

AW 1.1.214		AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

## 1. Objective

This procedure provides guidance for the assessment and approval of an air operator's reliability programs by a CAA Inspector

## 2. General

*Note: This task should be performed by the Airworthiness Inspectors and needs to be closely coordinated between both the maintenance and avionics specialties. Approving a reliability program is one of the most complex duties of an Airworthiness Inspectors and special attention must be given to every element of the proposed program.*

*Further guidance is given in [AP-1.1.214A](#), as amended.*

### 2.1 Reliability program criteria

- 2.2.1 The word “reliable” is a broad term meaning dependable or stable. The term, as used by the aviation industry, applies to the dependability or stability of an aircraft system or part thereof under evaluation. A system or component is considered “reliable” if it follows an expected law of behavior and is regarded “unreliable” if it departs from this expectation. These expectations differ greatly, depending upon how the equipment is designed and operated.
- 2.2.2 The purpose of a reliability program is to ensure that the aircraft maintenance program is effective and task recurrence at regular intervals is adequate. The reliability program therefore may give rise to the escalation or de-escalation of a maintenance task interval, as well as the addition or deletion of a maintenance task. In this respect, the reliability program provides an appropriate means of monitoring the effectiveness of the maintenance program.
- 2.2.3 Reliability program should describe the techniques used for measuring the performance and calculating the remaining service life of the component sufficiently in advance in order to take corrective maintenance action prior to failure or reaching an unacceptable performance level. Essentially, reliability programs are used for the control of maintenance by establishing performance levels for each type of unit and/or system individually or as a class. Generally, reliability programs depend on the collection of data which can be analyzed and compared to previously established program goals.
- 2.2.4 A good reliability program should contain means for ensuring that the reliability which is forecast is actually achieved; a program which is very general may lack the details necessary to satisfy this requirement. It is not intended to imply that all of the information should be contained in one program, since the operating philosophy and program management practices for each air operator are different. However, the information could be applied to the specific needs of either a simple or a complex program.

AW 1.1.214	 <b>CAAI</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

## 2.2 Applicability

2.2.1 The CAAI requires that an air operator develop a reliability program in conjunction with its maintenance program in order to ensure the continuing airworthiness of the aircraft it operates. Specifically, the program may be required in the following cases:

- a) The aircraft maintenance program is based upon MSG-3 logic;
- b) The aircraft maintenance program includes condition monitored components;
- c) The aircraft maintenance program does not include overhaul time periods for all significant system components;
- d) When specified by the Manufacturer's maintenance planning document or MRB.

2.2.2 A reliability Program need not be developed in the following cases:

- a) The maintenance program is based upon the MSG-1 or 2 logic but only contains "hard time" or "on condition" items;
- b) For aeroplanes - the aeroplane is not a large aeroplane;
- c) The aircraft maintenance program provides overhaul time periods for all significant system components.

*NOTE 1: for the purpose of this paragraph, "significant system" is a system the failure of which could cause a hazard to the safe operation of the aircraft.*

*Note 2: There exists two primary maintenance procedures that have currently been utilized for the purpose of a maintenance program:*

- *MSG-2 for maintenance processes, i.e. hard time (HT), on condition (OC) and condition monitoring (CM);*
- *MSG-3 for maintenance tasks, i.e. lubrication \ servicing, operational \ visual check, inspection \ function \ functional check, restoration and discard.*

## 2.3 Engineering judgment

2.3.1 Engineering judgment is itself inherent to reliability programs, as no interpretation of data is possible without judgment. In approving an air operator's maintenance and reliability programs, the CAAI is expected to ensure that the air operator hires sufficiently qualified personnel with appropriate engineering experience and understanding of the reliability concept.

2.3.2 Failure to provide appropriately qualified personnel for the reliability program may lead the CAAI to reject the approval of the reliability program and, therefore, the aircraft maintenance program.

