREASE
     DESTROY THE T.INSPECTION.INCREASE
    REGARDLESS
     RETURN
   OTHERWISE
     CALL INSTALL.MODIFICATION
     LET SMOD.PENDING(ID) = "NO"
     RETURN
  OTHERWISE
 ''
    IF FSH(ID) = "YES"
     LET FAILURE = AF(ID)
     CANCEL THE FAILURE
     DESTROY THE FAILURE
     LET FSH(ID) = "NO"
    ALWAYS
    IF AIL(ID) = "YES"
     LET REACH.FAIL.SAFE.LGT = ARFSL(ID)
     CANCEL THE REACH.FAIL.SAFE.LGT
     DESTROY THE REACH.FAIL.SAFE.LGT
     LET AIL(ID) = "NO"
    REGARDLESS
     LET RST = USAGE.LIFE - TIME.V + ENTRY.TIME(AIRPLANE(ID))
    IF CO.EXISTS(ID) = "YES"
     LET CGRI(ID) = 1.0
     LET CORROSION = AC(ID)
     LET TAC = TIME.A(CORROSION)
     DESTROY THE CORROSION
     LET CO.EXISTS(ID) = "NN"
     CALL PREDICT.CORROSION YIELDING HOURS.TO.CORROSION
    IF HOURS.TO.CORROSION LT RST
     SCHEDULE A CORROSION(ID) AT TIME.V + HOURS.TO.CORROSION
     LET AC(ID) = CORROSION
     LET CORR.TIME(ID) = TIME.V
     LET CO.EXISTS(ID) = "NS"
    REGARDLESS
   REGARDLESS
  IF 1.CR.EXISTS(ID) = "YES"
     LET CCL = CRIT.CRK.LGT
   IF CHG.FREQ.TIME = TIME.V
     JUMP AHEAD
   OTHERWISE
     LET 1.STRENGTH.REDUCTION = AISR(ID)
     LET TA1 = TIME.A(1.STRENGTH.REDUCTION)
```

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```
      LET CL = (TIME.V-TA1) * MSR(ID) * CGRI(ID)
    IF TAC GT TA1
      LET CL = (TAC-TA1)*MSR(ID) + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
    REGARDLESS
    IF CCL LT CL
      LET CL = CCL + ((CL-CCL)/MSR(ID))*MFR(ID)
    REGARDLESS
      LET MAX.CRK = CL
      LET STR.RED = CL
   IF 2.CR.EXISTS(ID) = "YES"
      LET 2.STRENGTH.REDUCTION = A2SR(ID)
      LET TA2 = TIME.A(2.STRENGTH.REDUCTION)
      LET CL = (TIME.V-TA2) * MSR(ID) * CGRI(ID)
    IF TAC GT TA2
      LET CL = (TAC-TA2)*MSR(ID) + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
    REGARDLESS
    IF CCL LT CL
      LET CL = CCL + ((CL-CCL)/MSR(ID))*MFR(ID)
    REGARDLESS
    IF MAX.CRK LT CL
      LET MAX.CRK = CL
    REGARDLESS
      ADD CL TO STR.RED
    IF 3.CR.EXISTS(ID) = "YES"
      LET 3.STRENGTH.REDUCTION = A3SR(ID)
      LET TA3 = TIME.A(3.STRENGTH.REDUCTION)
      LET CL = (TIME.V-TA3) * MSR(ID) * CGRI(ID)
     IF TAC GT TA3
      LET CL = (TAC-TA3)*MSR(ID) + (TIME.V-TAC)*MSR(ID)*CGRI(ID)
     REGARDLESS
     IF CCL LT CL
      LET CL = CCL + ((CL-CCL)/MSR(ID))*MFR(ID)
     REGARDLESS
     IF MAX.CRK LT CL
      LET MAX.CRK = CL
     REGARDLESS
      ADD CL TO STR.RED
    REGARDLESS
   REGARDLESS
      LET FLEET.STR.RED = FLEET.STR.RED + STR.RED
      LET POT.CRK = MAX.CRK + M1.MEAN * AHC(LIL)
    IF POT.CRK GT CCL
      LET POT.CRK = CCL + ((POT.CRK-CCL)/M1.MEAN) * M2.MEAN
    REGARDLESS
    IF MAX.CRK GT CCL
      LET POT.CRK = MAX.CRK + M2.MEAN * AHCR(LIL)
    REGARDLESS
    IF POT.CRK + STR.RED - MAX.CRK GT FSAF.LGT/2.0
      SCHEDULE AN INCREASE.INSPECTION.FREQUENCY NOW
      SCHEDULE AN IMMEDIATE.FLEET.INSPECTION NOW
      LET CHG.FREQ.TIME = TIME.V
      JUMP AHEAD
    REGARDLESS
```

```
     IF FLEET.STR.RED GT (FSAF.LGT/5.0) * (IDCK-1.NUM.OF.RETIRE-2.NUM.OF.CRASH)
       SCHEDULE AN INCREASE.INSPECTION.FREQUENCY NOW
       SCHEDULE AN IMMEDIATE.FLEET.INSPECTION NOW
       LET CHG.FREQ.TIME = TIME.V
      REGARDLESS
      HERE
''
       LET COST.OF.REPAIRS = COST.OF.REPAIRS + FIXIT.COST
    IF THR.MOD.SCH = "NO" AND DEC.ON.MOD.SCH = "NO"
     IF TES.FAILURE = "YES" AND TIME.V LT START.TEST + ACTUAL.AVG.FAT.LIFE /
       TEST.ACCEL.FACT OR TES.FAILURE = "YES" AND TIME.V GT START.TEST +
       ACTUAL.AVG.FAT.LIFE / TEST.ACCEL.FACT + LEAD.TIME OR TES.FAILURE = "NO"
      IF TIME.MODIFIED - BEEN.MODIFIED - 1.NUM.OF.RETIRE - 2.NUM.OF.CRASH LE 0
       SCHEDULE A DECISION.ON.MOD NOW
       LET DEC.ON.MOD.SCH = "YES"
      REGARDLESS
     REGARDLESS
    REGARDLESS
''
       LET AAFL = ACTUAL.AVG.FAT.LIFE
     IF I LE FDCK
       LET AAFL = IAAFL
     REGARDLESS
       CALL FATIGUE.LIFE.SCATTER(AAFL,3) YIELDING FIRST.LIFE, SECOND.LIFE AND
       THIRD.LIFE
       LET 1.STRENGTH.REDUCTION = A1SR(ID)
       LET 2.STRENGTH.REDUCTION = A2SR(ID)
       LET 3.STRENGTH.REDUCTION = A3SR(ID)
       DESTROY THE 1.STRENGTH.REDUCTION
    IF 2.CR.EXISTS(ID) = "YES"
       DESTROY THE 2.STRENGTH.REDUCTION
     IF 3.CR.EXISTS(ID) = "YES"
       DESTROY THE 3.STRENGTH.REDUCTION
       JUMP AHEAD
     OTHERWISE
     IF 3.CR.EXISTS(ID) = "NO"
      IF TIME.A(3.STRENGTH.REDUCTION) - TIME.V LT FIRST.LIFE
       LET THIRD.LIFE = SECOND.LIFE
       LET SECOND.LIFE = FIRST.LIFE
       LET FIRST.LIFE = TIME.A(3.STRENGTH.REDUCTION) - TIME.V
       CANCEL THE 3.STRENGTH.REDUCTION
       DESTROY THE 3.STRENGTH.REDUCTION
       JUMP AHEAD
      ELSE
      IF TIME.A(3.STRENGTH.REDUCTION) - TIME.V LT SECOND.LIFE
       LET THIRD.LIFE = SECOND.LIFE
       LET SECOND.LIFE = TIME.A(3.STRENGTH.REDUCTION) - TIME.V
       CANCEL THE 3.STRENGTH.REDUCTION
       DESTROY THE 3.STRENGTH.REDUCTION
       JUMP AHEAD
      ELSE
       LET THIRD.LIFE = TIME.A(3.STRENGTH.REDUCTION) - TIME.V
       CANCEL THE 3.STRENGTH.REDUCTION
```

```
        DESTROY THE 3.STRENGTH.REDUCTION
        JUMP AHEAD
      OTHERWISE
        LET THIRD.LIFE = USAGE.LIFE
        JUMP AHEAD
    OTHERWISE
    IF 2.CR.EXISTS(ID) = "NS"
     IF 3.CR.EXISTS(ID) = "NS"
      IF TIME.A(3.STRENGTH.REDUCTION).- TIME.V LT FIRST.LIFE
       LET THIRD.LIFE = FIRST.LIFE
       LET SECOND.LIFE = TIME.A(3.STRENGTH.REDUCTION) - TIME.V
       LET FIRST.LIFE = TIME.A(2.STRENGTH.REDUCTION) - TIME.V
       CANCEL THE 2.STRENGTH.REDUCTION
       DESTROY THE 2.STRENGTH.REDUCTION
       CANCEL THE 3.STRENGTH.REDUCTION
       DESTROY THE 3.STRENGTH.REDUCTION
       JUMP AHEAD
      OTHERWISE
      IF TIME.A(2.STRENGTH.REDUCTION) - TIME.V LT FIRST.LIFE
       LET THIRD.LIFE = TIME.A(3.STRENGTH.REDUCTION) - TIME.V
       LET SECOND.LIFE = FIRST.LIFE
       LET FIRST.LIFE = TIME.A(2.STRENGTH.REDUCTION) - TIME.V
       CANCEL THE 2.STRENGTH.REDUCTION
       DESTROY THE 2.STRENGTH.REDUCTION
       CANCEL THE 3.STRENGTH.REDUCTION
       DESTROY THE 3.STRENGTH.REDUCTION
       JUMP AHEAD
      OTHERWISE
       LET SECOND.LIFE = TIME.A(2.STRENGTH.REDUCTION)
       LET THIRD.LIFE = TIME.A(3.STRENGTH.REDUCTION)
       CANCEL THE 2.STRENGTH.REDUCTION
       DESTROY THE 2.STRENGTH.REDUCTION
       CANCEL THE 3.STRENGTH.REDUCTION
       DESTROY THE 3.STRENGTH.REDUCTION
       JUMP AHEAD
     OTHERWISE
     IF TIME.A(2.STRENGTH.REDUCTION) - TIME.V LT FIRST.LIFE
       LET THIRD.LIFE = USAGE.LIFE
       LET SECOND.LIFE = FIRST.LIFE
       LET FIRST.LIFE = TIME.A(2.STRENGTH.REDUCTION)
       CANCEL THE 2.STRENGTH.REDUCTION
       DESTROY THE 2.STRENGTH.REDUCTION
       JUMP AHEAD
     OTHERWISE
       LET SECOND.LIFE = TIME.A(2.STRENGTH.REDUCTION)
       JUMP AHEAD
    OTHERWISE
       LET SECOND.LIFE = USAGE.LIFE
       LET THIRD.LIFE = USAGE.LIFE
     HERE
       LET 1.CR.EXISTS(ID) = "NN"
       LET 2.CR.EXISTS(ID) = "NN"
       LET 3.CR.EXISTS(ID) = "NN"
```

```
IF FIRST.LIFE LT RST OR CO.EXISTS(ID) = "NS" OR SD.SCH(ID) = "YES"
   SCHEDULE A 1.STRENGTH.REDUCTION(ID) AT TIME.V + FIRST.LIFE
   LET A1SR(ID) = 1.STRENGTH.REDUCTION
   LET 1.CR.EXISTS(ID) = "NS"
  IF SECOND.LIFE LT RST OR CO.EXISTS(ID) = "NS" OR SD.SCH(ID) = "YES"
    SCHEDULE A 2.STRENGTH.REDUCTION(ID) AT TIME.V + SECOND.LIFE
    LET A2SR(ID) = 2.STRENGTH.REDUCTION
    LET 2.CR.EXISTS(ID) = "NS"
   IF THIRD.LIFE LT RST OR CO.EXISTS(ID) = "NS" OR SD.SCH(ID) = "YES"
    SCHEDULE A 3.STRENGTH.REDUCTION(ID) AT TIME.V + THIRD.LIFE
    LET A3SR(ID) = 3.STRENGTH.REDUCTION
    LET 3.CR.EXISTS(ID) = "NS"
   REGARDLESS
  REGARDLESS
 REGARDLESS
REGARDLESS
 IF IE1(ID) = "YES"
   LET 1.ITE = A1E(ID)
   LET IE1(ID) = "NO"
   CANCEL THE 1.ITE
   DESTROY THE 1.ITE
  IF IE2(ID) = "YES"
   LET 2.ITE = A2E(ID)
   LET IE2(ID) = "NO"
   CANCEL THE 2.ITE
   DESTROY THE 2.ITE
  IF IE3(ID) = "YES"
   LET 3.ITE = A3E(ID)
   LET IE3(ID) = "NO"
   CANCEL THE 3.ITE
   DESTROY THE 3.ITE
  ALWAYS
 ALWAYS
ALWAYS
IF LTH1 = "YES"
   FOR I = 1 TO TLOAC(LDX)
   DO
 IF ID = TLID(LDX,I)
   SKIP 1 OUTPUT LINE
   PRINT 4 LINES WITH ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)), FIRST.LIFE,
   SECOND.LIFE, THIRD.LIFE AS FOLLOWS
     A/C NO. *** HAS ALL DEFECTS REPAIRED AT ****** FLIGHT HOURS
          1ST CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
          2ND CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
          3RD CRACK INITIATION PROJECTED AT ******* FLIGHT HOURS
   LEAVE
  ELSE
   LOOP
 ALWAYS
''
'' CANCEL SCHEDULED INSPECTIONS ON THIS AIRCRAFT
''
     CALL CANCEL.SCHEDULED.INSPECTIONS
```

```
 262        RETURN
 263        END

                LOCAL VARIABLES OF THIS ROUTINE

 AAFL       DOUBLE     WORD 25     CCL        DOUBLE     WORD  9
 CL         DOUBLE     WORD 13     FIRST.LIFE DOUBLE     WORD 27
 HOURS.TO.C DOUBLE     WORD  7     I.1        INTEGER    WORD 37
 I.2        INTEGER    WORD 38     I.3        INTEGER    WORD 39
 IOREP      INTEGER    WORD  1     J.1        INTEGER    WORD 40
 K.1        INTEGER    WORD 42     K.2        INTEGER    WORD 43
 K.3        INTEGER    WORD 44     K.4        INTEGER    WORD 45
 L.4        INTEGER    WORD 33     MAX.CRK    DOUBLE     WORD 15
 N.1        INTEGER    WORD 41     PIT.CRK    DOUBLE     WORD 23
 R.1        DOUBLE     WORD 35     RST        DOUBLE     WORD  3
 SECOND.LIF DOUBLE     WORD 29     STR.RED    DOUBLE     WORD 17
 TAC        DOUBLE     WORD  5     TA1        DOUBLE     WORD 11
 TA2        DOUBLE     WORD 19     TA3        DOUBLE     WORD 21
 THIRD.LIFE DOUBLE     WORD 31
```

```
EVENT T.INSPECTION.INCREASE(IDTI)
        DEFINE IDTI AS AN INTEGER VARIABLE
        LET ID = IDTI
      IF LTD = 3 OR LFL = 3
        LET C.INTERVAL(ID) = C.INTERVAL(ID) * T.FREQ.CHG
      REGARDLESS
  ''
      IF ID = 4 OR LFL = 4
        LET D.INTERVAL(ID) = D.INTERVAL(ID) * T.FREQ.CHG
      REGARDLESS
        RETURN
        END
```

