



**Civil Aviation Authority**






# **MAINTENANCE AND REPORTING PROCEDURE FOR AERONAUTICAL TELECOMMUNICATION FACILITIES**

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**Corrigendum of Amendments**

No.	Rev	Description
01	01	<p>This amendment incorporated the followings:</p> <ul style="list-style-type: none"><li>(1) Inclusion of new terms or abbreviations in Glossary of Term</li><li>(2) Updates on Surveillance Facilities and Automation System.</li><li>(3) Details on preventive Maintenance.</li><li>(4) Rectification for Failure Category 2</li><li>(5) Details on Facility Logbook</li><li>(6) Updates details on periodic report</li><li>(7) Revision on Appendix 6 to change total failure into total Outage</li><li>(8) Revision on Appendix 6A to add details on Problem Code</li><li>(9) Revision on Appendix 6B to add condition to the title of related table.</li><li>(10) ILS Integrity and Continuity method of calculation</li><li>(11) Required editorial correction.</li></ul>

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## Glossary of Terms

The following terms or acronyms may be used in any manual or document published by CAA. Reproduction in part or whole is allowed without prior approval. The Document Control Office reserves the rights to include such a listing in any CAA manual or document prior to publishing.

<b>AFS</b>	Aeronautical Fixed Service
<b>AFTN</b>	Aeronautical Fixed Telecommunication Network
<b>AIP</b>	Aeronautical Information Publication
<b>AIS</b>	Aeronautical Information Service
<b>ASMGCS</b>	Advance Surface Movement Guidance Control System
<b>ATC</b>	Air Traffic Control
<b>AUTHORITY</b>	Civil Aviation Authority
<b>DME</b>	Distance Measuring Equipment
<b>FDPS</b>	Flight Data Processing System
<b>ICAO</b>	International civil aviation organization
<b>IFR</b>	Instrument Flight Rules
<b>ILS</b>	Instrument Landing System
<b>MLAT</b>	Multilateration
<b>MTBF</b>	Mean Time Between Failure
<b>MTBO</b>	Mean Time Between Outage
<b>NDB</b>	Non-Directional Beacon
<b>PAR</b>	Precision Approach Radar
<b>PSR</b>	Primary Surveillance Radar
<b>RDPS</b>	Radar Data Processing System
<b>RMU</b>	Remote Monitoring Unit
<b>SSR</b>	Secondary Surveillance Radar
<b>UHF</b>	Ultra High Frequency
<b>UPS</b>	Uninterrupted Power Supply
<b>VDL</b>	VHF Digital Link
<b>VFR</b>	Visual Flight Rules
<b>VHF</b>	Very High Frequency
<b>VOR</b>	Very High Frequency Omni Directional Radio Range.
<b>WAM</b>	Wide Area Multilateration

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## **1. GENERAL**

### **1.1. Requirements**

Civil Aviation Regulation (CAR) 171.235 requires each Aeronautical Telecommunication Service Provider shall apply proper maintenance to each Aeronautical Telecommunication / Radio Navigation Facilities and report its condition to the CAA.

This requirement includes all service interruption to the Aeronautical telecommunication service shall be reported and acted upon according to the standard corrective maintenance procedures

### **1.2. Implementation**

In implementing of maintenance activity, service provider may cooperate with other Aeronautical Telecommunication Facilities Maintenance Organization approved by CAA.

### **1.3. Objectives**

The objectives of maintenance activity in paragraph 1.1 are:

- (a) prevent equipment not functioning according to standard.
- (b) prevent failure of operation.
- (c) prevent major failure to the equipment.
- (d) ensure the availability, reliability, integrity, accuracy, and continuity of equipment's are met the standards.
- (e) ensure operational reliability of equipment by extending Mean Time Between Failure (MTBF).
- (f) shorten the repair time or Mean Time to Repair (MTTR).
- (g) extend the life of the equipment operation.
- (h) reduce repair costs by Carrying out maintenance activities effectively and efficiently.
- (i) Increasing direct and indirect support for aviation security and safety.
- (j) Ensure operational readiness of all facilities needed during emergency use.

### **1.4. Maintenance Elements**

To achieve the maintenance objectives of Aeronautical Telecommunication facilities as referred to in paragraph 1.3, it is necessary to provide the following elements:

- (a) human resources in accordance with adequate quality and quantity of maintenance I personnel.
- (b) equipment maintenance fund.
- (c) work tools, measuring tools, testing equipment, spare parts (modules and / or consumables) and technical documents.
- (d) Maintenance guidelines

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## **2. AERONAUTICAL TELECOMMUNICATION FACILITIES.**

Aeronautical Telecommunication Facilities, consist of:

- (a) Communication Facilities.
- (b) Radio Navigation Aids.
- (c) Surveillance Facilities.
- (d) Automation System.

### **2.1. Communications**

Communication Facilities as referred to paragraph 2.1. (a) covers:

#### **2.1.1. Communication system for Aeronautical Mobile Service**

- (a) Very High Frequency Air Ground Communication (VHF-A/G).
- (b) High Frequency Air Ground Communication (HF-A/G).
- (c) High Frequency - Single Side Band (HF-SSB).
- (d) Voice Recorder.

#### **2.1.2. Communication system for Aeronautical Broadcast Service**

- (a) Automatic Terminal Information Service (ATIS).
- (b) Meteorological operation circuits, networks, and broadcast system
- (c) Meteorological information for aircraft in flight (VOLMET)

#### **2.1.3. Communication system for aeronautical fixed service**

- (a) ATS Direct Speech (DS) circuit and network.
- (b) Common ICAO data interchange network
- (c) Aeronautical Fixed Telecommunication Network (AFTN)
- (d) Automatic Message Handling System (AMHS).
- (e) Inter-Centre Communication (ICC)

#### **2.1.4. Voice Switching Communication System**

- (a) Voice Switching Communication System (VSCS).
- (b) Central Exchange and telephony system

#### **2.1.5. Transmission system**

- (a) Radio Link VSAT
- (b) Fiber optic

#### **2.1.6. Digital data Link**

- (a) SSR Mode S Air- Ground Data Link VHF Air-Ground Digital Link (VDL)
- (b) Transmission System
- (c) VHF Data Link.

## 2.2. Radio Navigation Aids

Radio Navigation Aid Facilities as referred to paragraph 2.1. (b) covers:

- (a) Non-Directional Beacon (NDB).
- (b) Instrument Landing System (ILS).
- (c) Very High Frequency Omni Directional Range (VOR).
- (d) Distance Measuring Equipment (DME).
- (e) Precision Approach Radar (PAR).
- (f) Global Navigation Satellite System (GNSS) and the augmentation system.

## 2.3. Surveillance

Surveillance Facilities as referred to paragraph 2.1. (c) covers:

- (a) Primary Surveillance Radar (PSR).
- (b) Secondary / Monopulse Surveillance Radar (SSR/MSSR).
- (c) Advance Surface Movement Guidance Control System (ASMGCS)
- (d) MSSR Mode S
- (e) Multilateration (MLAT)
- (f) Wide Area Multilateration (WAM)
- (g) Automatic Dependent Surveillance-Broadcast (ADS-B),
- (h) Surface Movement Radar (SMR)

## 2.4. Automation Systems

Automation System as referred to paragraph 2.1. (d) covers:

- (a) Controller Pilot Data Link Communication (CPDLC) Processing System.
- (b) Radar Data Processing System (RDPS).
- (c) Flight Data Processing System (FDPS).
- (d) Voice and Data Surveillance recording system

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### **3. MAINTENANCE ACTIVITIES**

The maintenance activities of Aeronautical Telecommunication facilities consist of but not limited to:

- (a) establishment of history of Facilities.
- (b) maintenance planning of facilities.
- (c) implementation of maintenance of facilities.

#### **3.1. History of Facilities**

The history of Aeronautical Telecommunication facilities should include:

- (a) date / month / year of equipment procurement / installation.
- (b) repair / replacement of units / parts / equipment modules.
- (c) recondition / overhaul equipment.
- (d) Repair / replacement of software.

The historical format of Aeronautical Telecommunication Facilities should refer to the Appendix 1 to this Document.

#### **3.2. Planning**

Planning for maintenance of Aeronautical Telecommunication facilities should include the following elements:

- (a) the planning of the maintenance personnel 's provision includes:
  - 1. quality and quantity of maintenance personnel.
  - 2. Training program for maintenance personnel to support the implementation of maintenance program
- (b) Allocation budget for maintenance activity.
- (c) providing work tools, measuring tools, testing tools and calibration laboratory of measuring tools for improvement.
- (d) required and recommended spare parts.

#### **3.3. Implementation**

Implementation of maintenance of Aeronautical Telecommunication facilities as referred to paragraph 3.1. (c) cover the following activities:

- (a) preventive maintenance.
- (b) corrective maintenance.

#### **3.4. Preventative Maintenance**

Preventive maintenance aims to maintain performance of equipment. The activity includes:

- (a) daily maintenance.
- (b) weekly maintenance.
- (c) monthly maintenance.
- (d) quarterly maintenance.
- (e) semi-annual maintenance.
- (f) annual maintenance



A list of minimum preventative maintenance contained in Appendix 2, 2A and 2B of this Document.

Aeronautical Telecommunication Service provider may adjust the preventive maintenance activity to include the preventive maintenance recommended by Equipment Manufacture. It is required for service provider to record the result of all the parameter's reading and measurement, during the preventive maintenance.

### 3.5. Corrective Maintenance

Corrective Maintenance aims to put the equipment that is experiencing in disruption / failure back to normal conditions. The corrective maintenance include:

- (a) analysis of equipment failure.
- (b) re-adjustment of equipment.
- (c) replacement of components / modules / parts / units of equipment.
- (d) repair of modules / parts / unit's / equipment software.
- (e) equipment modification.
- (f) recondition or overhaul equipment.

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## **4. MAINTENANCE LEVEL**

### **4.1. Levels of Maintenance**

Based on the level of difficulties, maintenance of the facilities is divided into:

- (a) maintenance level 1 (Preventative).
- (b) maintenance level 2 (Minor Corrective Maintenance).
- (c) maintenance level 3 (Moderate Corrective Maintenance).
- (d) maintenance level 4 (Severe Corrective Maintenance).

### **4.2. Preventative Maintenance**

Maintenance level 1 as referred to paragraph 4.1. (a) is a preventive maintenance that is carried out periodically with the following activities:

- (a) cleaning of the room.
- (b) cleaning equipment, units / parts of equipment or modules.
- (c) inspection of equipment, unit / equipment parts or equipment modules.
- (d) power supply and its back up measurement and indicator light tests.
- (e) measurement and recording of equipment's parameter.
- (f) replacement of indicator lights, safety components and other consumables

### **4.3. Minor Corrective Maintenance**

Maintenance level 2 as referred to paragraph 4.1. (b) consists of:

- (a) preventive maintenance that is carried out periodically, with the following activities:
  - 1. trials on equipment, unit / piece of equipment.
  - 2. view and target observation.
  - 3. Checking the output of equipment, unit / parts of equipment.
- (b) corrective maintenance for minor abnormalities / failure / failure, the activities as follows:
  - 1. failure analysis.
  - 2. adjustment of equipment parameters.
  - 3. replacement and adjustment of defective equipment units / parts / modules.

