Federal Aviation Agency

AC NO: AC No: 120-17

ADVISORY CIRCULAR

Change 1 4/7

HANDBOOK FOR MAINTENANCE CONTROL BY RELIABILITY METHODS

Federal Aviation Agency

ADVISORY CIRCULAR CHANGE

AC NO:	AC 120-17 CH 1 AIR CARRIER AND COMMERCIAL OPERATIONS
EFFECTIVE:	6/24/66

SUBJECT: HANDBOOK FOR MAINTENANCE CONTROL BY RELIABILITY METHODS

1. PURPOSE. This advisory circular transmits new material to the subject handbook.

2. PRINCIPAL CHANGES. Exhibit D is added which outlines a typical reliability program for propulsion systems that may be structured from the guidelines contained in this handbook.

PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
-	-	17 thru 27 (and 28)	6/24/66

C. W. Walker
Director
Flight Standards Service

TABLE OF CONTENTS

HANDBOOK FOR MAINTENANCE CONTROL BY RELIABILITY METHODS

Federal Aviation Agency

AC NO: AC 120-17
AIR CARRIER AND COMMERCIAL OPERATIONS
EFFECTIVE: 12/31/64

ADVISORY CIRCULAR

SUBJECT: HANDBOOK FOR MAINTENANCE CONTROL BY RELIABILITY METHODS

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1. PURPOSE. This handbook provides information and guidance material which may be used to design or develop maintenance reliability programs which include a standard for determining time limitations.

2. REFERENCES. This document is appropriate for guidance of certificate holders who operate aircraft in accordance with Federal Aviation Regulations Parts 121 (CAR Parts 40, 41 and 42) and 127.

3. HOW TO GET THE HANDBOOK.

   a. Order copies of this publication from:

      Federal Aviation Agency
      Distribution Section, HQ-438
      Washington, D.C. 20553

   b. Identify the publication in your order as:

      FAA AC No. 120-17
      Handbook for Maintenance Control by Reliability Methods
      Dated 12/31/64

   c. This publication will be furnished free of charge.

4. CHANGES TO THE HANDBOOK. Revised pages to this Advisory Circular (AC No: 120-17) will be transmitted by Advisory Circular Changes. If you order the basic book, we will put you on the mailing list to receive Changes.

for George S. Moore
Director
Flight Standards Service

CHAPTER 1. INTRODUCTION

1. PURPOSE. This handbook provides information and guidance material which may be used to design or develop maintenance reliability programs which include a standard for determining time limitations. Maintenance reliability programs may be designed for all aircraft systems and components or portions thereof as may be determined by the certificate holder. Systems and components now contained in the Propulsion System Reliability Program may be considered for inclusion in separate programs under the criteria herein established. The concept is appropriate to the small as well as the large operator.

   The object of the acceptance of this method of maintenance program management is not merely the release of these controls to the operator, although that is one of the necessary elements. It is primarily a plan to more effectively implement Federal Aviation Regulations 121.25 (CAR Part 40.19(e) and similar provisions of Part 41 and 42) and 127.25 which relate to the inclusion of "time limitation for overhauls, inspections, and checks of airframes, engines, propellers and appliances or standards by which such time limitations shall be determined." It is, in addition, a method to realistically and responsively relate operating experience to the maintenance controls established. The controls ordinarily are:

   a. Established overhaul time.

   b. Inspection time.

   c. Functional checks.

   d. Other methods, or combination of methods, having demonstrable capability of detecting and measuring aircraft system or component deterioration or failure.

2. HISTORY. In order to explore the possibility of this approach for the control of maintenance scheduling and to provide a means of measuring aircraft system and component reliability, the Federal Aviation Agency invited several operators to participate in aircraft reliability studies. The purpose of these studies was to acquire, through practical application, information that could be used to amend and refine our present system of monitoring operator's maintenance quality and yet permit the operator maximum flexibility in establishing its own maintenance controls within the bounds of generally accepted reliability philosophies.