LOCAL VARIABLES OF THIS ROUTINE

```
IDTI         INTEGER  WORD  1
```

```
EVENT INCREASE.INSPECTION.FREQUENCY
''
'' INCREASES THE FREQUENCY OF THE LOWEST LEVEL INTERNAL AND EXTERNAL INSPECTIONS
''     THESE MAY OR MAY NOT BE THE SAME LEVEL OF INSPECTION
''     THE A-LEVEL AND B-LEVEL FREQUENCIES ARE NEVER CHANGED
''
      LET FLEET.STR.RED = 0.0
 IF ARCD(LIL)*S.FREQ.CHG GE 1ARCD(LIL-1) OR ARCD(LEL)*S.FREQ.CHG GE 1ARCD(LEL-1)
     IF ARCD(LIL)*S.FREQ.CHG GE 1ARCD(LIL-1)
      LET DIFF = ARCD(LIL) - ARCD(LIL) * S.FREQ.CHG
      LET ARCD(LIL) = ARCD(LIL) * S.FREQ.CHG
     ALWAYS
    IF LIL NE LEL
     IF ARCD(LEL)*S.FREQ.CHG GE 1ARCD(LEL-1)
      LET ARCD(LEL) = ARCD(LEL) * S.FREQ.CHG
     ALWAYS
    REGARDLESS
     IF LTHO = "YES"
      SKIP 1 OUTPUT LINE
      PRINT 3 LINES WITH ARCD(3), ARCD(4) AS FOLLOWS
        INSPECTION INTERVAL DECREASE IMPLEMENTED
            C-LEVEL INTERVAL NOW ***** HOURS
            D-LEVEL INTERVAL WAS ***** HOURS
     ALWAYS
      LET CINSL = ARCD(3)
      LET DINSL = ARCD(4)
      LET NICHG = NICHG +1
     IF NICHG GT 30
      JUMP AHEAD
    OTHERWISE
      LET SC(NICHG) = ARCD(3)
      LET SD(NICHG) = ARCD(4)
    HERE
      FOR EVERY AIRCRAFT IN ACTIVE.FLEET
      DO
      LET ID = TAIL.ID
      LET C.INTERVAL(ID) = ARCD(3)
      LET D.INTERVAL(ID) = ARCD(4)
    IF LIL = 4
      LET D.LEVEL.INSPECTION = ADL(ID)
      CANCEL THE D.LEVEL.INSPECTION
     IF TIME.A(D.LEVEL.INSPECTION) - TIME.V LT DIFF
      RESCHEDULE THE D.LEVEL.INSPECTION(ID) NOW
      JUMP AHEAD
     OTHERWISE
      RESCHEDULE THE D.LEVEL.INSPECTION(ID) AT TIME.A(D.LEVEL.INSPECTION) - DIFF
      JUMP AHEAD
    OTHERWISE
''
    IF INSP.SCH(ID) = "YES"
      LET C.LEVEL.INSPECTION = ACL(ID)
      CANCEL THE C.LEVEL.INSPECTION
     IF TIME.A(C.LEVEL.INSPECTION) - TIME.V LT DIFF
```

```
LINE   CACI SIMSCRIPT II.5  RELEASE 8E
          RESCHEDULE THE C.LEVEL.INSPECTION(ID) NOW
           JUMP AHEAD
         OTHERWISE
           RESCHEDULE THE C.LEVEL.INSPECTION(ID) AT TIME.A(C.LEVEL.INSPECTION) - DIFF
        REGARDLESS
         HERE
           LOOP
       ALWAYS
          RETURN
          END
```