## 2.4 Reliability program contents

A reliability program should contain at least the following elements:

AW 1.1.214		AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

## 2.4.1 Objectives

- 2.4.1.1 A statement should be included in the reliability program summarizing as precisely as possible the prime objectives of the program. To the minimum it should include the following:
- a) The recognition of the need for corrective action;
  - b) The establishment of what corrective action is needed; and
  - c) The determination of the effectiveness of that action.
- 2.4.1.2 The extent of the objectives should be directly related to the scope of the program. Its scope could vary from a component defect monitoring system for a small air operator, to an integrated maintenance management program for a big air operator. The manufacturer's maintenance planning documents may give guidance on the objectives and should be consulted in every case.
- 2.4.1.3 In case of a MSG-3 based maintenance program, the reliability program should provide a monitor that all MSG-3 related tasks from the maintenance program are effective and their periodicity is adequate.

## 2.4.2 Identification of items

The items controlled by the program should be stated, e.g. by ATA chapters. Where some items (e.g. aircraft structure, engines, APU) are controlled by separate programs, the associated procedures (e.g. individual sampling or life development programs, constructor's structure sampling programs) should be cross referenced in the program.

## 2.4.3 Terms and definitions

The significant terms and definitions applicable to the Program should be clearly identified.

## 2.4.4 Information sources and collection

- 2.4.4.1 Sources of information should be listed and procedures for the transmission of information from the sources, together with the procedure for collecting and receiving it, should be set out in detail.
- 2.4.4.2 The type of information to be collected should be related to the objectives of the program and should be such that it enables both an overall broad based assessment of the information to be made and also allow for assessments to be made as to whether any reaction, both to trends and to individual events, is necessary.
- 2.4.4.3 The following are examples of the normal prime sources:

AW 1.1.214	 <b>CAAI</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

- a) Pilots reports;
- b) Technical logs;
- c) Aircraft maintenance access terminal \ on-board maintenance system readouts;
- d) Maintenance worksheets;
- e) Workshop reports;
- f) Reports on functional checks;
- g) Reports on special inspections;
- h) Stores issues \ reports;
- i) Air safety reports;
- j) Events related to technical delays and Incidents, such as delays, cancellations, diversions and return to ramp.

2.4.4.4 In addition to the normal prime sources of information, due account should be taken of continuing airworthiness and safety information promulgated by the manufacturer, State of Design and the CAAI.

## 2.4.5 Display of information

Collected information may be displayed graphically or in a tabular format or a combination of both. The rules governing any separation or discarding of information prior to incorporation into these formats should be stated. The format should be such that the identification of trends, specific highlights and related events would be readily apparent.

2.4.5.1 Air operators with programs incorporating statistical performance standards (“alert” programs) should develop a monthly report, with appropriate data displays summarizing the previous month’s activity. This report should include the following:

- a) All aircraft systems controlled by the program, in sufficient depth to enable the CAAI and other recipients to evaluate the effectiveness of the total maintenance program.
- b) Identification of systems that had exceeded the established performance standards and discussion of what corrective action has been taken or planned.
- c) An explanation of changes that have been made or are planned in the aircraft maintenance program, including changes in maintenance and inspection intervals and changes from one maintenance process \ task to another.
- d) A discussion of continuing over-alert conditions carried forward from previous reports, and proposed corrective action.
- e) The progress of corrective action programs.

AW 1.1.214	 <b>CAAI</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

2.4.5.2 Programs using other analytical standards (“non-alert” programs) should consolidate or summarize significant reports used in controlling their program to provide for evaluating program effectiveness. These reports may be computer printouts, summaries, or other forms. A typical program of this type reports the following information:

- a) Mechanical Interruption Summary (MIS) reports;
- b) Mechanical Reliability Reports (MRR);
- c) Maintenance process \ task and interval assignments (master specification);
- d) Weekly update to the maintenance process and interval assignments;
- e) Daily repetitive item listing by aircraft;
- f) Monthly component premature removal report, including removal rate;
- g) Monthly engine shutdown and removal report;
- h) Quarterly engine reliability analysis report;
- i) Engine threshold adjustment report; and
- j) Worksheets for maintenance process \ task and interval changes (not provided to the CAAI but the CAAI approves the process \ task changes).