   The first discussions with the industry on the basic concepts of this approach were held in late 1962 and early 1963. Following this, meetings were held by an FAA/Industry Committee from which the first proposals developed. When formalized and presented, the resulting programs were

approved by the FAA for operation as 6-month studies. They were later extended for another six months to provide additional data for evaluation of their effectiveness and appropriateness. As a result of these evaluations, it was determined that practical reliability programs could be developed that would assure a high level of aircraft system and component reliability.

CHANGE

AC NO: 120-17 CHG 2
DATE: 5/6/68

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: HANDBOOK FOR MAINTENANCE CONTROL BY RELIABILITY METHODS

1. PURPOSE. This advisory circular change transmits revised material to the subject handbook.

2. PRINCIPAL CHANGE. This material revises instructions for handling the approval of maintenance reliability programs.

PAGE CONTROL CHART

Remove Page	Dated	Insert Page	Dated
Page 3 (and 4)	12/31/64	Page 3 (and 4)	5/6/68

James F. Rudolph
Director
Flight Standards Service

Initiated by: FS-320

CHAPTER 2. APPLICATION

3. GENERAL. Application for approval of reliability programs will be accepted by the air carrier district office having responsibility for * the operating certificate involved. Program approval, or disapproval, will be accomplished by the air carrier district office in coordination with the area or regional office. Should an air carrier or commercial operator propose a reliability program which significantly deviates from this advisory circular, it will be forwarded through channels to the Washington office for review and decision. Each approved program will be incorporated in the operator's maintenance program by approval of Operations Specifications - Aircraft Maintenance. Sample Operations Specifications pages for this purpose are shown in Exhibits B and C. *

An operator's application for approval should be accompanied by a document describing program operation. The document should contain the essentials of system operation as outlined in the following chapters and any other instructions required because of the particular program or character of maintenance organization involved. It should describe the system of data collection used, the methods of data analysis and its application to the maintenance controls employed (overhaul times, inspection schedules, etc.), the method of reliability program and instruction amendment, and the procedures used in establishment of performance standards. Samples of the program status displays mentioned in Chapter 4 should be included.

It is intended that the specific needs of each air carrier, in terms of operating philosophy, recordkeeping practices, etc., be reflected in their programs. The extent of statistical and data processing sophistication required for program operation is entirely dependent on the character of the individual program. Programs may be simple or complex dependent on the size of the operator and numerous other factors. The smaller as well as the larger operator may develop reliability oriented programs to meet its own specific needs. For this reason, only the broadest of program parameters are herein prescribed. General reliability program operation is graphically presented in Exhibit A.

CHAPTER 3. RELIABILITY PROGRAM ELEMENTS

4. DATA COLLECTION SYSTEM. The operator should describe its system of collection of information relating to aircraft system and/or component reliability. It should include a description of the flow of information. It should identify the sources, describe the steps from source to analysis, and define in detail the information and processes mentioned generally in the preceding chapters. Responsibilities within the operator's organization should be established for each step of data development and movement.

The type of reliability source information may be:

a. Unscheduled removals.

b. Confirmed failures.

c. Deficiencies observed and corrected but not otherwise reportable.

d. Pilot reports.

e. Sampling inspection.

f. Functional checks.

g. Shop findings.

h. Bench checks.

i. Mechanical Reliability Reports.

j. Mechanical Interruption Summary.

k. Other sources.

It is not implied that all of the above be necessarily used in the measurement of experienced reliability or in the establishment of performance standards subsequently discussed. Logical array and availability of this information, however, would provide a breadth of operating history of value to the operator in interpretation of its success or failure in meeting its established goals.

The collection of information directly related to the levels of performance established as mentioned in paragraph 4, which follows, must be emphasized since this represents program accomplishment. A comparison of program accomplishment with the established standards is the measure of success of the reliability program.