LOCAL VARIABLES OF THIS ROUTINE

DIFF	DOUBLE	WORD 1	I.1	INTEGER	WORD 7
I.2	INTEGER	WORD 8	I.3	INTEGER	WORD 9
J.1	INTEGER	WORD 10	K.1	INTEGER	WORD 12
K.2	INTEGER	WORD 13	K.3	INTEGER	WORD 14
K.4	INTEGER	WORD 15	L.1	INTEGER	WORD 3
L.4	INTEGER	WORD 16	M.3	INTEGER	WORD 11
M.1	DOUBLE	WORD 5			

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```
EVENT IMMEDIATE.FLEET.INSPECTION
''
'' THIS EVENT REPRESENTS AN IMMEDIATE FLEET WIDE INSPECTION CAUSED BY FINDING A
''    DEFECT CONSIDERED TOO HAZARDOUS TO DEPEND ON SCHEDULED INSPECTIONS
''
'' THIS EVENT IS ALWAYS PRECEDED BY THE EVENT INCREASE.INSPECTION.FREQUENCY
''
      IF LTH1 = "YES"
       SKIP 1 OUTPUT LINE
       PRINT 1 LINE AS FOLLOWS
         FLEET WIDE SPECIAL INSPECTION PERFORMED
      ALWAYS
       LET CCL = CRIT.CHK.LGT
       LET NSIC = NSIC + 1
       LET FIXIT.COST = S.REPAIR.COST
       FOR EVERY AIRCRAFT IN ACTIVE.FLEET
       DO
       LET LIST = 0.0
       LET ID = TAIL.ID
    IF LTH0 = "YES"
       FOR I = 1 TO NOAC(LDX)
       DO
     IF ID = ILID(LDX,I)
       LET LIST = 1.0
       LEAVE
     ELSE
       LOOP
    ALWAYS
       LET N1 = NS1(ID)
       LET N2 = NS2(ID)
       LET FOUND = 0
       LET TAC = 0.0
''
    IF CO.EXISTS(ID) = "YES"
       LET CORROSION = CC(ID)
       LET TAC = TIME.A(CORROSION)
       LET AREA = C.GROWTH.RATE * CRRF * (TIME.V - TAC)
     IF RANDOM.F(1) LE PODD(.999,.971,.180,AREA)
      IF LIST = 1.0
       SKIP 1 OUTPUT LINE
       PRINT 1 DOUBLE LINE WITH AREA, ID, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS
       FOLLOWS
         CORROSION OF AREA **.** SQ. INCHES DETECTED DURING SPECIAL INSPECTION OF A/C NO. *** AT ****** FLIGHT HOURS
      ALWAYS
       LET SCA = AREA
       LET TSCA = AREA
       LET USCD = USCD + 1
       LET SUSCD = SUSCD + 1
       LET FOUND = 2
     REGARDLESS
    REGARDLESS
''
   IF I.TH.EXISTS(ID) = "YES"
```