## **2.4.6 Examination, analysis and interpretation of the information**

2.4.6.1 Data analysis is the process of evaluating mechanical performance data to identify characteristics indicating a need for program adjustment, revising maintenance practices, improving (modifying) hardware, etc. The objective of data analysis is to recognize the need for corrective action, establish what corrective action is needed, and determine the effectiveness of that action.

2.4.6.2 The method employed for examining, analyzing and interpreting the program information should be explained.

### **2.4.6.3 Examination**

Methods of examination of information may be varied according to the content and quantity of information of individual programs. These can range from examination of the initial indication of performance variations to formalized detailed procedures at specific periods, and the methods should be fully described in the program documentation.

### **2.4.6.4 Analysis and Interpretation**

The procedures for analysis and interpretation of information should be such as to enable the performance

AW 1.1.214		AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

of the items controlled by the program to be measured; they should also facilitate recognition, diagnosis and recording of significant problems. The whole process should be such as to enable a critical assessment to be made of the effectiveness of the program as a total activity. Such a process may involve:

- a) Comparisons of operational reliability with established or allocated standards (in the initial period these could be obtained from in-service experience of similar equipment of aircraft types);
- b) Analysis and interpretation of trends;
- c) The evaluation of repetitive defects;
- d) Confidence testing of expected and achieved results;
- e) Studies of life-bands and survival characteristics;
- f) Reliability predictions;
- g) Other methods of assessment;

2.4.6.5 The range and depth of engineering analysis and interpretation should be related to the particular program and to the facilities available. The following, at least, should be taken into account:

- a) Flight defects and reductions in operational reliability;
- b) Defects occurring on-line and at main base;
- c) Deterioration observed during routine maintenance;
- d) Workshop and overhaul facility findings;
- e) Modification evaluations;
- f) Sampling programs;
- g) The adequacy of maintenance equipment and publications;
- h) The effectiveness of maintenance procedures;
- i) Staff training;
- j) Service bulletins, technical instructions, etc.

2.4.6.6 The air operator should establish detailed arrangements with its approved maintenance organization(s) for the availability and continuity of such information as an information input to the program.

## 2.4.7 Performance Standards

2.4.7.1 Each reliability program should include a performance standard expressed in mathematical terms. This standard becomes the point of measure of maximum tolerable unreliability. Thus, satisfactory reliability trend measurements are those which fall at or preferably below

AW 1.1.214		AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

the performance standard. Conversely, a reliability trend measurement exceeding the performance standard is unsatisfactory and calls for some type of follow-up and corrective action.

2.4.7.2 The following factors are acceptable for establishing or revising a reliability program's performance standards:

- a) Past and present individual air operator and industry experience. If industry experience is used, the program must include a provision for reviewing the standards after the air operator has gained 1 year of operating experience;
- b) Performance analysis of similar equipment currently in service;
- c) Aircraft or equipment manufacturers' reliability engineering analysis;
- d) History of experience where reliability standards were acceptable to the airline industry.

2.4.7.3 Performance measurements should be expressed numerically, for example in terms of:

- a) System or component failure;
- b) Pilot reports;
- c) Delays;
- d) Operating hours;
- e) Number of landings;
- f) Cycles;
- g) Other.

2.4.7.4 The performance standards should be adjusted to:

- a) Air operator's experience;
- b) Monthly flight hours;
- c) Routes;
- d) Seasonal considerations; and
- e) Environmental considerations.

2.4.7.5 The program should include procedures for periodic review and revision of the performance standards, and provide for their upward and downward adjustment.

2.4.7.6 The program should include procedures for monitoring new aircraft until sufficient operating experience is available to compute performance standards, normally for a period of one year.