5. DATA ANALYSIS METHODS AND APPLICATION TO MAINTENANCE PROGRAM. The operator should describe its system of data analysis and its application to maintenance program controls. The effects on overhaul time, content of inspection and/or overhaul, or other maintenance controls and how necessary changes are implemented should be fully described. A description of the types of action appropriate to the circumstances revealed by the trend and the level of reliability experienced should be included. This is the central core of maintenance control by reliability measurement. It is the element that relates operating experience to maintenance control requirements. Statistical techniques used in arriving at reliability measurements presented in support of maintenance control actions should be described. Appropriate action might be:

   a. Actuarial or engineering studies employed to determine need for maintenance program changes.

   b. Actual maintenance program changes involving inspection frequency and content, functional checks, overhaul limits and times.

   c. Aircraft, aircraft system or component modification or repair.

   d. Other actions peculiar to the condition that prevails.

   Changes to maintenance controls may be made only when such action is approved by at least two separate organizational segments of the operator, one of which exercises inspection or quality control responsibility for the operator or has been specifically delegated to act as program monitor.

6. AMENDMENT TO THE OPERATOR'S RELIABILITY PROGRAM INSTRUCTIONS. A procedure for implementing changes in the certificate holder's program should exist and be described in sufficient detail to identify and isolate those areas which require the approval of the Administrator. The areas requiring approval include any changes in the maintenance reliability program and standards which involve:

   a. Reliability measurements.

   b. Established performance standards.

   c. Instructions relating to development of these measurements and standards.

   d. Data collection system.

   e. Data analysis methods and application to maintenance program.

CHAPTER 4. PROGRAM STATUS DISPLAYS AND DEFINITIONS

8. PROGRAM STATUS DISPLAYS. The operator should develop monthly displays covering the operating experience for the previous period, including details of corrective action taken or planned when an established standard is not met. The displays should also summarize operating experience for at least the last three months.

   The operator should make all such displays and supporting information available for examination by representatives of the Administrator. On request, the operator should furnish the Administrator data derived from its displays.

   All systems and components covered should be identified by a suitable numerical system and subsystem code. This code should be identical to the identification code currently in use by the major portion of the air carrier and commercial operator industry.

   Displays should cover:

   a. Aircraft system and/or component reliability numerically expressed as the number of reported failures per 1000 aircraft hours or other appropriate denominator.

   b. Aircraft system and/or component reliability numerically expressed as the number of nonroutine removals per 1000 aircraft hours or other appropriate denominator.

   c. Aircraft system and/or component reliability numerically expressed as the number of confirmed failures per 1000 aircraft hours or other appropriate denominator.

   d. Graphic presentation of operating experience shown in paragraph 8c above in relation to the level of performance established.

   Changes made or planned in the maintenance program, as authorized or required by the reliability program control document, should be made a matter of record.

9. DEFINITIONS FOR THE PURPOSE OF THESE PROGRAMS. Each reliability program document should define the significant terms used in that program. The definitions should include, but not be limited to:

   a. System failure.

   b. Component failure.

   c. Functional check.

   d. Unscheduled removal.

   e. All other terms basic to the particular program.