```
          LET 1.STRENGTH.REDUCTION = A1SH(ID)
          LET TA1 = TIME.AC1.STRENGTH.REDUCTION)
          LET CL = (TIME.V-TA1) * V1 * CGH1(ID))
        IF TAC GT TA1
          LET CL = (TAC-TA1)*V1 + (TIME.V-TAC)*V1*CGH1(ID)
        REGARDLESS
        IF CL GT CCL
          LET CL = CCL + ((CL-CCL)/V1)*V2
        REGARDLESS
          LET SH = CL
          LET MAX.CRK = CL
  ''
        IF RANDOM.F(1) LE PROB(.996,.971,.102,CL)
         IF LIST = 1.0
          SKIP 1 OUTPUT LINE
          PRINT 1 DOUBLE LINE WITH CL, TC, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS
          FOLLOWS
            CRACK OF LENGTH **.** INCHES DETECTED DURING SPECIAL INSPECTION OF A/C NO. *** AT ****** FLIGHT HOURS
         ALWAYS
          LET SCRK1 = CL
          LET RSCRK = CL
          ADD 1 TO NSCR
          ADD 1 TO NSCR
          LET FOUND = 1
        REGARDLESS
  ''
       IF 2.CR.EXISTS(ID) = "YES"
          LET 2.STRENGTH.REDUCTION = A2SH(ID)
          LET TA2 = TIME.AC2.STRENGTH.REDUCTION)
          LET CL = (TIME.V-TA2) * V1 * CGH1(ID))
        IF TAC GT TA2
          LET CL = (TAC-TA2)*V1 + (TIME.V-TAC)*V1*CGH1(ID)
        REGARDLESS
        IF CL GT CCL
          LET CL = CCL + ((CL-CCL)/V1)*V2
        REGARDLESS
          ADD CL TO SH
        IF MAX.CRK LT CL
          LET MAX.CRK = CL
        REGARDLESS
  ''
        IF RANDOM.F(1) LE PROB(.996,.971,.102,CL)
         IF LIST = 1.0
          SKIP 1 OUTPUT LINE
          PRINT 1 DOUBLE LINE WITH CL, TC, TIME.V-ENTRY.TIME(AIRPLANE(ID)) AS
          FOLLOWS
            CRACK OF LENGTH **.** INCHES DETECTED DURING SPECIAL INSPECTION OF A/C NO. *** AT ****** FLIGHT HOURS
         ALWAYS
          LET SCRK1 = CL
          LET RSCRK = CL
          ADD 1 TO NSCR
          ADD 1 TO RNSCR
          LET FOUND = 1
```

```
    REGARDLESS
''
    IF S.CR.EXISTS(ID) = "YES"
      LET S.STRENGTH.REDUCTION = S3S.(T.)
      LET THIS.LIFE = USAGE.LIFE
      CANCEL THE 2.STRENGTH.REDUCTION
      DESTROY THE 2.STRENGTH.REDUCTION
      LET TAS = TIME.A(S.STRENGTH.REDUCTION)
      LET CL = (TIME.V-TAS) * M1 * CGHI(ID)
     IF TAC GT TAS
      LET CL = (TAC-TAS)*M1 + (TIME.V-TAC)*M1*CGHI(ID)
     REGARDLESS
     IF CL GT CCL
      LET CL = CCL + ((CL-CCL)/M1)*K2
     REGARDLESS
      ADD CL TO SR
     IF MAX.CRK LT CL
      LET MAX.CRK = CL
     REGARDLESS
''
     IF RS(LIST.F(I)) GE R000(.999,.971,.102,CL)
     IF LIST = 1.0
      SKIP 1 OUTPUT LINE
      PRINT 1 DOUBLE LINE WITH CL, ID, TIME.V+ENTRY.TIME(AIRPLANE(ID)) AS
      FOLLOWS
        CRACK OF LENGTH **.** INCHES DETECTED DURING SPECIAL INSPECTION OF A/C NO. *** AT ****** FLIGHT HOURS
     ALWAYS
      LET SCRAL = CL
      LET ...CRK = CL
      ADD 1 TO NSCR
      ADD 1 TO DISCR
      LET FOUND = 1
     REGARDLESS
''
    REGARDLESS
   REGARDLESS
  REGARDLESS
''
       LET STR.RED = SR
     IF FOUND = 1
       FOR I = 1 TO 10
       DO
      IF HT.TIME.ACRFT(I) = ID
       LET MROD(I) = TIME.V
       LEAVE
      ELSE
       LOOP
     REGARDLESS
    IF FOUND GT 0
       SCHEDULE A REPAIR(ID) NOW
     IF TMOD.PENDING(ID) = "NO" AND SMOD.PENDING(ID) = "NO"
       LET POT.CRK = MAX.CRK + M1.MEAN * AHCD(LIL)
      IF POT.CRK GT CCL
```