## 2.4.8 Corrective Actions

AW 1.1.214	 <b>CAAI</b> <b>JIT</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

2.4.8.1 The procedures and time scales both for implementing corrective actions and for monitoring the effects of corrective actions should be fully described. Corrective actions shall correct any reduction in reliability revealed by the program and could take the form of:

- a) Changes to maintenance, operational procedures or techniques;
- b) Maintenance changes involving inspection frequency and content, function checks, overhaul requirements and time limits, which will require amendment of the scheduled maintenance periods or tasks in the approved maintenance program. This may include escalation or de-escalation of tasks, addition, modification or deletion of tasks;
- c) Amendments to approved manuals (e.g. maintenance manual, crew manual);
- d) Initiation of modifications;
- e) Special inspections of fleet campaigns;
- f) Spares provisioning;
- g) Staff training;
- h) Manpower and equipment planning.

*Note: Some of the above corrective actions may need the CAAI approval before implementation.*

2.4.8.2 The procedures for effecting changes to the maintenance program should be described, and the associated documentation should include a planned completion date for each corrective action, where applicable.

2.4.8.3 The corrective action system must include provisions for the following:

- a) Notifying the organization responsible for taking the action;
- b) Obtaining periodic feedback until performance reaches an acceptable level;
- c) Encompassing methods that have been established for the overall maintenance program, such as work orders, special inspection procedures, engineering orders, and technical standards;
- d) Identifying Critical failures in which loss of function or the secondary effects of failure could affect the airworthiness of the aircraft.

## **2.4.9 Organizational Responsibilities**

The organizational structure and the department responsible for the administration of the program should be stated. The chains of responsibility for individuals and departments (Engineering,

AW 1.1.214	 <b>CAAI</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

Production, Quality, Operations etc.) in respect of the program, together with the information and functions of any program control committees (reliability group), should be defined. Participation of the CAAI should be stated. This information should be contained in the Maintenance Control Manual as appropriate.

#### **2.4.10 Presentation of information to the CAAI**

The following information should be submitted to the CAAI for approval as part of the reliability program:

- a) The format and content of routine reports.
- b) The time scales for the production of reports together with their distribution.
- c) The format and content of reports supporting request for increases in periods between maintenance (escalation) and for amendments to the approved maintenance program. These reports should contain sufficient detailed information to enable the CAAI to make its own evaluation where necessary.

#### **2.4.11 Evaluation and review**

2.4.11.1 Each program should describe the procedures and individual responsibilities in respect of continuous monitoring of the effectiveness of the program as a whole. The time periods and the procedures for both routine and non-routine reviews of maintenance control should be detailed (progressive, monthly, quarterly, or annual reviews, procedures following reliability “standards” or “alert levels” being exceeded, etc.).

2.4.11.2 Each Program should contain procedures for monitoring and, as necessary, revising the reliability “standards” or “alert levels”. The organizational responsibilities for monitoring and revising the “standards” should be specified together with associated time scales.

2.4.11.3 Although not exclusive, the following list gives guidance on the criteria to be taken into account during the review:

- a) Utilization (high \ low \ seasonal);
- b) Fleet commonality;
- c) Alert Level adjustment criteria;
- d) Adequacy of data;
- e) Reliability procedure audit;
- f) Staff training;
- g) Operational and maintenance procedures.

## **2.5 Contracted maintenance**

AW 1.1.214	 <b>CAAI</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

- 2.5.1 Whereas regulation 131 of the Air Navigation Regulations (Operation of Aircraft and Rules of Flight), 1981 (hereinafter – **ANR.OPS**) requires that the aircraft maintenance program, which includes the associated reliability program, shall be managed and presented by the air operator to the CAAI, it is understood that the air operator may delegate certain functions (such as the development of the maintenance and reliability programs, the collection and analysis of the reliability data, the provision of reliability reports and the proposal of corrective actions) to its approved maintenance organization(s) under contract, provided that this organization(s) proves to have the appropriate expertise.
- 2.5.2 Notwithstanding the above, decision to implement a corrective action (or the decision to request from the CAAI the approval to implement a corrective action) remains the air operator’s prerogative and responsibility. A decision not to implement a corrective action should be justified and documented.
- 2.5.3 The arrangements between the air operator and the approved maintenance organization(s) in regards to the reliability program should be specified in the maintenance contract and the relevant MCM and MOPM procedures.