### **4.4. Moderate Corrective Maintenance**

Maintenance level 3 as referred to paragraph 4.1. (c) is corrective maintenance if the equipment is interrupted / failure moderately, with the following activities:

- (a) failure analysis.
- (b) repair and re-adjustment of defective unit / part / module of.

### **4.5. Severe Corrective Maintenance**

Maintenance of level 4 as referred to paragraph 4.1. (d) is corrective maintenance if the equipment is subject to severe failure, with the following activities:

- (a) failure analysis.
- (b) repair of software system of the equipment.
- (c) repair and re-adjustment of unit / part / module of equipment with complex failure by using external measuring instruments.
- (d) modification and re-adjustment of equipment units / parts / modules.
- (e) recondition or overhaul equipment

#### 4.6. Maintenance Methodology & Flow Charts

Maintenance of equipment in accordance with the levels of difficulty referred to paragraph 4.1, should be carried out in accordance with the flowcharts as contained in Appendix 3 of this document.

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## **5. FAILURE CATEGORY**

### **5.1. Categories**

Failure to equipment is categorized as follows:

- (a) category 1 (one).
- (b) category 2 (two).
- (c) category 3 (three)

### **5.2. Category 1**

Failure category 1 (one) as referred to paragraph 5.1. (a), shall constitute a breakdown causing the discontinuation / cessation of equipment operation (main and standby).

#### **5.2.1. Rectification**

Rectification works of failure category 1 (one) shall be done not later than 8 (eight) hours since the occurrence of failure.

### **5.3. Category 2**

Failure category 2 as referred to paragraph 5.1. (b), shall constitute a failure which causes the decrease of equipment's performance but not cause the discontinuation / cessation of equipment's operation, such as decreased in coverage, or the emitted frequency is unstable.

#### **5.3.1. Rectification**

Rectification works of failure category 2 (two) shall be done not later than 72 (seventy-two) hours since the occurrence of failure. The failure category shall be upgraded to Category 1 if the normal operation is not returned by due time.

### **5.4. Category 3**

Failure category 3 as referred to paragraph 5.1. (c), shall constitute equipment failure occurring on the supporting equipment but shall not affect the performance of equipment and if not corrected may turn into failure Category 1 or Category 2 (with specific date/time for restoration).

#### **5.4.1. Rectification**

Rectification works of failure category 3 (three) shall be made not later than 30 (thirty) days after failure occurs.

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## 6. FACILITY LOGBOOK

Each maintenance activities as referred to paragraph 3.5. (a) and (b) shall be recorded in the facility logbook.

The facility logbook shall contain sufficient information in the first pages of the logbook to identify:

- (a) Facility information.
- (b) Precautions of operation or its reference number that included in the exposition.
- (c) All entries include the date, time of entry, leaving and signature
- (d) The services are being provided from the facility.

The logbook is maintained throughout the operating hours of the facility and is signed by senior person, or the person on duty at a nominated operating position.

Logbook entries are:

- (a) In chronological sequence and in ink.
- (b) Without erasure, defacement, or obliteration; and
- (c) Corrected by drawing a single line through the erroneous information and initialing the correction.

Actual times of opening and closing facility are recorded in the logbook, together with the reason for every variation from published hours of service.

Logbooks are retained for a period of 3 years from the date of final entry.

**Note:** *This facility logbook is shown in Appendix 4 of this Document.*



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## **7. EVALUATION of FACILITY SERVICE PERFORMANCE**

The purpose of facility service performance evaluation is to determine the value of Availability, Reliability, Integrity, and Continuity of Service provided by each Equipment. Evaluation of facility service performance is conducted annually.

The Evaluation of value of facility service performance will assist the service provider to determine the maintenance program, including spare parts procurement and replacement of modules or units of an equipment or replacement of equipment as a full system.

### **7.1. Categorization**

The evaluation's result of AT/RN facilities as meant in paragraph 7.1 shall be categorized into 3 groups as follows:

- (a) a group of equipment that is very often disrupted / failure with availability and reliability < 0%.
- (b) a group of equipment that often experience disrupted / failure with availability and reliability  $70\% < A < 95\%$ .
- (c) any group of equipment with very rare disruption / failure with 95% and above availability and reliability.

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## **8. REPORT**

Each maintenance activity of facility shall be reported to the Air Navigation Safety Department periodically.

The periodic report will consist of:

- (1) Monthly report, containing the following:
  - (a) The performance of facilities, as described in Appendix 6
  - (b) Failure and corrective maintenance report, as described in Appendix 6A
- (2) Annual report, containing of:
  - (a) Updated on list of equipment and condition, as described in Appendix 6B
  - (b) Summary or list of corrective maintenance of facility within one year, as described in Appendix 6C

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**Appendix 1****HISTORY LOG SHEET  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

AIRPORT NAME :  
FACILITY :  
EQUIPMENT NAME :  
BRAND/TYPE :  
SERIAL NUMBER :

NO	DATE / TIME	DESCRIPTION	UPDATED BY

Chief of Section

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## Appendix 2

**LIST OF PREVENTIVE MAINTENANCE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY: COMMUNICATION

EQUIPMENT: AUTOMATIC MESSAGE HANDLING SYSTEM  
(AMHS)

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
<b>1. General</b> -	<b>1. General</b> a. Check main supply output  b. Clean the entire room of the equipment	<b>1. General</b> a. Check the output power supply voltage of UPS / Stabilizer	<b>1. General</b> a. Inspect all connectors	<b>1. General</b> -	<b>1. General</b> a. Clean the dust on the UPS and Stabilizer  b. Replace battery of UPS if necessary	
<b>2. Supervisory</b> a. Check the brightness  b. Check the paper supplies in the printer	<b>2. Supervisory</b> a. Check the printer display introductory function	<b>2. Supervisory</b> a. Check the keyboard function	<b>2. Supervisory</b> a. Check interconnection system	<b>2. Supervisory</b> a. Check the software function	<b>2. Supervisory</b> a. Check the cooling fan function of the rack	



c. Check the printer ribbon						
<b>3. Reject Edit</b>	<b>3. Reject Edit</b>	<b>3. Reject Edit</b>	<b>3. Reject Edit</b>	<b>3. Reject Edit</b>	<b>3. Reject Edit</b>	
a. Check the brightness	a. Check printer output	a. Check the keyboard function	a. Check interconnection system	a. Check the software function	a. clean filter cooling system CPU	
b. Check the paper supplies in the printer						
c. Check the printer ribbon						

**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

**FACILITY: COMMUNICATION**

**PERALATAN: DIRECT SPEECH (DS)**

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
-	a. Check the cleanliness of iPOS and indicators	a. Check physical equipment condition	a. Check the connection with the related section/unit	-	-	

**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY: COMMUNICATION

EQUIPMENT: VOICE SWITCHING COMMUNICATION SYSTEM (VSCS)

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
<b>1. General</b> -	<b>1. General</b> a. Clean the entire equipment from dust / dirt  b. Check the room temperature	<b>1. General</b> -	<b>1. General</b> a. Export the Monitor And Control Station configuration for backup	<b>1. General</b> -	<b>1. General</b> a. Replace the Fan Filter of the cabinet or rack	
<b>2. System Management</b> a. Check the monitor brightness	<b>2. System Management</b> a. Check the event Log  b. Check the cleanness of the rack	<b>2. System Management</b> a. Check the main power supply voltage b. Check the output power supply voltage of UPS / Stabilizer	<b>2. System Management</b> a. -	<b>2. System Management</b> a. -	<b>2. System Management</b> a. -	
<b>3. Position Control</b> a. Check the monitor brightness  b. Check the Monitor and Control Station - Status Display	<b>3. Position Control</b> a. Cek Monitor/function Indicator b. Check the Touch Screen Panel	<b>3. Position Control</b> a. Clean the MCS screen	<b>3. Position Control</b> a. -	<b>3. Position Control</b> a. -	<b>3. Position Control</b> a. -	

c. Check the status of RAID (if Applicable)	c. Clean the touch Panel					
d. Check the status of Duplicated MCS - Server (if Applicable)						

**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY : COMMUNICATION

EQUIPMENT

:

VERY HIGH FREQUENCY AIR to GROUND  
COMMUNICATION

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
<b>1. General</b> a. Check the TX room temperature  b. Check the power supply voltage out of the Stabilizer and UPS  <b>2. Transmitter</b> a. Check all indicators  b. Check LCD / Main Screen Display.	<b>1. General</b> a. Clean the entire Shelter of the equipment  <b>2. Transmitter</b> a. Check meter reading based on BITE  b. Check Change over switch function	<b>1. General</b> a. Check the power supply voltage out of the Stabilizer and UPS b. Check Obstacle around the shelter  c. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration  <b>2. Transmitter</b> a. Perform performance check as per approved form b. Check operational equipment using backup power supply	<b>1 General</b> a. Clean all equipment thoroughly  <b>2. Transmitter</b> a. Perform Transmitter Power calibration  b. Check VSWR	<b>1 General</b>  <b>2. Transmitter</b> a. Check the coverage range by plane	<b>1. General</b> a. Check lightning protection and grounding system.  b. Check condition of supply cable and control cable  <b>2. Transmitter</b> a. Check all the external connector s are securely fitted  b. Perform frequency measurement using frequency counter	

<b>3. Receiver</b> a. Check all indicators  b. Check LCD / Main Screen Display.	<b>3. Receiver</b> a. Check meter reading based on BITE  b. Check Change over switch function	<b>3. Receiver</b> a. Perform performance check as per approved form b. Check operational equipment using backup power supply b. Adjust Squelch to eliminate noise  c. Do recording parameter	c. Measure DC level terminal with ON equipment condition  <b>3. Receiver</b> a. Measure DC level terminal with ON equipment condition	<b>3. Receiver</b>          <b>4. Antenna</b> a. Perform antenna inspection	c. Perform a BIT Interruptive Test  d. Perform an AC and DC Change over check (if both supplies are connected)  <b>3. Receiver</b> a. Check all the external connector s are securely fitted    b. Perform frequency measurement using frequency counter c. Perform a BIT Interruptive Test d. Perform an AC and DC Change over check (if both supplies are connected)  <b>4. Antenna</b>	
<b>4. Antenna</b>  a. -	<b>4. Antenna</b>  a. -	<b>4. Antenna</b>	<b>4. Antenna</b>			

**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY : COMMUNICATION

EQUIPMENT : AUTOMATIC TERMINAL INFORMATION  
SERVICE (ATIS)