```
          LET POT.CRK = CCL + ((POT.CRK-CCL)/M1.MEAN) * M2.MEAN
         REGARDLESS
         IF MAX.CRK GT CCL
          LET POT.CRK = MAX.CRK + M2.MEAN * ABCD(LIL)
         REGARDLESS
         IF POT.STR.RED LT POT.CRK + STR.RED - MAX.CRK
          LET POT.STR.RED = POT.CRK + STR.RED - MAX.CRK
         REGARDLESS
        REGARDLESS
       REGARDLESS
          LOOP
  ''
  '' DEFECTS FOUND DURING THIS INSPECTION CAN CAUSE AN ADDITIONAL INCREASE IN THE
  ''     FREQUENCY OF NORMALLY SCHEDULED INSPECTIONS
  ''
        IF POT.STR.RED GT ESAF.LGT/2.0
           SCHEDULE AN INCREASE.INSPECTION.FREQUENCY NOW
        REGARDLESS
  ''
           RETURN
           END
```

LOCAL VARIABLES OF THIS ROUTINE

AREA	DOUBLE	WORD 29	CCL	DOUBLE	WORD 15
CL	DOUBLE	WORD 35	FOUND	DOUBLE	WORD 25
I.1	INTEGER	WORD 5	I.2	INTEGER	WORD 6
I.3	INTEGER	WORD 7	J.1	INTEGER	WORD 8
K.1	INTEGER	WORD 10	K.2	INTEGER	WORD 11
K.3	INTEGER	WORD 12	K.4	INTEGER	WORD 13
L.1	INTEGER	WORD 1	L.10	INTEGER	WORD 31
L.12	INTEGER	WORD 41	L.14	INTEGER	WORD 45
L.16	INTEGER	WORD 51	L.6	INTEGER	WORD 17
LIST	DOUBLE	WORD 19	MAX.CRK	DOUBLE	WORD 39
M1	DOUBLE	WORD 21	M2	DOUBLE	WORD 23
N.1	INTEGER	WORD 9	POT.CRK	DOUBLE	WORD 55
POT.STR.RE	DOUBLE	WORD 57	R.1	DOUBLE	WORD 3
SR	DOUBLE	WORD 37	STR.RED	DOUBLE	WORD 53
TAC	DOUBLE	WORD 27	TA1	DOUBLE	WORD 33
TA2	DOUBLE	WORD 43	TA3	DOUBLE	WORD 49
THIRD.LIFE	DOUBLE	WORD 47			

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```
EVENT DECISION.ON.MOD
''
'' DECISION IS MADE TO IMPLEMENT A STRUCTURAL MODIFICATION WHENEVER
''    RCPH(REPAIR COST PER HOUR) + ICPH(INSPECTION COST PER HOUR)
''    IS GREATER THAN MCPH(MODIFICATION COST PER HOUR)
''
     DEFINE NPDL AS AN INTEGER VARIABLE
     LET DEC.ON.MOD.SCH = "NO"
     LET TOOLING = 1ST.TOOLING
     LET MD.COST = 1ST.MD.COST
   IF PREVIOUSLY.MODIFIED = "YES"
     LET TOOLING = AD.TOOLING
     LET MD.COST = AD.MD.COST
   REGARDLESS
     FOR EVERY AIRCRAFT IN ACTIVE.FLEET
     DO
     LET MREH = ENTRY.TIME + USAGE.LIFE - TIME.V - LEAD.TIME - AHCD(LIL)/2
   IF MREH GT 0.0
     LET POST.MOD.HRS = POST.MOD.HRS + MREH
   REGARDLESS
''
   IF TMOD.PENDING(TAIL.ID) = "NO" AND SMOD.PENDING(TAIL.ID) = "NO"
    IF OCCUR.MOD(TAIL.ID) GT 0.0
     LET ACCUMULATED.HRS = ACCUMULATED.HRS + TIME.V - OCCUR.MOD(TAIL.ID)
     JUMP AHEAD
    OTHERWISE
     LET ACCUMULATED.HRS = ACCUMULATED.HRS + TIME.V - ENTRY.TIME
   HERE
   REGARDLESS
     LOOP
     LET ACCUMULATED.HRS = ACCUMULATED.HRS + AIFFRAVE.TIME
     LET NPDL = TRUNC.F(LEAD.TIME/PRODUCTION.TIME)
   IF NPDL GT SIZE.OF.FLEET - IDCK
     LET NPDL = SIZE.OF.FLEET - IDCK
   REGARDLESS
     LET POST.MOD.HRS = POST.MOD.HRS+NPDL*(USAGE.LIFE-(LEAD.TIME+AHCD(LIL))/2)
     + (SIZE.OF.FLEET - IDCK - NPDL) * USAGE.LIFE
     LET ICPH = CAHCD(LIL) * (1/AHCD(LIL) - 1/1AHCD(LIL)) + CAHCD(LEL) *
     (1/AHCD(LEL) - 1/1AHCD(LEL))
   IF LIL EQ LEL
     LET ICPH = CAHCD(LEL) * (1/AHCD(LEL) - 1/1AHCD(LEL))
   REGARDLESS
   IF POST.MOD.HRS = 0.0
     RETURN
   OTHERWISE
     LET MCPH = (MD.COST*(IDCK+NPDL-1.NUM.OF.RETIRE-2.NUM.OF.CRASH) + TOOLING)/
     POST.MOD.HRS
     LET RCPH = COST.OF.REPAIRS / ACCUMULATED.HRS
   IF RCPH + ICPH GT MCPH
     LET NFIS = (SIZE.OF.FLEET + 1 - TRUNC.F(PRCHG/PRODUCTION.TIME)) *
     2.PRODUCTION.TIME
    IF TIME.V + LEAD.TIME LT BEGIN.PRODUCTION + PRCHG + NFIS + USAGE.LIFE
     SCHEDULE AN IMPLEMENT.MODIFICATION AT TIME.V + LEAD.TIME
```

```
      ALWAYS
       LET TYP.MOD.SCH = "YES"
       LET PREVIOUSLY.MODIFIED = "YES"
      IF TES.FAILURE = "YES" AND TIME.V LE START.TEST + ACTUAL.AVG.FAT.LIFE /
       TEST.ACCEL.FACT
       LET TES.FAILURE = "NO"
       CANCEL THE T.IMPLEMENT.MOD
       DESTROY THE T.IMPLEMENT.MOD
      REGARDLESS
     REGARDLESS
       RETURN
       END
```

LOCAL VARIABLES OF THIS ROUTINE

ACCUMULATE	DOUBLE	WORD 13	ICPH	DOUBLE	WORD 15
L.H	INTEGER	WORD 7	MCPH	DOUBLE	WORD 17
MP.COST	DOUBLE	WORD 5	MREH	DOUBLE	WORD 9
NETS	DOUBLE	WORD 21	NPPL	INTEGER	WORD 1
POST.MOD.H	DOUBLE	WORD 11	RCPH	DOUBLE	WORD 19
TOOLING	DOUBLE	WORD 3			

```
EVENT IMPLEMENT.MODIFICATION
''
'' REPRESENTS DEVELOPMENT OF MODIFICATION BECAUSE OF SERVICE EXPERIENCE
''
      LET NMD = NMD + 1
      LET FPCK = 0
      LET TO.BE.MODIFIED = IPCK
      LET BEEN.MODIFIED = 0
      LET IMP.MOD.SCH = "NO"
      LET ABCD(LFL) = 1ABCD(LFL)
      LET ABCD(LIL) = 1ABCD(LIL)

     IF NICHG GT 30
      JUMP AHEAD
    OTHERWISE
      LET SC(NICHG) = ABCD(5)
      LET SU(NICHG) = ABCD(4)
    HERE
      LET COST.OF.REPAIRS = 0.0
      LET AIRFRAME.TIME = 0.0
    IF MOD.TESTED = "NO"
      LET NMU = MU.B + ((1.0-MU.W)*.15)
      LET NSIG = SIG.B + .05
      CALL REAL.LIFE(NMU,NSIG,PREDICTED.LIFE) YIELDING ACTUAL.AVG.FAT.LIFE
      JUMP AHEAD
    OTHERWISE
      LET ACTUAL.AVG.FAT.LIFE = PREDICTED.LIFE
    HERE
      FOR EVERY AIRCRAFT IN ACTIVE.FLEET
      DO
      LET SMOD.PENDING(TAIL.ID) = "YES"
      LOOP
      RETURN
      END
```