## **2.6 Applicability for an air operator of small fleets**

- 2.6.1 For the purpose of this paragraph, a small fleet of aircraft is a fleet of less than 6 aircraft of the same type.
- 2.6.2 The requirement for a reliability program is irrespective of the air operator’s fleet size. However, complex reliability programs could be inappropriate for a small fleet. It is recommended that such air operators tailor their reliability programs to suit the size and complexity of operation.
- 2.6.3 One difficulty with a small fleet of aircraft consists in the amount of available data which can be processed: when this amount is too low, the calculation of alert level is very coarse. Therefore “alert levels” should be used carefully.
- 2.6.4 An air operator of a small fleet of aircraft, when establishing a reliability program, should consider the following:
- a) The program should focus on areas where a sufficient amount of data is likely to be processed.
  - b) When the amount of available data is very limited, the air operator's engineering judgment is then a vital element. In the following examples, careful engineering analysis should be exercised before taking decisions:

In making its engineering judgment, an air operator is encouraged to establish contact and make comparisons with other operators of the same aircraft, where possible and

AW 1.1.214	 <b>CAAINJT</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

relevant. Making comparison with data provided by the manufacturer may also be possible.

For the analysis to be valid, the aircraft concerned, mode of operation, and maintenance procedures applied should be substantially the same: variations in utilization between two operators may, more than anything, fundamentally corrupt the analysis.

2.6.5 Notwithstanding the above there are cases where the operator will be unable to pool data with other Operators, e.g. at the introduction to service of a new type. In that case the CAAI shall impose additional restrictions on the MRB/MPD tasks intervals (e.g. no variations or only minor evolution are possible, and with the CAAI's approval).

## **2.7 Additional Applicability for an air operator operating EDTO**

2.7.1 ANR.OPS 418(7)(b) requires an air operator operating EDTO to develop a reliability program for propulsion systems and EDTO-significant systems, for each airplane-engine combination used in EDTO. The objectives of an EDTO reliability program are the timely identification and prevention of significant events pertaining to EDTO, and the assurance a minimal EDTO reliability level, as detailed in paragraphs 4 and 5 of the 6<sup>th</sup> appendix to the ANR.OPS.

2.7.2 This program must be the air operator's existing reliability program or its Continuing Analysis and Surveillance System (CASS) supplemented for EDTO. This program must be event-oriented and include procedures as follows:

### **2.7.3 Propulsion system monitoring**

2.7.3.1 If the IFSD rate (computed on a 12-month rolling average) for an engine installed as part of an airplane-engine combination exceeds the following values, the air operator must do a comprehensive review of its operations to identify any common cause effects and systemic errors. The IFSD rate must be computed using all engines of that type in the air operator's entire fleet of airplanes approved for EDTO.

(i) A rate of 0.05 per 1,000 engine hours for EDTO up to and including 120 minutes.

(ii) A rate of 0.03 per 1,000 engine hours for EDTO beyond 120-minutes up to and including 207 minutes in the North Pacific Area of Operation and up to and including 180 minutes elsewhere.

(iii) A rate of 0.02 per 1,000 engine hours for EDTO beyond 207 minutes in the North Pacific

AW 1.1.214	 <b>CAAI</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

Area of Operation and beyond 180 minutes elsewhere.

2.7.3.2 Within 30 days of exceeding the rates above, the air operator must submit a report of investigation and any necessary corrective action taken to the CAAI.

#### 2.7.4 Engine condition monitoring

2.7.4.1 The air operator must have an engine condition monitoring program to detect deterioration at an early stage and to allow for corrective action before safe operation is affected.

2.7.4.2 This program must describe the parameters to be monitored, the method of data collection, the method of analyzing data, and the process for taking corrective action.

2.7.4.3 The program must ensure that engine-limit margins are maintained so that a prolonged engine-inoperative diversion may be conducted at approved power levels and in all expected environmental conditions without exceeding approved engine limits. This includes approved limits for items such as rotor speeds and exhaust gas temperatures.