MAINTENANCE ACTIVITIES						REMARK
DAILY	Weekly	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
<b>1. General</b> a. Check the TX room temperature  <b>2. Console</b> a. Check the monitor's brightness setting b. Check the Indicator of each Unit of Equipment  <b>3. Transmitter</b> a. Check the fan (fan) air conditioner  b. Check all indicator lights	<b>1. General</b> a. Clean the entire equipment from dust / dirt  b. Check the power supply voltage  <b>2. Console</b> a. Check the connection system between units  <b>3. Transmitter</b> a. Check the transmitter indicators locally and remotely	<b>1. General</b> a. Check the backup power supply system (UPS)  <b>2. Console</b> a. Check the keyboard function b. Check the mouse function  <b>3. Transmitter</b> a. Test switch over unit to play to standby and vice versa	<b>1. General</b>   <b>2. Console</b> a. Check the recording function b. Check the play back function  <b>3. Transmitter</b> a. Measure DC level terminal with equipment condition "ON"	<b>1. General</b> a. Clean the dust on the UPS and Stabilizer  <b>2. Console</b> a. Clean air circulation filter (fan)  <b>3. Transmitter</b> a. Checking the transmitter working frequency	<b>1. General</b> a. Check Battery of UPS, do replacement if necessary  <b>2. Console</b> a. Check system operation thoroughly  <b>3. Transmitter</b> a. Measurement of power output  b. VSWR measurement	





## AERONAUTICAL TELECOMMUNICATION FACILITIES

FACILITY : RADIO NAVIGATION AIDS

EQUIPMENT: VERY HIGH FREQUENCY OMNI DIRECTIONAL  
RANGE (VOR)

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
<b>1 General</b> a. Check the TX room temperature  b. Check the power supply voltage out of the Stabilizer and UPS	<b>1 General</b> a. Check the input power supply voltage of Main Supply or Genset	<b>1 General</b> a. Clean the entire Shelter of the equipment  b. Check Obstacle around the shelter  c. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration	<b>1 General</b> a. Clean all equipment thoroughly	<b>1 General</b>	<b>1 General</b> a. Check lightning protection and grounding system.  b. Check condition of supply cable and control cable	
<b>2 Transmitter</b> a. Check all indicators  b. Check all Monitor Indicators  c. Check Tone Identification	<b>2 Transmitter</b> a. Record meter reading on VOR system  b. Perform Change Over Unit	<b>2 Transmitter</b> a. Perform Ground Check/inspection as per approved Ground Check Form  b. Check operational equipment using backup power supply	<b>2 Transmitter</b> a. Check Auto Transfer  b. Reassign Main /Standby Transmitter	<b>2 Transmitter</b> a. Check Carrier output power  b. Check Station Ident  c. Check Antenna VSWR d. Check carrier frequency	<b>2 Transmitter</b> a. Check Audio Frequency	

<b>3 RCSU</b> a. Check RCSU/RSU panel indicator b. Check RCSU/RSU alarm indicator	<b>3 RCSU</b>	<b>3 RCSU</b> a. Clean RCSU/RSU front panel	<b>3 RCSU</b> a. Visual Inspection b. RCSU Operational Check c. Station Alarm Check	e. Check operating frequency f. Verify BITE Wattmeter Calibration g. Verify BITE Frequency Counter Calibration h. Verify BITE VSWR Calibration <b>3 RCSU</b>	<b>3 RCSU</b> a.
<b>4 Antenna</b>	<b>4 Antenna</b>	<b>4 Antenna</b>	<b>4 Antenna</b> a. Perform Inspection of field monitor Antenna  b. Clean the field monitor antenna from debris	<b>4 Antenna</b>	<b>4 Antenna</b> a. Perform Inspection of antenna system (carrier and sideband)

**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY : RADIO NAVIGATION AIDS

EQUIPMENT : DISTANCE MEASURING EQUIPMENT (DME)

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
<b>1 General</b> a. Check the TX room temperature  b. Check the power supply voltage out of the Stabilizer and UPS  <b>2 Transmitter</b> a. Check all indicators  b. Check all Monitor Indicators	<b>1 General</b> a. Check the input power supply voltage of Main Supply or Genset  <b>2 Transmitter</b> a. Check meter reading on DME system  b. Perform Change Over Unit	<b>1 General</b> a. Clean the entire Shelter of the equipment  b. Check Obstacle around the shelter  c. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration <b>2 Transmitter</b> a. Perform Ground Check/inspection as per approved Ground Inspection Form b. Check operational equipment using backup power supply	<b>1 General</b> a. Clean all equipment thoroughly  b.  <b>2 Transmitter</b> a. Perform Remote DME Certification Check b. Reassign Main /Standby Transmitter	<b>1 General</b>          <b>2 Transmitter</b> a. Perform Transmitter Frequency Performance Check b. Receiver frequency performance check	<b>1 General</b> a. Check lightning protection and grounding system.  b. Check condition of supply cable and control cable          <b>2 Transmitter</b> a. Perform Local full Diagnostics	

c. Check Tone Identification				c. Interrogator frequency performance check d. Transmitter pulse performance check e. Transmitter power output performance check f. Receiver and Decoder performance check g. Transponder reply delay performance check h. Identification frequency performance check i. Monitor Interrogation performance check j. Monitor shutdown/transfer control performance check k. Monitor alarm integrity performance check		
<b>3 RCSU</b> a. Check RCSU/RSU panel indicator	<b>3 RCSU</b>	<b>3 RCSU</b> a. Clean RCSU/RSU front panel	<b>3 RCSU</b> a. Visual Inspection	<b>3 RCSU</b>	<b>3 RCSU</b> a. -	

b. Check RCSU/RSU alarm indicator			b. RCSU Operational Check c. Station Alarm Check			
4 Antenna	4 Antenna	4 Antenna	4 Antenna	4 Antenna a. Perform Inspection of Antenna b. Clean the antenna from debris	4 Antenna	

**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY : RADIO NAVIGATION AIDS

EQUIPMENT :

INSTRUMENT LANDING SYSTEM

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	7
<b>1 General</b> a. Check the TX room temperature  b. Check the power supply voltage out of the Stabilizer and UPS	<b>1 General</b> -  a.	<b>1 General</b> a. Clean the entire Shelter of the equipment  b. Check Obstacle around the shelter  c. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration	<b>1 General</b> a. Clean all equipment thoroughly  b.	<b>1 General</b> a. -	<b>1 General</b> a. Check lightning protection and grounding system.  b. Check condition of supply cable and control cable	
<b>2 Localizer</b> a. Check all indicators	<b>2 Localizer</b> a. Check meter reading on Localizer system	<b>2 Localizer</b> a. Perform Ground Check/inspection as per approved Ground Inspection Form	<b>2 Localizer</b> a. Check Spurious Modulation	<b>2 Localizer</b> a. Check unwanted Modulation	<b>2 Localizer</b> a. Check polarization	

b. Check Monitor Indicators  c. Check alarm indicator  d. Check Tone Identification	b. Perform Change Over Unit	b. Check operational equipment using backup power supply	b. Check Coverage  c. Check Auto Transfer  d. Reassign Main /Standby Transmitter		b. Check frequency synthesizer for carrier /and clearance frequency. c. Check transmitter signals with respect to further parameters like harmonics or spurious d. Take a complete memory readout of all possible parameters	Perform Phase Modulation every 3 years
3 <b>Glide Path</b> a. Check all indicators  b. Check Monitor Indicators	3 <b>Glide Path</b> a. Check meter reading on Glide path system  b. Perform Change Over Unit	3 <b>Glide Path</b> a. Perform Ground Check/inspection as per approved Ground Inspection Form  b. Check operational equipment using backup power supply	3 <b>Glide Path</b> a. Check Spurious Modulation  b. Check Coverage	3 <b>Glide Path</b> a. Check unwanted Modulation	3 <b>Glide Path</b> a. Check polarization  b. Check frequency synthesizer for carrier /and clearance frequency.	

c. Check alarm indicator			c. Check Auto Transfer		c. Check transmitter signals with respect to further parameters like harmonics or spurious	
			d. Reassign Main /Standby Transmitter		d. Take a complete memory readout of all possible parameters	
<b>4 RCSU</b>	<b>4 RCSU</b>	<b>4 RCSU</b>	<b>4 RCSU</b>	<b>4 RCSU</b>	<b>4 RCSU</b>	
a. -	a. -	a. Clean RCSU/RSU front panel	a. Visual Inspection		a. UPS Battery Check	
			b. RCSU Operational Check			
			c. Station Alarm Check			
<b>5 Antenna</b>	<b>5 Antenna</b>	<b>5 Antenna</b>	<b>5 Antenna</b>	<b>5 Antenna</b>	<b>5 Antenna</b>	
a. -	a. -	a. Perform Inspection of Antenna				
		b. Clean the antenna from debris				



**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY: SURVEILLANCE

EQUIPMENT: PRIMARY SURVEILLANCE RADAR (PSR)  
SECONDARY SURVEILLANCE RADAR/  
MONOPULSE SECONDARY SURVEILLANCE RADAR  
(SSR/MSSR)

MAINTENANCE ACTIVITIES						REMARK
DAILY	WEEKLY	MONTHLY	QUARTERLY	SEMESTER	YEARLY	
1	2	3	4	5	6	
<b>1 General</b> a. Check the TX room temperature	<b>1 General</b> a. Clean the entire Shelter of the equipment  b. Check the input power supply voltage of Main Supply or Genset  c. Check the power supply voltage out of the Stabilizer and UPS	<b>1 General</b> a. Check Obstacle around the shelter  b. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration	<b>1 General</b> a. Clean all equipment thoroughly  b. Check battery function by simulating a power failure	<b>1 General</b>	<b>1 General</b>	
<b>2 Antenna</b>	<b>2 Antenna</b>	<b>2 Antenna</b> a. Check Oil Level and evidence of oil leaks  b. Check for abnormal noise or vibration  c. Visual inspection of Moving part	<b>2 Antenna</b>	<b>2 Antenna</b> a. Check for Grease antenna rotation mechanism	<b>2 Antenna</b> a. Check state of guides visually for oxidation of flanges  b. Check VSWR at the guide input  c. Check losses in the guide	

er reading TE	3 <b>Transmitter</b> a. Perform Ground Check / Inspection as per approved ground inspection form  b. Check and adjust Transmitter frequency  c. Check and Adjust Pulse Repetition Frequency d. Check and Adjust all Pulse Shape	3 <b>Transmitter</b>	3 <b>Transmitter</b> a. Calibrate all meters and indicators	3 <b>Transmitter</b>	
nge Over					
er reading TE	4 <b>Receiver</b> a. Perform Ground Check / Inspection as per approved ground inspection form  b. Check RF Amplifier Gain	4 <b>Receiver</b>	4 <b>Receiver</b> a. Calibrate all meter and indicator	4 <b>Receiver</b>	
nge Over					
er reading TE	5 <b>Extractor &amp; Processing</b>	5 <b>Video Extractor &amp; Processing</b>	5 <b>Video Extractor &amp; Processing</b> a. Check all settings of Video Extractor	5 <b>Video Extractor &amp; Processing</b>	