LOCAL VARIABLES OF THIS ROUTINE

```
L.4       INTEGER   WORD  5      NMU        DOUBLE   WORD  1
NSIG      DOUBLE    WORD  3
```

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```
ROUTINE DISPLAY.OUTPUT
     DEFINE RNGE AS AN INTEGER VARIABLE
     START NEW PAGE
     WRITE MODEL(1), MODEL(2) AS S 50, "AIRCRAFT TYPE: ", 2 A 4
     SKIP 2 OUTPUT LINES
     PRINT 1 DOUBLE LINE WITH SIZE.OF.FLEET, USAGE.LIFE AS FOLLOWS
           NUMBER OF AIRCRAFT IN FLEET: *****                        AIRCRAFT SERVICE LIFE: ******* HOURS
     SKIP 1 OUTPUT LINE
     WRITE ELEMENT(1), ELEMENT(2), ELEMENT(3), ELEMENT(4)
     AS S 45, "STRUCTURAL ELEMENT: ", 4 A 4
     START NEW LINE
     SKIP 1 OUTPUT LINE
   IF PREDICTED.LIFE = 0.0
     PRINT 1 DOUBLE LINE WITH IAAFL AS FOLLOWS
  ELEMENT DESIGN FATIGUE TESTED PRIOR TO PRODUCTION                  ACTUAL AVERAGE FATIGUE LIFE: ******* HOURS
     JUMP AHEAD
   ELSE
     PRINT 1 DOUBLE LINE WITH PREDICTED.LIFE, IAAFL AS FOLLOWS
       PREDICTED AVERAGE FATIGUE LIFE: ****** HOURS                ACTUAL AVERAGE FATIGUE LIFE: ******* HOURS
   HERE
     SKIP 2 OUTPUT LINES
     PRINT 1 DOUBLE LINE AS FOLLOWS
                         NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS
     SKIP 1 OUTPUT LINE
   IF NICR GT 0          LET PNICR = NICR          LET PXICR = XICR        ALWAYS
   IF NCOR GT 0          LET PNICO = NICO          LET PXICO = XICO        ALWAYS
   IF NSDM GT 0          LET PNISD = NISD          LET PXISD = XISD        ALWAYS
     PRINT 6 DOUBLE LINES WITH NICR, NCOR, NSDM, OPD, PNICR, PNICO, PNISD,
     PXICR, PXICO, PXISD, MICR, MICO, MISD AS FOLLOWS
                      FIRST CRACK        CORROSION          SERVICE DAMAGE         PROD FILE DEFECTS
                      -----------        ---------          --------------         -----------------
 OCCURRENCES            *****              *****                *****                    *****
 MIN(HRS)              ******             ******               ******                    -----
 MAX(HRS)              ******             ******               ******                    -----
 AVG(HRS)              ******             ******               ******                    -----
     SKIP 2 OUTPUT LINES
     PRINT 1 DOUBLE LINE AS FOLLOWS
                         NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION
     SKIP 1 OUTPUT LINE
   IF NICR(1) GT 0       LET PNACR = NACR          LET PXACR = XACR        ALWAYS
   IF NICR(2) GT 0       LET PNHCR = NHCR          LET PXHCR = XHCR        ALWAYS
   IF NICR(3) GT 0       LET PNECR = NECR          LET PXECR = XECR        ALWAYS
   IF NICR(4) GT 0       LET PNDCR = NDCR          LET PXDCR = XDCR        ALWAYS
   IF NSCR GT 0          LET PNSCR = NSCR          LET PXSCR = XSCR        ALWAYS
     PRINT 6 DOUBLE LINES WITH NICR(1), NICR(2), NICR(3), NICR(4), OSCR, PNACR,
     PNHCR, PNECR, PNDCR, PNSCR, PXACR, PXHCR, PXECR, PXDCR, PXSCR, MACR, MHCR,
     MECR, MDCR, MSCR AS FOLLOWS
                      A-LEVEL            H-LEVEL            E-LEVEL            D-LEVEL           SER LIFE
                      -------            -------            -------            -------           -------
 OCCURRENCES           *****              *****              *****              *****             *****
 MIN(IN)              ***.**             ***.**             ***.**             ***.**            ***.**
 MAX(IN)              ***.**             ***.**             ***.**             ***.**            ***.**
 AVG(IN)              ***.**             ***.**             ***.**             ***.**            ***.**
```

```
      SKIP 2 OUTPUT LINES
      PRINT 1 DOUBLE LINE AS FOLLOWS
                        NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION
      SKIP 1 OUTPUT LINE
    IF DICO(1) GT 0       LET PNACA = NACA          LET PXACA = XACA       ALWAYS
    IF DICO(2) GT 0       LET PNBCA = NBCA          LET PXBCA = XBCA       ALWAYS
    IF DICO(3) GT 0       LET PNCCA = NCCA          LET PXCCA = XCCA       ALWAYS
    IF DICO(4) GT 0       LET PNDCA = NDCA          LET PXDCA = XDCA       ALWAYS
    IF DSCO GT 0          LET PNSCA = NSCA          LET PXSCA = XSCA       ALWAYS
      PRINT 6 DOUBLE LINES WITH DICO(1), DICO(2), DICO(3), DICO(4), DSCO, PNACA,
      PNBCA, PNCCA, PNDCA, PNSCA, PXACA, PXBCA, PXCCA, PXDCA, PXSCA, MACA, MBCA,
      MCCA, MDCA, MSCA AS FOLLOWS
                     A-LEVEL          B-LEVEL          C-LEVEL          D-LEVEL          SPECIAL
                     -------          -------          -------          -------          -------
  OCCURRENCES         *****            *****            *****            *****            *****
  MIN(SQ.IN)         ***.**           ***.**           ***.**           ***.**           ***.**
  MAX(SQ.IN)         ***.**           ***.**           ***.**           ***.**           ***.**
  AVG(SQ.IN)         ***.**           ***.**           ***.**           ***.**           ***.**
     SKIP 1 OUTPUT LINE
     PRINT 1 LINE AS FOLLOWS
  INSPECTION INTERVALS(HRS)
     SKIP 1 OUTPUT LINE
     PRINT 1 DOUBLE LINE WITH IAHCD(1), IAHCD(2), IAHCD(3), IAHCD(4) AS FOLLOWS
  INITIAL             *****            *****            *****            *****
     IF NICHG GT 30     LET NICHG = 30      REGARDLESS
     FOR I = 2 TO NICHG
     DO
     PRINT 1 DOUBLE LINE WITH I, IAHCD(1), IAHCD(2), SC(I), SD(I) AS FOLLOWS
    **                *****            *****            *****            *****
     LOOP
     SKIP 1 OUTPUT LINE
     LET SNSIC = SNSIC + NSIC
     PRINT 1 LINE WITH NSIC AS FOLLOWS
  NUMBER OF SPECIAL INSPECTIONS CONDUCTED: **
     LET SNMD = SNMD + NMD
     PRINT 1 LINE WITH NMD AS FOLLOWS
  NUMBER OF STRUCTURAL MODIFICATIONS: **
     PRINT 1 LINE WITH ACTUAL.AVG.FAT.LIFE AS FOLLOWS
  FINAL ACTUAL AVERAGE MODIFIED FATIGUE LIFE: ******* HOURS
     LET SNSMD = SNSMD + NSMD
     PRINT 1 LINE WITH USMD AS FOLLOWS
  NUMBER OF AIRCRAFT MODIFIED IN SERVICE: *****
     SKIP 1 OUTPUT LINE
     PRINT 1 DOUBLE LINE AS FOLLOWS
                STRUCTURAL FAILURES
     PRINT 1 DOUBLE LINE AS FOLLOWS                          RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH
          AIRCRAFT NO.        FLT. HOURS                           AIRCRAFT NO.        FLT. HOURS
     PRINT 1 DOUBLE LINE AS FOLLOWS
        ------------        ----------                           ------------        ----------
     LET RNGE = MAX.F(NRES,NSFL)
     FOR I = 1 TO RNGE
     DO
    IF NSFL GE I AND NRES GE I
```