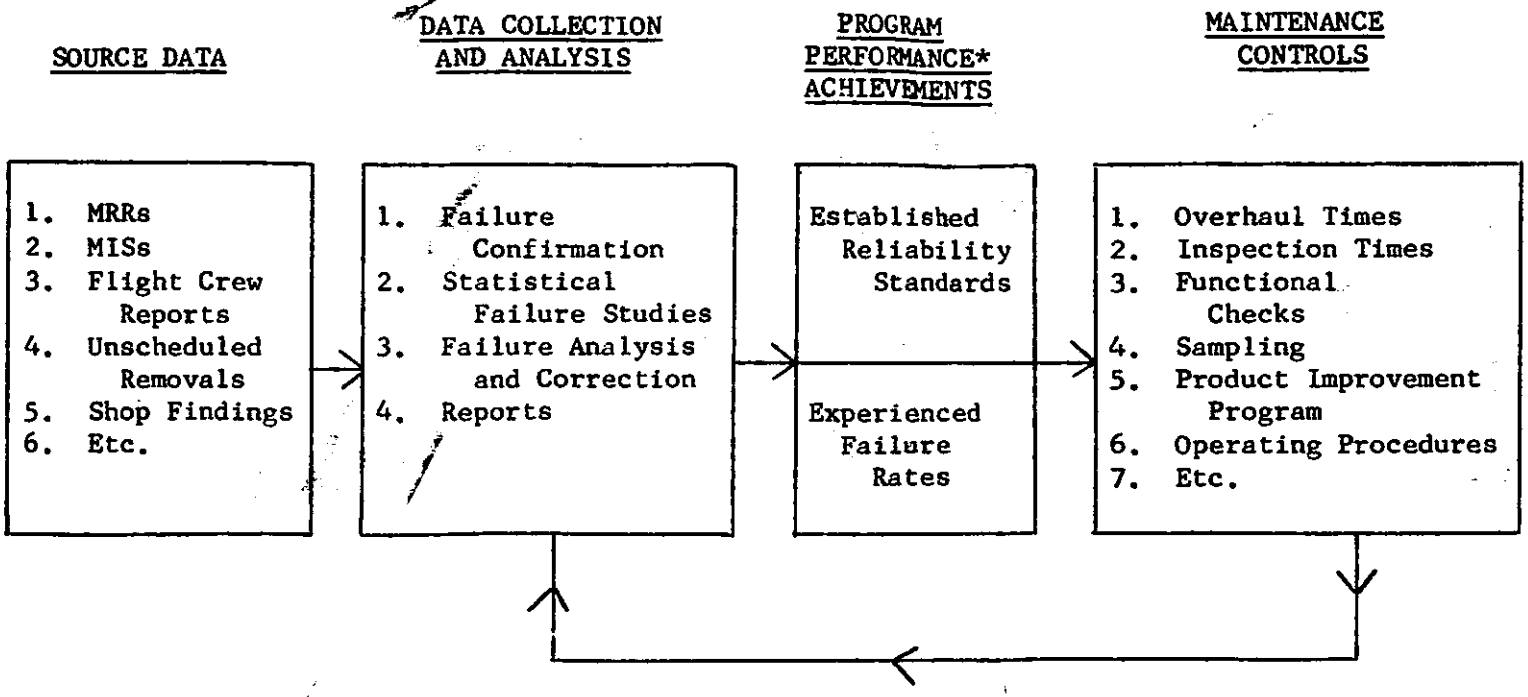
CHAPTER 5. PROGRAM APPROVAL

10. OPERATIONS SPECIFICATIONS. The certificate holder should submit its maintenance reliability program and standard for determining time limitations on Operations Specifications, Aircraft Maintenance. It is not necessary to type up the entire document in the Operations Specifications. The certificate holder may identify the document and refer to it in the Operations Specifications by proper identification. (A typical Operations Specification page is shown in Exhibit B.)

    In a manner consistent with existing Operations Specifications format, the certificate holder should identify the aircraft system and/or components that are controlled by a maintenance reliability program and standard for determining time limitations. This identification may be made by an asterisk (*) or similar notation with appropriate explanation as shown in Exhibit C.

EXHIBIT A

RELIABILITY PROGRAM OPERATION



*Established reliability standards (based on operating history and the airworthiness significance of aircraft system or component under consideration) as compared to experienced failure rates realized in program operations.

EXHIBIT B. TYPICAL OPERATIONS SPECIFICATIONS MAINTENANCE PREFACE PAGE AUTHORIZING RELIABILITY PROGRAM

UNITED STATES OF AMERICA
FEDERAL AVIATION AGENCY
WASHINGTON

Form Approved,
Budget Bureau No. 04-R078.

OPERATIONS SPECIFICATIONS

AIRCRAFT MAINTENANCE
AIRCRAFT SYSTEMS AND COMPONENTS RELIABILITY PROGRAM

_____ is authorized to utilize the provisions of a maintenance reliability program which contains the standards for determining time limitations. This program is described and standards established in _____ document _____.