6 Radar Maintenance Display	6 Radar Maintenance Display	6 Radar Maintenance Display	6 Radar Maintenance Display	6 Radar Maintenance Display	6 Radar Maintenance Display	
		<ul style="list-style-type: none"> <li>a. Check all light indicators</li> <li>b. Check all functions of display switch/button</li> <li>c. Observe the synthetic view/image (track, label, character)</li> <li>d. Check the functionality of the Keyboard</li> <li>e. Check the function of Mouse / Trackball</li> <li>f. Check the Brightness of the screen</li> <li>g. Check the transponder test and observe all targets on the monitor screen</li> </ul>			<ul style="list-style-type: none"> <li>a. Visual Inspection and Cleaning</li> </ul>	

**LIST OF PREVENTIVE MAINTENNACE ACTIVITY  
AERONAUTICAL TELECOMMUNICATION FACILITIES**

FACILITY : AUTOMATION

EQUIPMENT:

ATC SYSTEM

MAINTENANCE ACTIVITIES						REMARK
DAILY 1	WEEKLY 2	MONTHLY 3	QUARTERLY 4	SEMESTER 5	YEARLY 6	
a. Check ATC System input status (AFTN, AMHS, etc.)	a. Check operational of Air Situation Display (ASD) reply	a. Clean outer part of console and CPU of ATC System	a. Reboot server of ATC system	a. Update layout of ATC System	a. clean inner part of CPU's server of ATC system	
b. Check Radars input status	b. Check working light and mapping light of console desk	b. Clean outer part of console and CPU of ATC System replay	b. Reboot CWP's / Nodes of ATC system	b. Update network connection of ATC system	b. Clean inner part of CPU and keyboard of CWP's /Nodes	
c. Check server status	c. Clean ATC system display	c. Change over server of ATC system	c. reboot Server and CWP's of ATC system replay	c. Update layout of ATC replay System	c. Clean inner part of CPU and keyboard of replay's server	
d. Check CWP's/nodes status		d. Restart CWP's/nodes of ATC system		d. Update network connection of ATC replay system		
e. Check replies status						
f. Check other related system status (i.e., simulator, traces file, billing file tape recorder, etc.)						



[illegible]

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:		Brand/Type	:	
Site Location	:		Month	:	
Facility	:	Communication	Year	:	
Equipment	:	Direct Speech			

ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Daily Maintenance																																
a. -																																
Weekly Maintenance																																
a. Check the cleanliness of iPOS and indicators																																
Monthly Maintenance																																
a. Check physical equipment condition																																
Quarterly Maintenance																																
a. Check the connection with the related section/unit																																
Technician /Engineer																																
Chief/Supervisor																																

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:		Brand/Type	:	
Site Location	:		Month	:	
Facility	:	Communication	Year	:	
Equipment	:	Voice Switching Communication System			

ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
<b>Daily Maintenance</b>																																
1. General																																
a. -																																
2. System Management																																
a. Check the monitor brightness																																
3. Position Control																																
a. Check the monitor brightness																																
b. Check the Monitor and Control Station - Status Display																																
c. Check the status of RAID (if Applicable)																																
d. Check the status of Duplicated MCS -Server (if Applicable)																																
<b>Weekly Maintenance</b>																																
1. General																																
a. Clean the entire equipment from dust / dirt																																
b. Check the room temperature																																
2. System																																
a. Check the event Log																																
b. Check the cleanliness of the rack																																
3. Position Control																																
a. Cek Monitor/function Indicator																																
b. Check the Touch Screen Panel																																
c. Clean the touch Panel																																
<b>Monthly Maintenance</b>																																
1. General																																
a. -																																
2. System																																
a. Check the power supply voltage of PLN / Genset																																
b. Check the output power supply voltage of UPS / Stabilizer																																
3. Position Control																																
a. Clean the MCS screen																																
Technician /Engineer																																
Chief/Supervisor																																



## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name :  
 Site Location :  
 Facility : Communication  
 Equipment : Very High Frequency (VHF) Air to Ground  
 Transmitter Rack No. :

Brand/Type : .....  
 Month : .....  
 Year : .....

ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
<b>Daily Maintenance</b>																																
<b>1. General</b>																																
a. Check the TX room temperature																																
b. Check the power supply voltage out of the Stabilizer and UPS																																
<b>2. Transmitter</b>																																
a. Check all indicator s																																
b. Check LCD / Main Screen																																
<b>3. Receiver Rack</b>																																
a. Check all indicator																																
b. Check LCD / Main Screen																																
<b>4. Antenna</b>																																
a. -																																
<b>Weekly Maintenance</b>																																
<b>1. General</b>																																
a. Clean the entire Shelter of the equipment																																
<b>2. Transmitter Rack</b>																																
a. Check meter reading based on BITE																																
b. Check Change over switch function																																
<b>3. Receiver</b>																																
a. Check meter reading based on BITE																																
b. Check Change over switch function																																
<b>4. Antenna</b>																																
a. -																																
<b>Monthly Maintenance</b>																																
<b>1. General</b>																																
a. Check Obstacle around the shelter																																
b. Check Obstacle around the shelter																																
c. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration																																
<b>2. Transmitter</b>																																
a. Perform performance check as per approved form																																
b. Check operational equipment using backup power supply																																
<b>3. Receiver</b>																																
a. Perform performance check as per approved form																																
b. Check operational equipment using backup power supply																																
<b>4. Antenna</b>																																
a. -																																
Technician /Engineer																																
Chief/Supervisor																																

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name		Brand/Type	
Site Location		Month	
Facility	Communication	Year	
Equipment	Automatic Terminal Information Service		

ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
<b>Daily Maintenance</b>																																
<b>1. General</b>																																
a. Check the TX room temperature																																
<b>2. Console</b>																																
a. Check the monitor's brightness setting																																
b. Check the Indicator of each Unit of Equipment																																
<b>3. Transmitter</b>																																
a. Check the fan (fan) air conditioner																																
b. Check all indicator lights																																
<b>Weekly Maintenance</b>																																
<b>1. General</b>																																
a. Clean the entire equipment from dust / dirt																																
b. Check the power supply voltage																																
<b>2. Console</b>																																
a. Check the connection system between units																																
<b>3. Transmitter</b>																																
a. Check the transmitter indicators locally and remotely																																
<b>Monthly Maintenance</b>																																
<b>1. General</b>																																
a. Check the backup power supply system (UPS)																																
<b>2. Console</b>																																
a. Check the keyboard function																																
b. Check the mouse function																																
<b>3. Transmitter</b>																																
a. Test switch over unit to play to standby and vice versa																																
Technician /Engineer																																
Chief/Supervisor																																

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:		Brand/Type	:	
Site Location	:		Month	:	
Facility	:	Communication	Year	:	
Equipment	:	Voice Recorder			

ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
<b>Daily Maintenance</b>																																
1. General																																
a. Check the TX room temperature																																
2. Management System																																
a. Check recording file																																
b. Check channel status indicator																																
3. Work Station																																
a. Check hardware status																																
<b>Weekly Maintenance</b>																																
1. General																																
a. Clean the equipment room																																
b. Clean the equipment, unit / part of equipment or module																																
c. Check main power supply																																
d. Check output UPS/backup supply																																
2. Management System																																
a. Check all events in the event log file																																
3. Work Station																																
a. Check mouse and keyboard function																																
<b>Monthly Maintenance</b>																																
1. General																																
a. Check UPS's battery																																
2. Management System																																
a. Do hard disk data back up																																
3. Work Station																																
a. Clean screen display																																
Technician /Engineer																																
Chief/Supervisor																																

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name :  
 Site Location :  
 Facility : Radio Navigation Aids  
 Equipment : VHF Omni Range (VOR)

Brand/Type : .....  
 Month : .....  
 Year : .....

ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
<b>Daily Maintenance</b>																																
<b>1 General</b>																																
a. Check the TX room temperature																																
b. Check the power supply voltage out of the Stabilizer and UPS																																
<b>2 Transmitter</b>																																
a. Check all indicators																																
b. Check all Monitor Indicators																																
c. Check Tone Identification																																
<b>3 RCSU</b>																																
a. Check RCSU/RSU panel indicator																																
b. Check RCSU/RSU alarm indicator																																
<b>4 Antenna</b>																																
a. -																																
<b>Weekly Maintenance</b>																																
<b>1 General</b>																																
a. Check the input power supply voltage of Main Supply or Genset																																
<b>2 Transmitter</b>																																
a. Check meter reading on VOR system																																
b. Perform Change Over Unit																																
<b>3 RCSU</b>																																
a. -																																
<b>4 Antenna</b>																																
a. -																																
<b>Monthly Maintenance</b>																																
<b>1 General</b>																																
a. Clean the entire Shelter of the equipment																																
b. Check Obstacle around the shelter																																
c. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration																																
<b>2 Transmitter</b>																																
a. Perform Ground Check/inspection as per approved Ground Check Form																																
b. Check operational equipment using backup power supply																																
<b>3 RCSU</b>																																
a. Clean RCSU/RSU front panel																																
<b>4 Antenna</b>																																
a. -																																
Technician /Engineer																																
Chief/Supervisor																																



# PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name :  
 Site Location :  
 Facility : Radio Navigation Aids  
 Equipment : Instrument Landing System (ILS)

Brand/Type :  
 Month :  
 Year :

ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
<b>Daily Maintenance</b>																																
<b>1. General</b>																																
a. Check the TX room temperature																																
b. Check the power supply voltage out of the Stabilizer and UPS																																
<b>2. Localizer</b>																																
a. Check all indicators																																
b. Check all Monitor Indicators																																
c. Check Alarm Indicator																																
d. Check Tone Identification																																
<b>3. Glide Path</b>																																
a. Check all indicators																																
b. Check all Monitor Indicator																																
c. Check Alarm Indicator																																
<b>4. RCSU</b>																																
a. -																																
<b>5. Antenna</b>																																
a. -																																
<b>Weekly Maintenance</b>																																
<b>1. General</b>																																
a. -																																
<b>2. Localizer</b>																																
a. Check meter reading on Localizer system																																
b. Perform Change Over Unit																																
<b>3. Glide Path</b>																																
a. Check meter reading on Glide path system																																
b. Perform Change Over Unit																																
<b>4. RCSU</b>																																
a. -																																
<b>5. Antenna</b>																																
a. -																																
<b>Monthly Maintenance</b>																																
<b>1. General</b>																																
a. Clean the entire Shelter of the equipment																																
b. Check Obstacle around the shelter																																
c. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration																																
<b>2. Localizer</b>																																
a. Perform Ground Check/inspection as per approved Ground Inspection Form																																
b. Check operational equipment using backup power supply																																
<b>3. Glidepath</b>																																
a. Perform Ground Check/inspection as per approved Ground Inspection Form																																
b. Check operational equipment using backup power supply																																
<b>4. RCSU</b>																																
a. Clean RCSU/RSU front panel																																
<b>5. Antenna</b>																																
a. Perform Inspection of Antenna																																
b. Clean the antenna from debris																																
Technician /Engineer																																
Chief/Supervisor																																