```
      WRITE ACID(I), FLTHR(I), APID(I), STIY(I) AS S 21, I 5, S 14, I 6, S 41,
      I 5, S 14, I 6
      JUMP AHEAD
      ELSE
 ''
      IF NRES GE I
       WRITE APID(I), STIY(I) AS S 67, I 5, S 14, I 6
       JUMP AHEAD
      ELSE
       WRITE ACID(I), FLTHR(I) AS S 21, I 5, S 14, I 6
     HERE
       START NEW LINE
       LOOP
       RETURN
       END
```

LOCAL VARIABLES OF THIS ROUTINE

I.1	INTEGER	WORD	5	I.2	INTEGER	WORD	6
I.3	INTEGER	WORD	7	J.1	INTEGER	WORD	8
K.1	INTEGER	WORD	10	K.2	INTEGER	WORD	11
K.3	INTEGER	WORD	12	K.4	INTEGER	WORD	13
L.1	INTEGER	WORD	14	L.11	INTEGER	WORD	31
L.13	INTEGER	WORD	42	L.15	INTEGER	WORD	53
L.17	INTEGER	WORD	54	L.19	INTEGER	WORD	75
L.21	INTEGER	WORD	76	L.26	INTEGER	WORD	77
L.28	INTEGER	WORD	78	L.3	INTEGER	WORD	15
L.5	INTEGER	WORD	16	L.7	INTEGER	WORD	17
L.9	INTEGER	WORD	18	M.1	INTEGER	WORD	9
PNACA	DOUBLE	WORD	55	PNACB	DOUBLE	WORD	33
PNBCA	DOUBLE	WORD	59	PNBCB	DOUBLE	WORD	37
PNCCA	DOUBLE	WORD	63	PNCCB	DOUBLE	WORD	41
PNDCA	DOUBLE	WORD	67	PNDCB	DOUBLE	WORD	45
PNSCA	DOUBLE	WORD	71	PNSCB	DOUBLE	WORD	49
PN1CA	DOUBLE	WORD	23	PN1CB	DOUBLE	WORD	19
PN1SA	DOUBLE	WORD	27	PXACA	DOUBLE	WORD	57
PXACB	DOUBLE	WORD	35	PXBCA	DOUBLE	WORD	61
PXBCB	DOUBLE	WORD	39	PXCCA	DOUBLE	WORD	65
PXCCB	DOUBLE	WORD	43	PXDCA	DOUBLE	WORD	69
PXDCB	DOUBLE	WORD	47	PXSCA	DOUBLE	WORD	73
PXSCB	DOUBLE	WORD	51	PX1CA	DOUBLE	WORD	25
PX1CB	DOUBLE	WORD	21	PX1SA	DOUBLE	WORD	29
R.1	DOUBLE	WORD	3	RNGE	INTEGER	WORD	1

```
ROUTINE SUMMARY
      DEFINE RNGE AS AN INTEGER VARIABLE
      START NEW PAGE
      WRITE MODEL(1), MODEL(2) AS S 50, "AIRCRAFT TYPE: ", 2 A 4
      SKIP 2 OUTPUT LINES
      PRINT 1 DOUBLE LINE WITH SIZE.OF.FLEET, USAGE.LIFE AS FOLLOWS
           NUMBER OF AIRCRAFT IN FLEET: *****                    AIRCRAFT SERVICE LIFE: ******* HOURS
      SKIP 1 OUTPUT LINE
      WRITE SEL1, SEL2, SEL3 AS S 45, "SUMMARY OF STRUCTURAL ELEMENT: ", 2 A 4,
      A 3
      SKIP 2 OUTPUT LINES
      PRINT 1 DOUBLE LINE AS FOLLOWS
                             NUMBER AND TIME TO INITIATION OF AIRCRAFT DEFECTS
      SKIP 1 OUTPUT LINE
   IF GOICR GT 0        LET PSICR = SICR    LET PLICR = LICR          ALWAYS
   IF GOCOR GT 0        LET PSICO = SICO    LET PLICO = LICO          ALWAYS
   IF GOSOM GT 0        LET PSISD = SISD    LET PLISD = LISD          ALWAYS
     PRINT 6 DOUBLE LINES WITH GOICR, GOCOR, GOSOM, GOPD, PSICR, PSICO, PSISD,
     PLICR, PLICO, PLISD, AICR, AICO, AISD AS FOLLOWS
                   FIRST CRACK          CORROSION          SERVICE DAMAGE        PRODUCTION DEFECTS
                   -----------          ---------          --------------        ------------------
    OCCURRENCES       *****               *****                *****                   *****
    MIN(HRS)          ******              ******               ******                  -----
    MAX(HRS)          ******              ******               ******                  -----
    AVG(HRS)          ******              ******               ******                  -----
     SKIP 2 OUTPUT LINES
     PRINT 1 DOUBLE LINE AS FOLLOWS
                      NUMBER AND LENGTH OF CRACKS DETECTED AT EACH LEVEL OF INSPECTION
     SKIP 1 OUTPUT LINE
   IF GOICR(1) GT 0     LET PSACR = SACR    LET PLACR = LACR          ALWAYS
   IF GOICR(2) GT 0     LET PSHCR = SHCR    LET PLHCR = LHCR          ALWAYS
   IF GOICR(3) GT 0     LET PSCCR = SCCR    LET PLCCR = LCCR          ALWAYS
   IF GOICR(4) GT 0     LET PSDCR = SDCR    LET PLDCR = LDCR          ALWAYS
   IF GOSCR GT 0        LET PSSCR = SSCR    LET PLSCR = LSCR          ALWAYS
     PRINT 6 DOUBLE LINES WITH GOICR(1), GOICR(2), GOICR(3), GOICR(4), GOSCR,
     PSACR, PSHCR, PSCCR, PSDCR, PSSCR, PLACR, PLHCR, PLCCR, PLDCR, PLSCR,
     AACR, AHCR, ACCR, ADCR, ASCR AS FOLLOWS
                   A-LEVEL         H-LEVEL         C-LEVEL         D-LEVEL         SPECIAL
                   -------         -------         -------         -------         -------
    OCCURRENCES     *****           *****           *****           *****           *****
    MIN(IN)        ***.**          ***.**          ***.**          ***.**          ***.**
    MAX(IN)        ***.**          ***.**          ***.**          ***.**          ***.**
    AVG(IN)        ***.**          ***.**          ***.**          ***.**          ***.**
     SKIP 2 OUTPUT LINES
     PRINT 1 DOUBLE LINE AS FOLLOWS
                  NUMBER AND AREA OF CORROSION DEFECTS DETECTED AT EACH LEVEL OF INSPECTION
     SKIP 1 OUTPUT LINE
   IF GOICO(1) GT 0     LET PSACA = SACA    LET PLACA = LACA          ALWAYS
   IF GOICO(2) GT 0     LET PSHCA = SHCA    LET PLHCA = LHCA          ALWAYS
   IF GOICO(3) GT 0     LET PSCCA = SCCA    LET PLCCA = LCCA          ALWAYS
   IF GOICO(4) GT 0     LET PSDCA = SDCA    LET PLDCA = LDCA          ALWAYS
   IF GOSCO GT 0        LET PSSCA = SSCA    LET PLSCA = LSCA          ALWAYS
     PRINT 6 DOUBLE LINES WITH GOICO(1), GOICO(2), GOICO(3), GOICO(4), GOSCO,
```