Effective date _____

Form FAA-1011 (5-57)

EXHIBIT C. TYPICAL OPERATIONS SPECIFICATIONS MAINTENANCE PAGE IDENTIFYING ITEMS CONTROLLED BY RELIABILITY PROGRAM

UNITED STATES OF AMERICA
FEDERAL AVIATION AGENCY
WASHINGTON

Form Approved
Budget Bureau No. 04-R075.

OPERATIONS SPECIFICATIONS

MARTIN 202/404

	OVERHAUL PERIOD	INSPECTION & CHECK PERIOD
Air Conditioning, Chapter 21	12000	
Actuators, valves	*	
Blowers	2000	
Heaters	2000	
Ignitions units	*	
Compressor	2000	
Autopilot, Chapter 22	12000	
Electric, Chapter 23	*	
Equipment & Furnishings, Chapter 25	12000	
Fuel, Chapter 28	*	
Pump, fuel boost	2000	

*Maintenance schedule controlled by

_____ Document

_____.

Effective date _____

Form FAA-1014 (5-47)

EXHIBIT D. TYPICAL PROPULSION SYSTEM RELIABILITY CONTROL PROGRAM

FOREWORD. This program is typical of propulsion system reliability programs which may be structured from the guidelines provided by Advisory Circular AC 120-17. A substantial number of operators now employ this program or programs which incorporate many of the features outlined below. In addition to the control provisions of this program, it may also be used to substantiate revisions to time limitations for propulsion systems.

1. PROPULSION SYSTEM RELIABILITY

a. A numerical reliability index is calculated on a monthly basis and is used to indicate the level of propulsion system reliability. The index, when compared with an alert value, serves as a "flag" to indicate the effectiveness of maintenance procedures and the need for corrective action. Data is collected which shows the cause for shutdowns and is used to pinpoint areas which require corrective action. The reliability index is determined by the number of propulsion system shutdowns, in flight, per 1000-engine operating hours' time in service and is calculated by the following formula:

$$\frac{SD \times 1000}{EH}$$

Where SD = number of shutdowns experienced during the three preceding consecutive calendar months.

EH = total engine hours' time in service operated during the three preceding consecutive calendar months.

b. Typical alert values for individual airframe/engine combinations are:

AIRFRAME/ENGINE	ALERT VALUE
Martin 202 - P&W R-2800	.30
Martin 404 - P&W R-2800	.30
C-46 - P&W R-2800	.30
B-707 - P&W JT3C-6, JT4 & JT3D	.30
B-720 - P&W JT3C-7 & JT3D	.30
B-727 - P&W JT8D-1	.30
BAC 1-11 - RR Spey	.30
DC-9 - P&W JT8D	.30
DC-8 - P&W JT3C-6, JT4A & JT3D	.30
DC-3 - R-1820 & 1830	.30
CV-880 - GE CJ805-3	.30
CV-990 - GE CJ805-23	.30
Viscount - Rolls-Royce Dart 525	.30
Caravelle - Rolls-Royce Avon	.30
F-27 - Rolls-Royce Dart 511	.40

AW-650 - Rolls-Royce Dart 526	.40
CV-240, 340 & 440 - P&W R-2800	.40
CL-44 - Rolls-Royce Tyne	.40
DC-6, 6A & 6B - P&W R-2800	.40
DC-4 - P&W R-2000	.50
L-188 - Allison 501-D13	.50
CV-580 - Allison 501-D13	.50
L-049 & 149 - Wright C18BA	.50
L-749 - Wright C18BD	.50
L-1049 - Wright C18CB	.50
DC-7, 7B & 7C - Wright TC-18	.80
L-1049C, G & H - Wright TC-18	.80
L-1649 - Wright TC-18	.80
S-6IL/N - GE CT58	See note under c
V-107 - GE CT58	" " " "

c. For purposes of this program, an in-flight shutdown, including propeller feathering, is a shutdown of an aircraft engine by intentional or unintentional action occurring when an aircraft is in flight, except those engine shutdowns which are premeditated for training or test purposes. Failure of an engine to deliver its intended power to the drive system of a rotary wing aircraft during flight is also termed an in-flight shutdown.