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ACTIVITIES	DATE																															REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
<b>Monthly Maintenance</b>																																
<b>1. General</b>																																
a. Check Obstacle around the shelter																																
b. Perform physical check of shelter inside and out, for any sign of water filtration, damage, or other deterioration																																
<b>2. Antenna</b>																																
a. Check Oil Level and evidence of oil leaks																																
b. Check for abnormal noise or vibration																																
c. Visual inspection of Moving part																																
<b>3. Transmitter</b>																																
a. Perform Ground Check / Inspection as per approved ground inspection form																																
b. Check and adjust Transmitter frequency																																
c. Check and Adjust Pulse Repetition Frequency																																
d. Check and Adjust all Pulse																																
<b>4. Receiver</b>																																
a. Perform Ground Check / Inspection as per approved ground inspection form																																
b. Check RF Amplifier Gain																																
<b>5. Extractor and Processing</b>																																
a. -																																
<b>6. Radar Maintenance Display</b>																																
a. Check all indicators																																
b. Check all functions of display switch/button																																
c. Observe the synthetic view/image (track, label, character)																																
d. Check the functionality of the Key board																																
e. Check the function of Mo-use / Trackball																																
f. Check the Brightness of the screen																																
g. Check the transponder test and observe all targets on the monitor screen																																
Technician /Engineer																																
Chief/Supervisor																																



## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:		Brand/Type	:	
Site Location	:		Month	:	
Facility	:	Automation	Year	:	
Equipment	:	ATC System			

ACTIVITIES	DATE																															REMARK	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Daily Maintenance																																	
a. Check ATC System input status ( AFTN, AMHS, etc)																																	
b. Check Radars input status																																	
c. Check server status																																	
d. Check CWP's/nodes status																																	
e. Check reply status																																	
f. Check other related system status (i.e. simulator, traces file, billing file tape recorder, etc)																																	
Weekly Maintenance																																	
a. Check operational of Air Situation Display (ASD) reply																																	
b. Check working light and maping light of console desk																																	
c. Clean ATC system display																																	
Monthly Maintenance																																	
a. Clean outpart of console and CPU of ATC System																																	
b. Clean outpart of console and CPU of ATC System replay																																	
c. Change over server of ATC system																																	
d. Restart CWP's/nodes of ATC system																																	
Technician /Engineer																																	
Chief/Supervisor																																	



## Appendix 2B

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:		Brand/Type	:	.....
Site Location	:		Month	:	.....
Facility	:	Communication	Year	:	.....
Equipment	:	AUTOMATIC MESSAGE HANDLING SYSTEM			

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
<b>1. General</b>													
a. Inspect all connectors													
<b>2. Supervisory</b>													
a. Check interconnection system													
<b>3. Reject Edit</b>													
a. Check interconnection system													
<b>Semester Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. Supervisory</b>													
a. Check the software function													
<b>3. Reject Edit</b>													
a. Check the software function													
<b>Yearly Maintenance</b>													
<b>1. General</b>													
a. Clean the dust on the UPS and Stabilizer													
b. Replace battery of UPS if necessary													
<b>2. Supervisory</b>													
a. Check the cooling fan function of the rack													
<b>3. Reject Edit</b>													
a. clean filter cooling system CPU													
Technician / Engineer													
Chief/Supervisor													

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:												Brand/Type	:	
Site Location	:												Month	:	
Facility	:	Communication											Year	:	
Equipment	:	Direct Speech													

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
a. Check the connection with the related section/unit													
<b>Semester Maintenance</b>													
a. -													
<b>Yearly Maintenance</b>													
a. -													
Technician /Engineer													
Chief/Supervisor													

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:		Brand/Type	:	
Site Location	:		Month	:	
Facility	:	Communication	Year	:	
Equipment	:	VOICE SWITCHING COMMUNICATION SYSTEM			

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
<b>1. General</b>													
a. Export the Monitor And Control Station configuration for backup													
<b>2. System Management</b>													
a. -													
<b>3. Position Control</b>													
a. -													
<b>Semester Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. System Management</b>													
a. -													
<b>3. Position Control</b>													
a. -													
<b>Yearly Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. System Management</b>													
a. -													
<b>3. Position Control</b>													
a. -													
Technician /Engineer													
Chief/Supervisor													

### PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:				Brand/Type	:	
Site Location	:				Month	:	
Facility	:	Communication			Year	:	
Equipment	:	VERY HIGH FREQUENCY AIR TO GROUND					

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
<b>1. General</b>													
a. Clean all equipment thoroughly													
<b>2. Transmitter</b>													
a. Perform Transmitter Power calibration													
b. Check VSWR													
c. Measure DC level terminal with ON equipment condition													
<b>3. Receiver</b>													
a. Measure DC level terminal with ON equipment condition													
<b>4. Antenna</b>													
a. -													
<b>Semester Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. Transmitter</b>													
a. Check the coverage range by plane													
<b>3. Receiver</b>													
a. -													
<b>4. Antenna</b>													
a. Perform antenna inspection													
<b>Yearly Maintenance</b>													
<b>1. General</b>													
a. Check lightning protection and grounding system.													
b. Check condition of power supply cable and control cable													
<b>2. Transmitter</b>													
a. Check all the external connector s are securely fitted													
b. Perform frequency measurement using frequency counter													
c. Perform a BIT Interruptive Test													
d. Perform an AC and DC Change over check (if both supplies are connected)													
<b>3. Receiver</b>													
a. Check all the external connector s are securely fitted													
b. perform frequency measurement using frequency counter													
c. Perform a BIT Interruptive Test													
d. Perform an AC and DC Change over check (if both supplies are connected)													
<b>4. Antenna</b>													
a. -													
Technician /Engineer													
Chief/Supervisor													

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:							Brand/Type	:	
Site Location	:							Month	:	
Facility	:	Communication						Year	:	
Equipment	:	AUTOMATIC TERMINAL INFORMATION SERVICE								

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
1. General													
a. -													
2. Console													
a. Check the recording function													
b. Check the play back function													
3. Transmitter													
a. Measure DC level terminal with equipment condition "ON"													
<b>Semester Maintenance</b>													
1. General													
a. Clean the dust on the UPS and Stabilizer													
2. Console													
a. Clean air circulation filter (fan)													
3. Transmitter													
a. Checking the transmitter working frequency													
<b>Yearly Maintenance</b>													
1. General													
a. Check Battery of UPS, do replacement if necessary													
2. Console													
a. Check system operation thoroughly													
3. Transmitter													
a. Measurement of power output													
b. VSWR measurement													
Technician /Engineer													
Chief/Supervisor													

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:													Brand/Type	:	
Site Location	:													Month	:	
Facility	:	Communication												Year	:	
Equipment	:	VOICE RECORDER														

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
1. General													
a. -													
2. Management System													
a. Do hard disk data cloning, if necessary													
3. Work Station													
a. Perform audio quality measurements of recorded items													
<b>Semester Maintenance</b>													
1. General													
a. -													
2. Management System													
a. Check performance of voice recorder software													
3. Work Station													
a. Check the PC function													
<b>Yearly Maintenance</b>													
1. General													
a. -													
2. Management System													
a. Check the connection from server to hardware													
b. Check replay function													
3. Work Station													
a. Check interconnection from server to hardware													
b. Perform replacement of hard disk, if needed													
Technician /Engineer													
Chief/Supervisor													



### PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:									Brand/Type	:	
Site Location	:									Month	:	
Facility	:	Radio Navigation Aids								Year	:	
Equipment	:	VHF Omni Range (VOR)									:	

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
<b>1. General</b>													
a. Clean all equipment thoroughly													
<b>2. Transmitter</b>													
a. Check Auto Transfer													
b. Reassign Main /Standby Transmitter													
<b>3. RCSU</b>													
a. Visual Inspection													
b. RCSU Operational Check													
c. Station Alarm Check													
<b>4. Antenna</b>													
a. Perform Inspection of field monitor Antenna													
b. Clean the field monitor antenna from debris													
<b>Semester Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. Transmitter</b>													
a. Check Carrier output power													
b. Check Station Ident													
c. Check Antenna VSWR													
d. Check carrier frequency													
e. Check operating frequency													
f. Verify BITE Wattmeter Calibration													
g. Verify BITE Frequency Counter Calibration													
h. Verify BITE VSWR Calibration													
<b>3. RCSU</b>													
a. -													
<b>4. Antenna</b>													
a. -													
<b>Yearly Maintenance</b>													
<b>1. General</b>													
a. Check lightning protection and grounding system.													
b. Check condition of supply cable and control cable													
<b>2. Transmitter</b>													
a. Check Audio Frequency													
<b>3. RCSU</b>													
a. UPS Battery Check													
<b>4. Antenna</b>													
a. Do Inspection of antenna system (Carrier and Sideband)													
Technician /Engineer													
Chief/Supervisor													

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:		Brand/Type	:	
Site Location	:		Month	:	
Facility	:	Radio Navigation Aids	Year	:	
Equipment	:	Distance Measuring Equipment (DME)			

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
<b>1. General</b>													
a. Clean all equipment thoroughly													
<b>2. Transmitter</b>													
a. Perform Remote DME Certification Check													
b. Reassign Mian /Standby Transmitter													
<b>3. RCSU</b>													
a. Visual Inspection													
b. RCSU Operational Check													
c. Station Alarm Check													
<b>4. Antenna</b>													
a. -													
<b>Semester Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. Transmitter</b>													
a. Perform Transmitter Frequency Performance Check													
b. Receiver frequency performance check													
c. Interrogator frequency performance check													
d. Transmitter pulse performance check													
e. Transmitter power output performance check													
f. Receiver and Decoder performance check													
g. Transponder reply delay performance check													
h. Identification frequency performance check													
i. Monitor Interrogation performance check													
j. Monitor shutdown/transfer control performance check													
k. Monitor alarm integrity performance check													
<b>3. RCSU</b>													
a. -													
<b>4. Antenna</b>													
a. Perform Inspection of Antenna													
b. Clean the antenna from debris													

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Yearly Maintenance</b>													
<b>1 General</b>													
a. Check lightning protection and grounding system.													
b. Check condition of supply cable and control cable													
<b>3 RCSU</b>													
a. -													
<b>4 Antenna</b>													
a. -													
Technician /Engineer													
Chief/Supervisor													