#### 2.7.5 Oil-consumption monitoring

The air operator must have an engine oil consumption monitoring program to ensure that there is enough oil to complete each EDTO flight. APU oil consumption must be included if an APU is required for EDTO. The operator's oil consumption limit may not exceed the manufacturer's recommendation. Monitoring must be continuous and include oil added at each EDTO departure point. The program must compare the amount of oil added at each EDTO departure point with the running average consumption to identify sudden increases.

#### 2.7.6 APU in-flight start program.

2.7.6.1 If the airplane type certificate requires an APU but does not require the APU to run during the EDTO portion of the flight, the air operator must develop and maintain a program acceptable to the CAAI for cold soak in-flight start-and-run reliability.

### 2.8 Approval of maintenance program amendment

The program areas requiring formal CAAI approval include any changes to the program that involve the following:

- a) Procedures relating to reliability measurement / performance standards;
- b) Data collection;

AW 1.1.214	 <b>CAAIRJT</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

- c) Data analysis methods and application to the total maintenance program;
- d) Process/task changes;
- e) Adding or deleting components/systems;
- f) Adding or deleting aircraft types; and
- g) Procedural and organizational changes concerning administration of the program.

### 3. Reference Material, Forms & Job-Aids

- 3.1 [AP-1.1.214A](#), Maintenance Control by Reliability Methods, as amended.
- 3.2 AWF 1.1.214A – Operator Certificate – Reliability Program – Certification Inspection Checklist.
- 3.3 Related ANR.OPS regulations: 131(a)(6), 132, 399(d)(4), 420, 418(7)(b), Appendices 4 and 6.

### 4. Process

#### 4.1 A meeting with the air operator \ applicant

In addition to providing [AP-1.1.214A](#), as amended, inform the air operator \ applicant of the following reliability program requirements:

- Program application;
- Organizational structure;
- Data collection system;
- Methods of data analysis and application to maintenance control;
- Procedures for establishing and revising performance standards;
- Definition of significant terms;
- Program displays and status of corrective action programs;
- Procedures for program revision; and
- Procedures for maintenance control changes.

#### 4.2 Evaluate the Program Application Procedures

When the applicant submits a formal reliability program, ensure that the program document defines the following:

- 4.2.1 Components, systems, or complete aircraft controlled by the program. Individual systems and/or components are identified by Air Transport Association (ATA) Specification. A list of all components controlled by the program must be included as an appendix to the program document or included by reference (e.g., time limits, manuals, or computer report).
- 4.2.2 The portion of the maintenance program controlled by the reliability program (e.g. overhaul and \ or inspection, check periods).

#### 4.3 Evaluate Organizational Structure

AW 1.1.214	 <b>CAAINJT</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

- 4.3.1 The structure must be described adequately and address the reliability committee membership, if appropriate, and meeting frequency.
- 4.3.2 Ensure that the reliability program includes an organizational chart that shows the following:
  - 4.3.2.1 The relationships among organizational elements responsible for administering the program.
  - 4.3.2.2 The organizational elements responsible for approving changes to the maintenance control manual and specifying the duties and responsibilities for initiating maintenance program revisions.

#### **4.4 Evaluate the Organizational Responsibilities**

- 4.4.1 Determine if the reliability program document addresses the following:
  - 4.4.1.1 The method of exchanging information among organizational elements. This may be displayed in a diagram.
  - 4.4.1.2 Activities and responsibilities of each organizational element and/or reliability control committee for enforcing policy and ensuring corrective action.
- 4.4.2 Ensure that authority is delegated to each organizational element to enforce policy.
- 4.4.3 Ensure that the air operator has hired sufficiently qualified personnel with appropriate engineering experience and understanding of the reliability concept.