NOTE: An in-flight shutdown of a propulsion system that involves aircraft structural damage, fire, generated projectiles, or any loss of engine control is a critical shutdown. All in-flight shutdowns of an engine on a rotary wing aircraft are critical shutdowns. Immediate action should be initiated to determine the cause of a critical shutdown and corrective action taken to preclude the possibility of recurring shutdowns from the same cause.

2. SUGGESTED DATA COLLECTION METHODS

a. Data for use by the operator in controlling propulsion system reliability should be collected on a monthly basis in three general areas:

(1) Shutdown rate data should show for each specific airframe/engine combination operated, the total engine hours' time in service accumulated, number of propulsion system in-flight shutdowns experienced, and the reliability index for the preceding three consecutive calendar months.

(2) Cause for shutdown data should show, for each airframe/engine combination operated, the prime cause for each in-flight shutdown experienced during the preceding calendar month. The data should include the part, component, accessory, maintenance, or operational practice which caused the malfunction or failure to occur.

(3) Corrective action data should be assembled when the reliability index exceeds the applicable alert index during any particular month. The data should include corrective programs which outline the action initiated to improve propulsion system reliability. These programs should include details such as the dates or times when the program is to begin and end, revised inspection frequencies or procedures, fleet campaigns, additional maintenance/flight personnel training, improved parts design by manufacturers, and reduction of overhaul times, etc. Suggested formats for data collection are provided in paragraph 4.

3. REVISION OF OVERHAUL TIME LIMITATIONS

a. The procedures and data used in measuring propulsion system reliability may be used to substantiate revisions to overhaul time limitations. The data will serve to establish the existence of satisfactory service experience at the current TBO level and to indicate that no condition exists that would become critical at the proposed overhaul period.

b. A representative number of units (below), which have operated to within 100 hours of the currently approved time limitations, should be disassembled and examined to determine the condition and the potential of such units to operate to the proposed overhaul period:

TABLE A

Number of Operating Units Engine/Components/Accessories	Representative Number of Units for Disassembly Inspection
1 - 4	1
5 - 9	2
10 - 21	3
22 - 61	4
62 - 100	5
101 and above	6

c. Table B provides maximum increment of overhaul time increases for engine and other propulsion system components, except as noted:

TABLE B

Components and Associated Accessories	Time Increases
Helicopter Rotors - Blades - Transmissions - Drives - Gearboxes	100 Hours
Engines - Reciprocating	100 Hours
Engine - Turbine	200 Hours
Propellers	400 Hours

NOTE 1: When an accessory, appurtenance, or component part has an overhaul time established as a multiple of its associated component, it may be increased by the amount of time necessary to retain the multiple factor.

NOTE 2: When the overhaul program for components (excluding propellers and helicopter rotors - blades - transmissions - drives - gearboxes) is established on a sectionalized overhaul basis, a section, part, accessory, or appurtenance of such component may be increased in overhaul time to an amount not to exceed twice the maximum increase specified for its associated component.

4. SUGGESTED FORMAT FOR COLLECTING DATA. Shown below is a suggested format for collecting the data described in paragraph 2:

a. Shutdown Rate Data (Figure 1). In compiling this data, the information entered on the line entitled "Airframe/Engine Combination" should include the make and model designation of the aircraft and the make and model designation of the engine, e.g., B720-B JT3D or DC7-C TC-18. The time entered on the next line may be rounded off to whole hours. The figures to be entered on the line "Reliability Index" should be carried to two decimal places.

b. Cause for In-flight Shutdown Data (Figure 2). The items shown on this form are considered to be the minimum information desired. Unlike the form shown in Figure 1, this form lists the shutdowns for only one month.