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name	:									Brand/Type	:	.....
Site Location	:									Month	:	.....
Facility	:	Radio Navigation Aids								Year	:	.....
Equipment	:	Instrument Landing System (ILS)										

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
<b>1. General</b>													
a. Clean all equipment thoroughly													
<b>2. Localizer</b>													
a. Check Spurious Modulation													
b. Check Coverage													
c. Check Auto Transfer													
d. Reassign Main /Standby Transmitter													
<b>3. Glide Path</b>													
a. Check Spurious Modulation													
b. Check Coverage													
c. Check Auto Transfer													
d. Reassign Main /Standby Transmitter													
<b>4. RCSU</b>													
a. Visual Inspection													
b. RCSU Operational Check													
c. Station Alarm Check													
<b>5. Antenna</b>													
a. -													
<b>Semester Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. Localizer</b>													
a. Check unwanted Modulation													
<b>3. Glide Path</b>													
a. Check unwanted Modulation													
<b>4. RCSU</b>													
a. -													
<b>5. Antenna</b>													
a. -													

MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Yearly Maintenance</b>													
<b>1 General</b>													
a. Check lightning protection and grounding system.													
b. Check condition of supply cable and control cable													
<b>2 Localizer</b>													
a. Check polarization													
b. Check frequency synthesizer for carrier /and clearance frequency.													
c. Check transmitter signals with respect to further parameters like harmonics or spurious													
d. Take a complete memory readout of all possible parameters													
<b>3 Glide Path</b>													
a. Check polarization													
b. Check carrier frequency													
c. Take a complete memory readout of all possible parameters													
<b>4 RCSU</b>													
a. UPS Battery Check													
<b>5 Antenna</b>													
a. -													
Technician /Engineer													
Chief/Supervisor													



MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Yearly Maintenance</b>													
<b>1. General</b>													
a. -													
<b>2. Antenna</b>													
a. Check state of guides visually for oxidation of flanges													
b. Check VSWR at the guide input													
c. Check losses in the guide													
<b>3. Transmitter</b>													
a. -													
<b>4. Receiver</b>													
a. -													
<b>5. Extractor &amp; Processing</b>													
a. -													
<b>6. Radar Maintenance Display</b>													
a. Visual Inspection and Cleaning													
Technician /Engineer													
Chief/Supervisor													

## PREVENTIVE MAINTENANCE ACTIVITIES CHECKLIST

Airport Name														Brand/Type			: .....
Site Location														Month			: .....
Facility	AUTOMATION													Year			: .....
Equipment	: ATC SYSTEM																

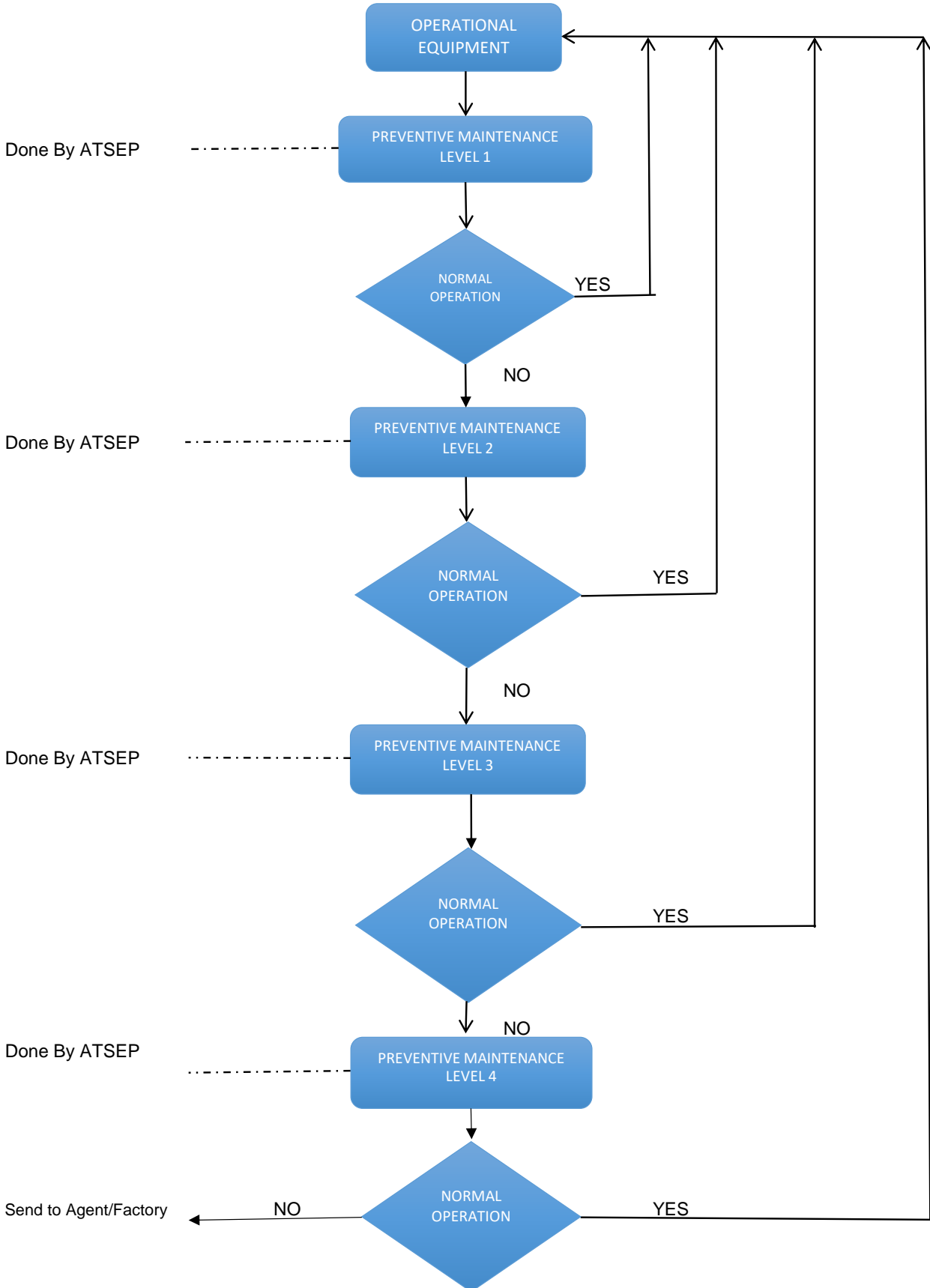
MAINTENANCE ACTIVITY	MONTH / YEAR												REMARK
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Quarterly Maintenance</b>													
a. Reboot server of ATC system													
b. Reboot CWP's / Nodes of ATC system													
c. reboot Server and CWP's of ATC system replay													
<b>Semester Maintenance</b>													
a. Update layout of ATC System													
b. Update network connection of ATC system													
c. Update layout of ATC replay System													
d. Update network connection of ATC replay system													
<b>Yearly Maintenance</b>													
a. clean inner part of CPU's server of ATC system													
b. Clean inner part of CPU and keyboard of CWP's /Nodes													
c. Clean inner part of CPU and keyboard of replay's server													
Technician /Engineer													
Chief/Supervisor													



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**FLOWCART PREVENTIVE MAINTENANCE  
AERONAUTICAL TELECOMMUNICATIO/RADIO NAVIGATION FACILITIES**



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## Appendix 4

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## Appendix 5

### GUIDANCE ON EQUIPMENT EVALUATION

#### A. Calculation of MTBF

Mean time between failures (MTBF) is the actual operating time of a facility divided by the total number of failures of the facility during that period of time. The operating time is in general chosen so as to include at least five, and preferably more, facility failures in order to give a reasonable measure of confidence in the figure derived.

The following formula is used to calculate MTBF.

$$\text{MTBF} = \frac{\text{Actual operating time}}{\text{Number of failures}}$$

#### B. Facility Reliability

Facility Reliability is the probability that the ground installation operates within the specific tolerance. This definition refers to the probability that the facility will operate for a specified period.

1. The following formula expresses facility reliability as a percentage:

$$R = 100 e^{-t/m}$$

where:

R = reliability (probability that the facility will be operative within the specified tolerances for a time t , also referred to as probability of survival, Ps );

e = base of natural logarithms;

t = time period of interest;

m = mean time between facility failures.

the above formula is true for the majority of electronic equipment's where the failures follow a Poisson distribution. It will not be applicable during the early life of an equipment when there is a relatively large number of premature failures of individual components; neither will it be true when the equipment is nearing the end of its useful life.

Reliability increases as mean time between failures (MTBF) increases. For a high degree of reliability, and for operationally significant values of **t**, we must have a large MTBF; thus, MTBF is another more convenient way of expressing reliability

For example:

A conventional navigation equipment has MTBF = 1000 hours, time period of interest  $t = 24$  hours, then reliability R/PS of the equipment is:

$$\begin{aligned} R/PS &= 100 e^{-24/1000} \% \\ &= 100 e^{-0.024} \% \\ &= 97.6 \% \end{aligned}$$

i.e. the likelihood of facility failure during 24 hours period is about 2.4 %

2. The Factors which affect MTBF, and Facility Reliability are:
  - a. Inherent equipment reliability.
  - b. Degree and type of *redundancy*.
  - c. Reliability of serving utilities such as power and telephone or control lines.
  - d. Degree and quality of maintenance.
  - e. Environmental factors such as temperature and humidity.