#### **4.5 Evaluate the Data Collection System.**

- 4.5.1 Ensure that the reliability program document fully describes the data collection system for the aircraft, component, and/or systems to be controlled.
- 4.5.2 The following must be addressed:
  - a) Flow of information;
  - b) Identification of sources of information;
  - c) Steps of data development from source to analysis; and
  - d) Organizational responsibilities for each step of data development.
- 4.5.3 Ensure that the document includes samples of data to be collected, such as:
  - a) Powerplant disassembly and inspection reports;
  - b) Component condition reports;
  - c) Mechanical delay and cancellation reports;
  - d) Flight record reports;
  - e) Premature removal reports;

AW 1.1.214	 <b>CAAIRJT</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

- f) In-flight shutdowns;
- g) Confirmed failure reports;
- h) Internal leakage reports; and
- i) Engine shutdown reports.

4.5.4 Ensure that the reliability program includes a graphic portrayal of program operations. It must be a closed loop and show data sources, data collection methods and analysis.

#### **4.6 Evaluate the Methods of Data Analysis and Application to Maintenance Controls**

Ensure that the data analysis system includes the following:

- 4.6.1 A detailed description of the process and methods used for data examination, analysis and interpretation. The procedures should enable the performance of the items controlled by the program to be measured. The procedures should also facilitate recognition, diagnosis and recording of significant problems.
- 4.6.2 Procedures for evaluating critical failures as they occur.
- 4.6.3 A description of statistical techniques used to determine operating reliability levels.
- 4.6.4 Provisions for One or more of the types of action appropriate to the trend or level of reliability experienced, including:
  - a) Actuarial or engineering studies employed to determine a need for maintenance program changes;
  - b) Maintenance program changes involving inspection frequency and content, functional checks, overhaul procedures, and time limits;
  - c) Aircraft, aircraft system, or component modification or repair; and/or
  - d) Changes in operating procedures and techniques.
- 4.6.5 The effects on maintenance controls such as overhaul time, inspection and check periods and overhaul \ inspection procedures.
- 4.6.6 Documentation used to support and initiate changes to the maintenance program, including modifications, special inspections or fleet campaigns. The program must reference the air operator's manual procedures for handling these documents.
- 4.6.7 A Corrective action system that includes the following:
  - a) procedures to describe the criteria that would require further analysis to determine causal factors when instituting corrective action;
  - b) procedures to describe the definitive conditions when corrective action will take place;
  - c) Check that the air operator's reliability program contains procedures that determine who implements corrective action.

AW 1.1.214	 <b>CAAINJT</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

- d) procedures for ensuring time limits (completion dates) are set for completing corrective action;
- e) procedures for ensuring there is a chain of authority for carrying out the corrective action;
- f) procedures ensuring that when a corrective action is initiated by performance standards, the action is positive enough to restore performance effectively to an acceptable level within a reasonable time;
- g) procedures to obtain periodic feedback (follow-up) until performance reaches an acceptable level to ensure the actions taken were effective;
- h) methods to ensure that the corrective action program shows results as a matter of record.

4.6.8 Check that the air operator's reliability program includes sample forms used to implement these corrective actions.

#### **4.7 Evaluate the Procedures for Establishing and Revising Performance Standards**

4.7.1 Ensure that each program includes one of the following for each aircraft system and/or component controlled by the program:

- Initial performance standards defining the area of acceptable reliability.
- Methods, data, and a schedule to establish the performance standard.

4.7.2 Ensure that the performance standard is responsive and sensitive to the level of reliability experienced and is stable without being fixed. The standard should not be so high that abnormal variations would not cause an alert, nor so low that it is constantly exceeded in spite of the best known corrective action measures.

4.7.3 Ensure that the procedures specify the organizational elements responsible for monitoring and revising the performance standard, as well as when and how to revise the standard.

#### **4.8 Evaluate Definitions**

Verify that each reliability program clearly defines all significant terms used in the program. Definitions must reflect their intended use in the program and will therefore vary from program to program. Acronyms and abbreviations unique to the program must also be defined.

#### **4.9 Evaluate Program Displays, Status of Corrective Action Programs and Reporting**

4.9.1 Ensure that the program describes reports, charts, and graphs used to document operating experience. Responsibilities for these reports must be established and the reporting elements must be clearly identified and described.