```
      PSACA, PSHCA, PSCCA, PSDCA, PSSCA, PLACA, PLBCA, PLCCA, PLDCA, PLSCA,
        AACA, AHCA, ACCA, ADCA, ASCA AS FOLLOWS
                          A-LEVEL        B-LEVEL        C-LEVEL        D-LEVEL        SPECIAL
                          -------        -------        -------        -------        -------
  OCCURRENCES              *****          *****          *****          *****          *****
  MIN(SQ.IN)              ***.**         ***.**         ***.**         ***.**         ***.**
  MAX(SQ.IN)              ***.**         ***.**         ***.**         ***.**         ***.**
  AVG(SQ.IN)              ***.**         ***.**         ***.**         ***.**         ***.**
            SKIP 1 OUTPUT LINE
        PRINT 1 LINE AS FOLLOWS
  INSPECTION INTERVALS(HRS)
        PRINT 1 DOUBLE LINE WITH IABCD(1), IABCD(2), IABCD(3), IABCD(4) AS FOLLOWS
  INITIAL                  *****          *****          *****          *****
        PRINT 1 DOUBLE LINE WITH IABCD(1), IABCD(2), ECINS, NDINS AS FOLLOWS
  SHORTEST                 *****          *****          *****          *****
        PRINT 1 DOUBLE LINE WITH IABCD(1), IABCD(2), XCINS, XDINS AS FOLLOWS
  LONGEST                  *****          *****          *****          *****
        SKIP 1 OUTPUT LINE
        PRINT 1 LINE WITH SNSIC AS FOLLOWS
  NUMBER OF SPECIAL INSPECTIONS CONDUCTED: ***
        PRINT 1 LINE WITH SNMD AS FOLLOWS
  NUMBER OF STRUCTURAL MODIFICATIONS: ***
        PRINT 1 LINE WITH SNSMD AS FOLLOWS
  NUMBER OF AIRCRAFT MODIFIED IN SERVICE: *****
        SKIP 1 OUTPUT LINE
        PRINT 1 DOUBLE LINE AS FOLLOWS
                STRUCTURAL FAILURES                        RESIDUAL STRENGTH EQUALS FAIL-SAFE STRENGTH
        PRINT 1 DOUBLE LINE AS FOLLOWS
  AIRCRAFT NO.      FLT. HOURS        STA. NO.             AIRCRAFT NO.      FLT. HOURS      STA. NO.
        PRINT 1 DOUBLE LINE AS FOLLOWS
  ------------      ----------        --------             ------------      ----------      --------
        LET RNGE = MAX.F(SNRES,SNSFL)
        FOR I = 1 TO RNGE
        DO
      IF SNSFL GE I AND SNRES GE I
        WRITE SACID(I), SFLTHR(I), SSTAN(I), SAPID(I), SSTIM(I), SFLNR(I) AS S 13,
        I 5, S 14, I 6, S 12, A 4, S 24, I 5, S 14, I 6, S 13, A 4
        JUMP AHEAD
       ELSE
  ''
       IF SNRES GE I
        WRITE SAPID(I), SSTIM(I), SFLNR(I) AS S 76, I 5, S 14, I 6, S 13, A 4
        JUMP AHEAD
       ELSE
        WRITE SACID(I), SFLTHR(I), SSTAN(I) AS S 13, I 5, S 14, I 6, S 12, A 4
      HERE
        START NEW LINE
        LOOP
        RETURN
        END
```

LOCAL VARIABLES OF THIS ROUTINE

I.1	INTEGER	WORD 5	I.2	INTEGER	WORD 6
I.3	INTEGER	WORD 7	J.1	INTEGER	WORD 8
K.1	INTEGER	WORD 10	K.2	INTEGER	WORD 11
K.3	INTEGER	WORD 12	K.4	INTEGER	WORD 13
L.1	INTEGER	WORD 14	L.11	INTEGER	WORD 52
L.13	INTEGER	WORD 53	L.15	INTEGER	WORD 54
L.17	INTEGER	WORD 75	L.19	INTEGER	WORD 76
L.21	INTEGER	WORD 77	L.3	INTEGER	WORD 15
L.5	INTEGER	WORD 16	L.7	INTEGER	WORD 17
L.9	INTEGER	WORD 31	M.1	INTEGER	WORD 9
PLACA	DOUBLE	WORD 57	PLACB	DOUBLE	WORD 35
PLBCA	DOUBLE	WORD 61	PLBCB	DOUBLE	WORD 39
PLCCA	DOUBLE	WORD 65	PLCCB	DOUBLE	WORD 43
PLDCA	DOUBLE	WORD 69	PLDCB	DOUBLE	WORD 47
PLSCA	DOUBLE	WORD 73	PLSCB	DOUBLE	WORD 51
PL1CO	DOUBLE	WORD 25	PL1CB	DOUBLE	WORD 21
PL1SO	DOUBLE	WORD 29	PSACA	DOUBLE	WORD 55
PSACB	DOUBLE	WORD 33	PSBCA	DOUBLE	WORD 59
PSBCB	DOUBLE	WORD 37	PSCCA	DOUBLE	WORD 63
PSCCB	DOUBLE	WORD 41	PSDCA	DOUBLE	WORD 67
PSDCB	DOUBLE	WORD 45	PSSCA	DOUBLE	WORD 71
PSSCB	DOUBLE	WORD 49	PS1CO	DOUBLE	WORD 23
PS1CB	DOUBLE	WORD 19	PS1SO	DOUBLE	WORD 27
R.1	DOUBLE	WORD 3	RNGE	INTEGER	WORD 1