(1) The first column provides spaces for numerical numbering and for coding the item. Shown on pages 21, 22, 23, and 24 is a coding method that may be used:

SYSTEMS CODES

Turbine/Turboprop Engines

24 ELECTRICAL POWER

- -10 Generator Drive
- -11 Indicating
- -12 Connectors
- -20 AC Generation
- -21 Inverters
- -22 Gen/Alternators
- -23 Indicators
- -30 DC Generation
- -31 Gen/Alternators
- -32 Transformers

26 FIRE PROTECTION

- -10 Detection
- -11 Sensing Element
- -12 Indicators

61 PROPELLERS

- -10 Propeller Assembly
- -11 Slip Ring
- -12 Regulator
- -13 Blades
- -20 Controlling
- -21 Governor
- -22 Synchronizer - Phase
- -23 NTS Valve
- -30 Braking
- -31 Brake Mechanism
- -40 Indicating
- -41 Lights
- -42 Switches

71 POWERPLANT GENERAL

- -10 Cowling
- -11 Ring Cowls
- -12 Accessory Cowls
- -13 Cowl Flaps
- -20 Mounts
- -30 Fireseals
- -40 Attach Fittings

72 ENGINE

- -10 Reduction Gear & Shaft Section
- -11 Reduction Gears
- -12 Accessory Drives
- -13 Idler Gear
- -20 Air Inlet Section
- -21 Guide Vanes
- -22 Shrouds
- -23 Cases
- -30 Compressor Section
- -31 Vanes
- -32 Rotors
- -33 Diffusers
- -40 Combustion Section
- -41 Burner Cans
- -42 Cases
- -50 Turbine Section
- -51 Turbine Rotors
- -52 Bearings
- -60 Accessory Drives
- -61 Gears
- -62 Seals
- -63 Pumps
- -70 Bypass Section

73 ENGINE FUEL & CONTROL

-10 Distribution
-11 Pumps
-12 Temperature Regulator
-13 Nozzles

-20 Controlling
-21 Main Fuel Control

-30 Indicating
-31 Transmitter
-32 Indicator

74 IGNITION

-10 Electrical Power Supply

-20 Distribution

-30 Switching

75 AIR

-10 Engine Anti-Icing
-11 Bleed Valves

-20 Accessory Cooling

-30 Compressor Control

-40 Indicating

76 ENGINE CONTROLS

-10 Power Control

-20 Emergency Shutdown

77 ENGINE INDICATING

-10 Power

-20 Temperature

-30 Analyzers

78 EXHAUST

-10 Collector

-20 Noise Suppressor

-30 Thrust Reverser
-31 Clam Shells

79 OIL

-10 Storage

-20 Distribution

-30 Indicating

83 ACCESSORY GEARBOXES

-10 Drive Shaft Section

-20 Gearbox Section

90 MISCELLANEOUS

-10 Personnel Error

-20 Foreign Object Ingestion

-30 Investigation Incomplete

SYSTEMS CODES

Reciprocating Engines

24 ELECTRICAL POWER

- -10 Generator Drive
- -11 Indicating
- -12 Connectors
- -20 AC Generation
- -21 Inverters
- -22 Gen/Alternators
- -23 Indicators
- -30 DC Generation
- -31 Gen/Alternators

26 FIRE PROTECTION

- -10 Detection
- -11 Sensing Elements
- -12 Indicators

61 PROPELLERS

- -10 Propeller Assembly
- -11 Slip Ring
- -12 Hub
- -13 Dome
- -20 Controlling
- -21 Governor
- -22 Synchronizer
- -30 Braking
- -31 Brake Mechanism
- -40 Indicating
- -41 Lights
- -42 Switches

71 POWERPLANT GENERAL

- -10 Cowling
- -11 Ring Cowls
- -12 Accessory Cowls
- -13 Cowl Flaps
- -20 Mounts
- -30 Fireseals
- -40 Attach Fittings

72 ENGINE

- -10 Front Section
- -11 Reduction Gears
- -12 Accessory Drives
- -20 Power Section
- -21 Master/Link Rods
- -22 Cams
- -30 Cylinder Section
- -31 Cylinders
- -32 Valves - Exhaust/Intake
- -33 Pistons/Rings
- -40 Supercharger Section
- -41 Impeller & Drives
- -42 Accessory Drives
- -50 Lubrication
- -51 Scavenger Pumps