Figure F-1 shows the probability of facility survival,  $P_s$ , after a time period,  $t$ , for various values of MTBF

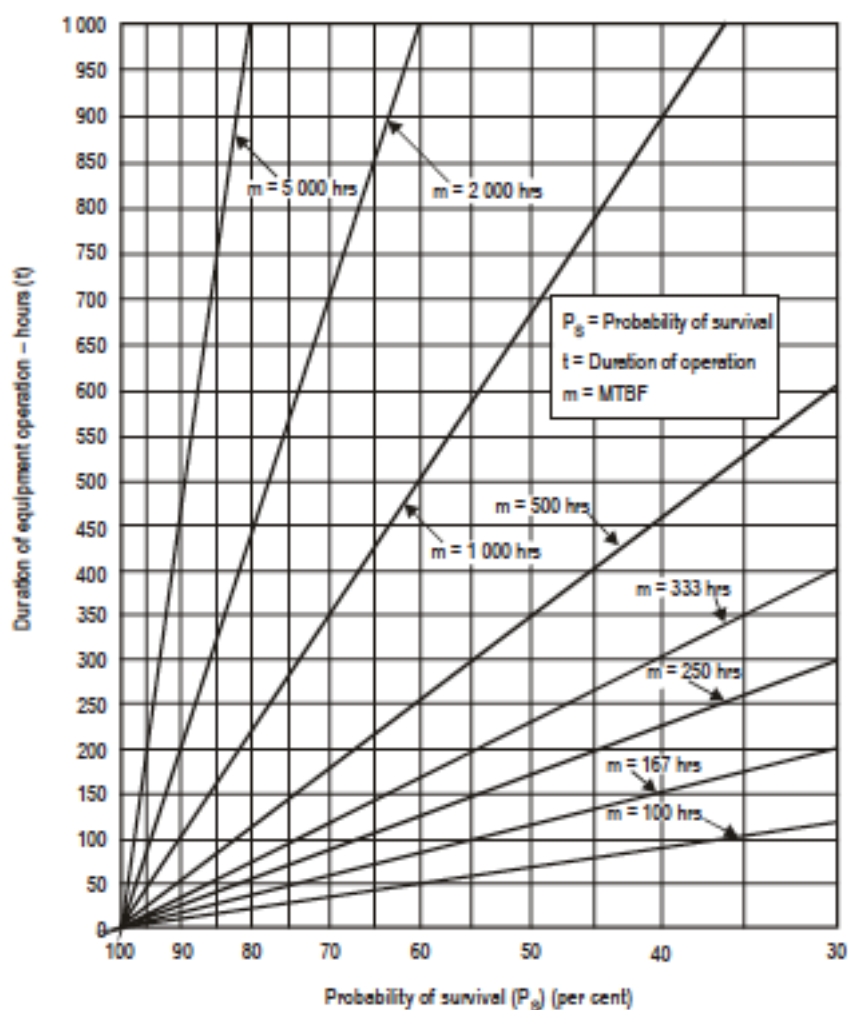




Figure - 1. Graphic  $P_s = 100 e^{-t/m}$ 

## C. Availability

1. The availability of equipment indicates the degree of readiness of an equipment or group of equipment to operate. Availability is a comparison between the actual operating time and the time of operation specified in a given period and expressed in percent.

Expressed in the formula,

$$A = \frac{\text{Actual operating time}}{\text{The specified operating time}} \times 100 \%$$

Example : if a equipment operates normally for 700 hours from 720 hours (24 hours x 30) in a month, availability of the equipment for that month is:

$$A = \frac{700}{720} \times 100 \%$$

$$= 97.2 \%$$

2. Factors which affect the level of equipment availability are:

- a. facility reliability.
- b. quick response of maintenance personnel to failure.
- c. adequate training of maintenance personnel.
- d. equipment design providing good component accessibility and maintainability.
- e. efficient logistic support.
- f. provision of adequate test equipment.
- g. standby equipment and/or utilities

## D. Practical Aspect of reliability and availability

The basic quantity and manner of reliability and availability measurement are indicated in Figure 2.

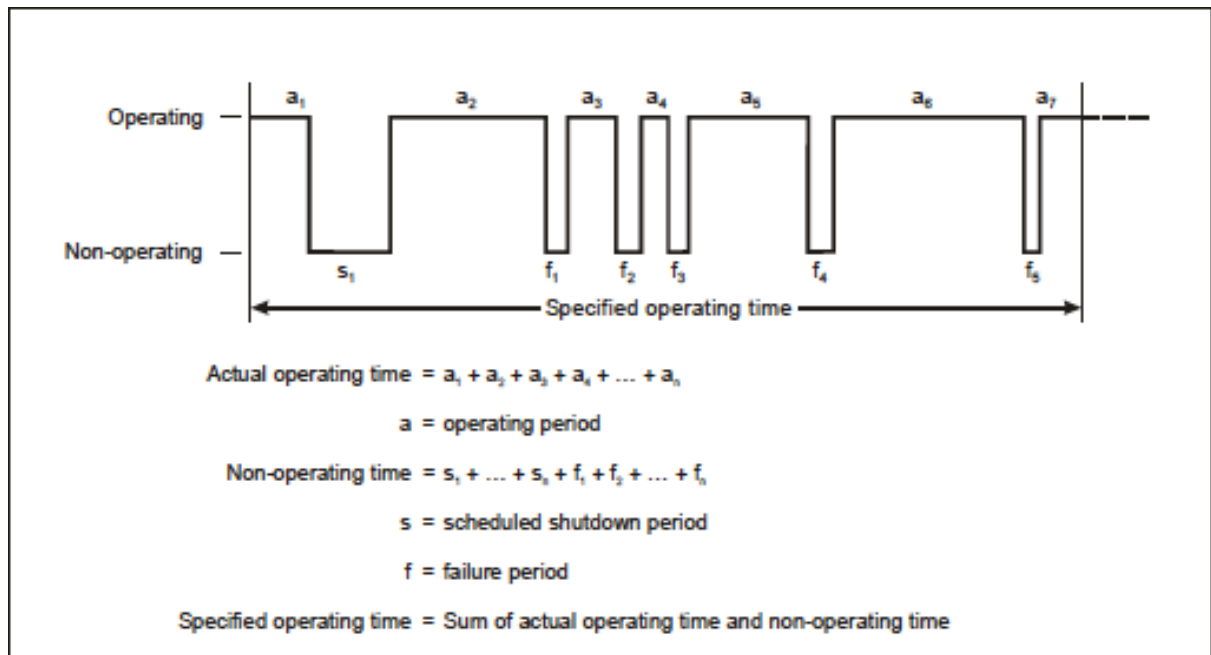


Figure 2. Evaluation of facility availability and reliability

Referred to figure 2, the calculation of the mean time between failure (MTBF) and availability (A)

Example:

$$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 + a_7 = 5540 \text{ hours}$$

$$s_1 = 20 \text{ hours}$$

$$f_1 = 2 \frac{1}{2} \text{ j hours}$$

$$f_2 = 6 \frac{1}{4} \text{ hours}$$

$$f_3 = 3 \frac{3}{4} \text{ hours}$$

$$f_4 = 5 \text{ hours}$$

$$f_5 = 2 \frac{1}{2} \text{ hours}$$

$$\text{Number of failures} = 5 \text{ times}$$

$$\text{The specified operating time} = 5580 \text{ hours}$$

$$\text{MTBF} = \frac{\text{Actual operating time}}{\text{Number of failures}}$$

$$= \frac{\sum_{i=1}^7 a_i}{5}$$

$$= \frac{5540}{5} = 1108 \text{ hours}$$

$$A = \frac{\text{Actual Operating Time}}{\text{Specified Operating Time}} \times 100 \%$$

$$= \frac{\sum_{i=1}^7 a_i \times 100}{\sum_{i=1}^7 a_i + s_1 + \sum_{i=1}^5 f_i}$$

$$= \frac{5540}{5580} \times 100 \% = 99.3 \%$$

#### E. Calculation of Mean Time To Repair (MTTR)

$$\text{MTTR} = \frac{\text{Total of time the equipment is not operating due to failure}}{\text{Number of Failure}}$$

$$= \frac{\sum_{i=1}^5 f_i}{5}$$

$$= \frac{2 \frac{1}{2} + 6 \frac{1}{4} + 3 \frac{3}{4} + 5 + 2 \frac{1}{2}}{5} = \frac{20}{5} = 4 \text{ hours}$$

#### F. ILS CLASIFICATION.

ILS classification system is given in conjunction with the current facility performance categories to provide a more comprehensive method of describing an ILS system.

The ILS Localizer classification is defined by using three characters as follows:

- a) I, II or III: this character indicates conformance to Facility Performance Category in Annex 10 Volume I Chapter 3, 3.1.3.
- b) A, B, C, T, D or E: this character defines the ILS points to which the localizer structure conforms to the course structure given at Annex 10 Volume I Chapter 3, 3.1.3.4.2, except the letter T, which designates the runway threshold. The points are defined in Chapter 3, 3.1.1.
- c) 1, 2, 3 or 4: this number indicates the level of integrity and continuity of service of the localizer as defined in Annex 10 Volume I Chapter 3, 3.1.3.12 and summarized in Table F-1.

The ILS glide path classification is defined by using three characters as follows:

- a) I, II or III: this character indicates conformance to Facility Performance Category in Chapter 3, 3.1.3 and 3.1.5.
- b) A, B, C or T: this character defines the ILS points to which the glide path structure conforms to the path structure given at Chapter 3, 3.1.5.4.2, except the letter T, which designates the runway threshold. The points are defined in Chapter 3, 3.1.1.
- c) 1, 2, 3 or 4: this number indicates the level of integrity and continuity of service of the glide path as defined in Chapter 3, 3.1.5.8 and summarized in Table F-1.

As an example, a Facility Performance Category II — localizer which meets the localizer course structure criteria appropriate to a Facility Performance Category II — localizer down to ILS point "D" and conforms to the integrity and continuity of service objectives of Level 3 would be described as class II/D/3.

ILS classes are appropriate only to the ground ILS element. Consideration of operational categories must also include additional factors such as operator capability, critical and sensitive area protection, procedural criteria and ancillary aids, such as transmissometers and lights.

Level	Localizer or glide path		
	Integrity	Continuity of service	MTBO (hours)
1		Not demonstrated, or less than required for Level 2	
2	$1 - 10^{-7}$ in any one landing	$1 - 4 \times 10^{-6}$ in any period of 15 seconds	1 000
3	$1 - 0.5 \times 10^{-9}$ in any one landing	$1 - 2 \times 10^{-6}$ in any period of 15 seconds	2 000
4	$1 - 0.5 \times 10^{-9}$ in any one landing	$1 - 2 \times 10^{-6}$ in any period of 30 seconds (localizer) 15 seconds (glide path)	4 000 (localizer) 2 000 (glide path)
<p><i>Note.— For currently installed systems, in the event that the Level 2 integrity value is not available or cannot be readily calculated, it is necessary to at least perform a detailed analysis of the integrity to assure proper monitor fail-safe operation.</i></p>			

Table F-1 Integrity and Continuity of service objectives

## G. INTEGRITY AND CONTINUITY FOR INSTRUMENT LANDING SYSTEM

### 1) Introduction.

Integrity is needed to ensure that an aircraft on approach will have a low probability of receiving false guidance and continuity of service is needed to ensure that an aircraft in the final stages of approach will have a low probability of being deprived of a guidance signal.

Integrity and continuity of service are both key safety factors during the critical phase of approach and landing. The integrity and continuity of service must be known from an operational viewpoint in order to decide the operational application which an ILS could support.

The requirements for integrity and high continuity of service require highly reliable systems to minimize the probability of failure which may affect any characteristic of the total signal-in-space. It is suggested that ANSP endeavour to achieve reliability with as large a margin as is technically and economically reasonable. Reliability of equipment is governed by basic construction and operating environment. Equipment should be operated in environmental conditions appropriate to the manufacturers' design criteria.

It is generally accepted, irrespective of the operational objective, that the average rate of a fatal accident during landing, due to failures or shortcomings in the whole system, comprising the ground equipment, the aircraft, and the pilot, should not exceed  $1 \times 10^{-7}$ . This criterion is frequently referred to as the global risk factor. In the case of Category, I operations, responsibility for assuring that the above objective is not exceeded is vested more or less completely in the pilot. In Category III operations, the same objective is required but must now be inherent in the whole system. In this context it is of the utmost importance to endeavour to achieve the highest level of integrity and continuity of service of the ground equipment.