4.9.2 Ensure that the program displays containing the essential information for each aircraft, aircraft system, and component

AW 1.1.214	 <b>CAAI</b>	AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

controlled by the program are addressed. Each system and component must be identified by the appropriate ATA Specification system code number.

4.9.3 Ensure that the program includes displays showing:

- Performance trends;
- The current month's performance;
- A minimum of 12 months' experience; and
- Reliability performance standards ("alert" values).

4.9.4 The program must include the status of corrective action programs. This includes all corrective action programs implemented since the last reporting period.

#### **4.10 Evaluate the Interval Adjustments and Process and/or Task Changes System**

4.10.1 Review the system change procedures. Ensure that there are special procedures for escalating systems or components whose current performance exceeds control limits.

4.10.2 Ensure that the program does not allow for the maintenance interval adjustment of any Certification Maintenance Requirements (CMR) items.

*Note 1: CMRs are part of the certification basis. No CMR item may be escalated through the air operator's maintenance/reliability program. CMRs are the responsibility of CAAI as far as approval and escalation.*

*Note 2: The air operator may not use its reliability program as a basis for adjusting the repeat interval for its corrosion prevention and control program; however, the air operator may use the reliability program for recording data for later submission to the CAAI to help substantiate repeat interval changes.*

4.10.3 Ensure that the program includes provisions for notifying the CAAI and receiving an approval when changes are made.

#### **4.11 Evaluate the Procedures for Program Revisions**

The reliability program document must accomplish the following:

4.11.1 Recognition of the following requirements and procedures for adequately administering and implementing changes required by these actions:

- a) Reliability measurement;
- b) Changes involving performance standards, including instructions relating to the development of these standards;
- c) Data collection system;
- d) Data analysis methods and application to maintenance program; and
- e) Any procedural or organizational change concerning program administration.

AW 1.1.214		AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

- 4.11.2 Identify the organizational element responsible for approving amendments to the program.
- 4.11.3 Provide a periodic review to determine that the established performance standard is still realistic.
- 4.11.4 Provide procedures for distributing approved revisions.
- 4.11.5 Reference the air operator's Maintenance program and provide the overhaul and inspection periods, work content, and other maintenance program activities controlled by the program.

#### **4.12 Evaluate the Procedures for Maintenance Control Manual changes**

Ensure that the reliability program addresses the following:

- 4.12.1 Procedures for Maintenance Control Manual changes to the reliability program.
- 4.12.2 The organizational elements responsible for preparing substantiation reports to justify Maintenance Control Manual changes. Processes used to specify Maintenance Control Manual changes (e.g., sampling, functional checks, bench checks, decision tree analysis, and unscheduled removal).
- 4.12.3 Procedures covering all maintenance program activities controlled by the program.
- 4.12.4 Procedures to ensure maintenance interval adjustments do not interfere with ongoing corrective actions.
- 4.12.5 Identification of critical failures and procedures for taking corrective action.
- 4.12.6 Procedures for notifying the CAAI when increased time limit adjustments or other program adjustments are addressed.

#### **4.13 Evaluate the EDTO reliability program (if applicable)**

- 4.13.1 Ensure that the EDTO reliability program addresses the following:
  - 4.13.1.1 Propulsion system monitoring
  - 4.13.1.2 Engine condition monitoring
  - 4.13.1.3 Oil consumption monitoring
  - 4.13.1.4 APU in-Flight start program

#### **4.14 Analyze the Reliability Program Evaluation**

Upon completion, record all deficiencies noted. Determine the appropriate corrective action(s) to be taken. Deficiencies noted in the program must be submitted to the air operator \ applicant in writing.

## **5. Task Outcome**

### **5.1 Completion**

AW 1.1.214		AW Inspector Handbook
Assessment and approval of a Reliability Program		Revision 3
		06 Mar 2014

Successful completion of this task will result in the approval of the air operator \ applicant's reliability program.

**5.2 Document Task**

File all supporting paperwork in the air operator's \ applicant's file.

**5.3 Future Activities**

Normal surveillance.