73 ENGINE FUEL & CONTROLS

- -10 Distribution
- -11 Pumps
- -12 Valves
- -20 Controlling
- -21 Carburetor/Master Control
- -22 Fuel Injection Nozzle
- -30 Indicating

73 ENGINE FUEL & CONTROLS (Cont'd)

-31 Transmitters
-32 Indicators

74 IGNITION

-10 Electrical/Power Supply
-11 Magneto
-12 Distributors

-20 Distribution
-21 Leads
-22 Harness
-23 Coils
-24 Spark Plugs

-30 Switching
-31 Ignition Switches

76 ENGINE CONTROLS

-10 Power Control

-20 Emergency Shutdown

77 ENGINE INDICATING

-10 Power
-11 BMEP
-12 Pressure Ratio
-13 RPM

-20 Temperature
-21 Cylinder Head
-22 Oil

-30 Analyzers

78 EXHAUST

-10 Collector
-11 Exhaust Manifold
-12 Clamps

-20 Noise Suppressors
-21 Baffles
-22 Shields

79 OIL

-10 Storage

-20 Distribution

-30 Indicating

81 TURBINES

-10 Power Recovery

90 MISCELLANEOUS

-10 Personnel Error

-20 Foreign Object Ingestion

-30 Investigation Incomplete

NOTE: The foregoing codes are closely related to those used currently by industry coding system. The breakdown provided is considered to be as detailed as necessary for this purpose. No further breakdown or additional codes need be used. The code number is expressed as a four-digit number with the first two digits representing the general system and the last two digits indicating the detailed system. Thus, a shutdown due to a valve failure on a reciprocating engine would be coded 72-32. A shutdown due to a firewarning caused by a broken

element would be coded 26-11 on both a turbine engine and a reciprocating engine. Items such as a leaking rocker-box cover for which there is no specific detail code should be listed under one of the general categories ending in zero, such as 72-30.

(2) The next three columns are self-explanatory.

(3) The column headed "Reason for Shutdown" should include a brief statement of the symptomatic reason for shutting the engine down, such as "While in cruise, MAP and BMEP dropped," or "On takeoff, Zone 1 firewarning light flickered and then stayed on."

(4) The column headed "Line Action" should contain a brief statement of the action required to return the aircraft to service, such as "Changed No. 2 cylinder on account of an exhaust valve failure," or "Replaced broken firewarning element, Zone 1," or "Changed No. 2 engine on account of metal in the sump."

(5) The column headed "Findings" should list the part which failed or malfunctioned and the nature of the failure, such as "Exhaust valve stem broken" or "First-stage turbine blade broken in fir tree area," etc.

NOTE: The code entered in the first column is determined by the entry in the last column, not by the symptomatic reason for shutting the engine down.

(6) The last column provides space for entering the part number of the unit involved, where applicable, and also provides an indication of whether the failure was critical as defined in Part I.

c. Corrective Action Data may be summerized in narrative form describing the programmed action to improve the reliability of propulsion systems operating above the alert index. Each separate item in the report may be coded to reflect the system involved.

PROPULSION SYSTEM RELIABILITY

SHUTDOWN RATE DATA

For Three Months Period Ending _____

Airframe/engine Combination						
Total Engine Operating Hours for Previous Consecutive Three Months						
Total Number of Shutdowns for Previous Consecutive Three Months						
Reliability Index						

Date Compiled _____

Signed _____

Title _____

FIGURE 1. SHUTDOWN RATE DATA FORMAT

CAUSE FOR IN-FLIGHT SHUTDOWN

______________ Aircraft and Engine Type   Date Compiled ______________

For Month of ______________

Item No. Code	Aircraft Position Engine S/N	Date Station	Engine TSO	Reason for Shutdown	Line Action	Findings
						P/N____ Critical Yes No

FIGURE 2. CAUSE FOR IN-FLIGHT SHUTDOWN DATA FORMAT