### 2) ILS Integrity.

#### 2.1 Achievement and retention of integrity service levels

An integrity failure can occur if radiation of a signal which is outside specified tolerances is either unrecognized by the monitoring equipment or the control circuits fail to remove the faulty signal. Such a failure might constitute a hazard if it results in a gross error.

The highest order of protection is required against the risk of undetected failures in the monitoring and associated control system. This would be achieved by careful design to reduce the probability of such occurrences to a low level and provide fail-safe operations compliant with the ICAO Standards of Annex 10 Volume I Chapter 3, 3.1.3.11.4 and 3.1.5.7.4, and by carrying out maintenance checks on the monitor system performance at intervals which are determined by a design analysis.

The following formula applies to certain types of ILS and provides an example of the determination of system integrity,  $I$ , from a calculation of the probability of transmission of undetected erroneous radiation,  $P$ .

$$(1) \quad I : 1 - P$$

$$P : \frac{T_1 T_2}{\alpha_1 \alpha_2 M_1 M_2} \quad \text{when } T_1 < T_2$$

where

I : integrity

P : the probability of a concurrent failure in transmitter and monitor systems resulting in erroneous undetected radiation

M<sub>1</sub> : transmitter mean time between failures (MTBF)

M<sub>2</sub> : MTBF of the monitoring and associated control system

$\frac{1}{\alpha_1}$  : ratio of the rate of failure in the transmitter resulting in the of an erroneous signal to the rate of all transmitter failures

$\frac{1}{\alpha_2}$  : ratio of the rate of failure in the monitoring and associated control system resulting in inability to detect an erroneous signal to the rate of all monitoring and associated control system failures

T<sub>1</sub> : period of time (in hours) between transmitter checks

T<sub>2</sub> : period of time (in hours) between checks on the monitoring and associated control system

When  $T_1 \geq T_2$  the monitor system check may also be considered a transmitter check. In this case, therefore  $T_1 = T_2$  and the formula would be:

$$(2) \quad P : \frac{T_2}{\alpha_1 \alpha_2 M_1 M_2}$$

Since the probability of occurrence of an unsafe failure within the monitoring or control equipment is extremely remote, to establish the required integrity level with a high degree of confidence would necessitate an evaluation period many times that needed to establish the equipment MTBF. Such a protracted period is unacceptable and therefore the required integrity level can only be predicted by rigorous design analysis of the equipment

## 2.2 Data Collection and Analysis

Integrity calculation required total outage data collection at least for one-year operational period. Data is categorized based on nature of fault, the cause and time of occurrence as shown in form G-1. It is recognized that total failures in the for G-1 will not cause total outage of the facility. Only few of them caused an outage and remaining will cause change over to the transmitter.

The monitor consists of inbuilt integrity test. It is required to initiate a fault to check the performance of monitor and associated control system. The time period between checks for both transmitters and monitor shall be recorded. Then, details of integrity calculation required is tabulated in form G-2a to G-2d.

Form G-1 - Categorization

## Nature of Fault and Number of events

SR	Nature of Fault	Number of Events
1	Failure of facility due to power supply problem	
2	Antenna and Antenna Cable faults	
3	Modules problem	
4	Remote status indication failure due to transmission media	
5	RCMS or RMM Software problem	
6	Failure due to bad connector, wire and component	
7	Failure Due to lightning, bad weather and storm	
8	Interlock failure between Runway In Use	

9	Obstruction and passage of vehicle and men at NFM and FFM	
10	Failure of facility with unknown cause	



FORM G-2a

Calculation of Transmitter MTBF (M1)

Airport :

Date	ILS Runway selected	Equipment in Operation	Scheduled Operating Time ( A )		Non-Operating Time				Actual Operating Time (AOT) ( A - B )	No. of Failures ( C )	Remark/Signature
					(B)						
					Scheduled Shutdown of TX		Shutdown of TX due to other reason				
		LLZ/GP	From	To	From	To	From	To	Hrs		
TOTAL											
Transmitter MTBF M1 ( Total AOT/ No. Failures)			:								

Form G-2b

Calculation of Monitoring and Associated Control system MTBF (M2)

Airport :

Date	ILS Runway selected	Equipment in Operation	Scheduled Operating Time ( A )		Non-Operating Time				Actual Operating Time (AOT) ( A - B )	No. of Failures ( C )	Remark/Signature
					(B)						
					Scheduled Shutdown of TX		Shutdown of TX due to other reason				
		LLZ/GP	From	To	From	To	From	To	Hrs		
TOTAL											
Monitoring and Assciated Control MTBF M2 ( Total AOT/ No. Failures)			:								

Form G-2c

Calculation of  $1/\alpha_1$   
( C1/D1 )

Airport :

Date	ILS Runway selected	Equipment in Operation	Operating Time		Failures of Transmitter due to Radiation of Erroneous Signal (refer to RMS log Alarm) (A1)		Failures of Transmitter due to all reasons (from user point of view) and Refer Indicator Monthly Report (B1)		Rate of Failure of A1 (total failures times per no. of failures)	Rate of Failure of B1 (total failures times per no. of failures)	Remark/Signature
		LLZ/GP	From	To	From	To	From	To	C1	D1	
TOTAL											
$1/\alpha_1$ ( C1/D1 )		:									

Form G-2d

Calculation of Monitoring and Associated Control system MTBF (M2)  
( C2 / D2 )

Airport :

Date	ILS Runway selected	Equipment in Operation	Operating Time		Failure of Monitor / Associated Control Unit due inability to detect an erroneous Signal (Monitor self-certification activated) (A2)		Failure of Monitor / Associated Control Unit due all reasons (B2)		Rate of Failure of A2 (total failures times per no. of failures)	Rate of Failure of B2 (total failures times per no. of failures)	Remark/Signature
		LLZ/GP	From	To	From	To	From	To	C2	D2	
TOTAL											
1/α2 ( C2/D2 )		:									



### 3. ILS Continuity

#### 3.1 Achievement and retention of continuity of service level

ILS level continuity of service requires Mean Time Between Outage (MTBO) to be confirmed by evaluation in an operational environment. Outage is defined as any unanticipated cessation of signal in space. The evaluation of MTBO take into account the impact of operational factors, such as airport environment, inclement weather condition, power availability, quality and frequency of maintenance. MTBO is related to MTBF, but is not equivalent. Some equipment failures, such as a failure of transmitter resulting in the immediate transfer to a standby transmitter and may not necessarily result in an outage. For continuity of service level 2,3 or 4 the evaluation period should be sufficient to determine achievement of the required level with a high degree of confidence.

Sequential test method is one of method that can be used to demonstrate the continuity standard are met. In term of service provider decide to use the method, then the following consideration will be applied:

- a. The minimum acceptable confidence level is 60 per cent. To achieve the confidence level of 60 per cent, the evaluation period has to be longer than the required MTBO hours. Typically, these minimal evaluation periods for new and subsequent installations are for Level 2, 1 600 operating hours, for Level 3, 3 200 hours and for Level 4, 6 400 hours.

To assess the seasonal influence of the environment, a minimal evaluation period of one year is typically required for a new type of installation in a particular environment. It may be possible to reduce this period in cases where the operating environment is well controlled and similar to other proven installations. Where several identical systems are being operated under similar conditions, it may be possible to base the assessment on the cumulative operating hours of all the systems; this will result in a reduced evaluation period. Once a higher confidence level is obtained for a type of installation, subsequent installation of the same type of equipment under similar operational and environmental conditions may follow shorter evaluation periods;

- b. During the evaluation period, it should be decided for each outage if it is caused by a design failure or if it is caused by a failure of a component due to its normal failure rate. Design failures are, for instance, operating components beyond their specification (overheating, overcurrent, overvoltage, etc. conditions). These design failures should be dealt with such that the operating condition is brought back to the normal operating condition of the component or that the component is replaced with a part suitable for the operating conditions. If the design failure is treated in this way, the evaluation may continue and this outage is not counted, assuming that there is a high probability that this design failure will not occur again. The same applies to outages due to any causes which can be mitigated by permanent changes to the operating conditions.

An assigned continuity of service level should not be subject to frequency change. A suitable method to assess the behaviour of particular installation is to keep the records and calculate the average MTBO over the last five to eight failures of the equipment. This weighs the MTBO for continuity of service purpose to be more relevant to the next approach, rather than computing MTBO over the lifetime of the equipment. If continuity of the service deteriorates, the assigned designation should be reduced until improvement in performance can be effected.

The following documents may be consulted for additional guidance and details to calculate the continuity of service of ILS:

European Guidance Material on Continuity of Service Evaluation in Support of the Certification of ILS & MLS Ground Systems, EUR DOC 012

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## Appendix 6

## **FACILITY PERFORMANCE MONTHLY REPORT**

AIRPORT	:									
FACILITY	:	Communication/Navigation/Surveillance/Automation*								
MONTH/YEAR	:									

[illegible]

Operational Color Indicator :	-	Normal Operation	=	O /	Green Color											
	-	Intermittent / Decrease operation	=	- /	Yellow Color											
	-	Failure Operation	=	X /	Red Color		<b>Chief of Facility</b>									
	-	Disruption on supporting equipment	=	V /	Blue Color											

\* : Choose the appropriate

Date of Issue 13-Jun-22: |

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## Appendix 6A

## FAILURE AND CORRECTIVE ACTION REPORT

NO.	DESCRIPTION	DATA											
1.	Date/Month/Year												
2.	Location/Site Name												
3.	Facility												
4.	Equipment Name												
5.	Part Of Equipment Name												
6.	Failure Category												
7.	Failure Description												
8.	Corrective Action							By			SITE		FACTORY
9.	Cause of Failure												
10.	Date of Failure							Problem Code ET - No Equipment Test FC - Waiting for Flight Check T/E - No Technician/Engineer SP - Waiting for Spare Part TR - No Transportation SAT - Not Site Acceptance Yet DW - Due to Weather AR - Another Reason (Pls Explain) NO- No Obstacle/Problem					
	Time of Failure												
11.	Date of Corrective Action												
	Time of Corrective Action Complete												
12.	Total Failure Hours												
13.	Problem Code												
Known By													
CHIEF OF FACILITY/		Person In Charge of Corrective Action											
Signature		Signature											

## LIST OF EQUIPMENT and CONDITION

**NOTE :** Condition (%) = (1-age of equipment in years/15)X100%

**Chief of Facility**

## LIST OF CORRECTIVE MAINTENANCE ACTIVITY

[illegible][illegible]

.....  
 CHIEF OF FACILITY  
 .....

\*\*\*\*\*E N D\*\*\*\*\*