



# **Manual of Standards - Aeronautical Telecommunication**

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## AMENDMENT RECORDS

The amendments listed below have been incorporated into this copy of the Manual of Standards – Aeronautical Telecommunication.

Amendment no.	Version no.	Subject	Source	Sections affected	Entered by (Date)	Approved by (Date)	Effective date
-	1.0	Original version	ICAO Annex 10 Volumes I to V incorporating Amendment 83	All	Ong Chuan Bin (1 Oct 2009)	Loo Chee Beng (1 Oct 2009)	1 Oct 2009
1	1.1	Table of Contents List of Effective Pages (deleted) Foreword Definitions Introduction Use of Units of Measurement Safety Directive, Safety Publication, Information Circular Exemption, deviation and non-compliance  Deletion of Certification	ICAO Annex 10 Volumes I to V incorporating Amendment 84  Arising from AAR Div's continual review of the MOS- ATE	Pg i, ii  Pg v Pg vi, vii  1.1, 1.3 1.7  1.8  1.9 - 1.11  2.1 - 2.5	Ong Chuan Bin (27 Apr 2010)	Loo Chee Beng (27 Apr 2010)	27 Apr 2010

Amendment no.	Version no.	Subject	Source	Sections affected	Entered by (Date)	Approved by (Date)	Effective date
		Requirements Safety Investigation and Safety Audit Human Factors Safety Investigation Documents and Records Certification Process and Requirements Appendices		3.2.1(c)(iv),(v) 5.3 7.2 8.1.1 Chapter 9  Appendix 1			
2	2.0		Ministerial Directions No. 1/2010		AAR Div (30 July 2010)	Chief Executive (30 July 2010)	30 July 2010
3	2.1	Foreword	CAAS(ANS) (Amendment) Directions 2011 ICAO Annex 10 Volumes I to V Amendment 85	Pg v	AAR Div (4 January 2011)	Authority 12 January 2011	12 January 2011

Amendment no.	Version no.	Subject	Source	Sections affected	Entered by (Date)	Approved by (Date)	Effective date
4	2.2	Foreword Definitions and Abbreviations Introduction SMS Introduction SMS Implementation Plan, Documentation Safety Assurance Safety Audit Training & Personnel Requirement Safety Case Safety Investigation	Arising from AAR Division's continual review of the MOS-ATE  ICAO Annex 19	Pg vi Pg vii, ix Pg 1-1,1-2,1-3  Pg 3-1 3-2 3-3 3-4 4-1  5-2 7-1	AAR Division (25 June 2014)	Authority (25 June 2014)	4 July 2014
5	2.3	Training, competency assessment and approval of ATSEP	Arising from ICAO amendment to PANS-Training	Definitions and Abbreviations (Pg. vii, ix) Chapter 4	AAR Division ( 10 January 2017)	Authority (26 January 2017)	1 Feb 2017

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# FOREWORD

Pursuant to paragraph 5 of the Ministerial Direction No. 1/2010 [as amended by the CAAS (ANS) (Amendment) Directions 2011], this Manual of Standards – Aeronautical Telecommunication is issued by CAAS specifying the national standards, requirements and procedures pertaining to the planning, operation and maintenance of aeronautical telecommunication facilities by the air navigation service provider within the Singapore Flight Information Region.

The standards in this Manual are based on those stipulated in Annex 10 (entitled “Aeronautical Telecommunications”) to the Convention on International Civil Aviation [as in force and amended from time to time by the Council of the International Civil Aviation Organisation (ICAO)] and other relevant ICAO documents, and with such modifications as may be determined by CAAS to be applicable in Singapore.

Readers should forward advice of errors, inconsistencies or suggestions for improvement to this Manual to the addressee stipulated below.

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# DEFINITIONS AND ABBREVIATIONS

## Definitions

### **Aeronautical Information Publication**

A publication issued by and with the authority of the State and containing aeronautical information of a lasting character essential to air navigation

### **Aeronautical Information Services**

A service established within the defined area of coverage responsible for the provision of aeronautical data and aeronautical information necessary for the safety, regularity and efficiency of air navigation.

### **Aeronautical telecommunication service**

Provision of any communication, navigation and surveillance services for any aeronautical purpose, including any system that processes or displays air traffic control data

### **Air Traffic Safety Electronic Personnel**

Personnel engaged in the installation, operation or maintenance of a Communication, Navigation, Surveillance or Air Traffic Management (CNS/ATM) system and includes the personnel of a contractor

### **Facility**

Equipment, building or services that support an aeronautical telecommunication service

### **Malfunction incident**

Incident related to the malfunction or failure of a facility

### **Maintenance contractor**

An organisation contracted by the air navigation service provider to operate and maintain its facility on its behalf

### **Notice to Airmen**

A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service or procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations

### **Safety case**

A process that documents the evidence and argument that a facility or change to a facility meets the safety objectives or levels for the facility

**Safety incident**

Any incident involving a hazard to the provision of ATE facility which may or may not result in a service malfunction. Examples of safety incidents include:

- a fire or explosion at a facility
- hazards in the facility maintenance process such as human error which may have safety implications
- security breaches at a facility which may have safety implications

**Serious service failure**

Loss of aeronautical telecommunication service which breaches the established safety performance targets

**System performance target**

A set of performance targets for each facility which an air navigation service provider sets out to achieve as spelt out in its operations manual.

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## **Abbreviations**

<b>AAR</b>	Aerodrome and Air Navigation Services Regulation
<b>ADS-B</b>	Automatic Dependent Surveillance-Broadcast
<b>AIP</b>	Aeronautical Information Publication
<b>ANSP</b>	Air Navigation Service Provider
<b>ATC</b>	Air Traffic Control
<b>ATSEP</b>	Air Traffic Safety Electronic Personnel
<b>ATSIC</b>	Air Traffic Service Information Circular
<b>ATSSP</b>	Air Traffic Service Safety Publication
<b>ATS</b>	Air Traffic Service
<b>ATM</b>	Air Traffic Management
<b>ICAO</b>	International Civil Aviation Organisation
<b>IT</b>	Information Technology
<b>IVCS</b>	Integrated Voice Communication System
<b>ILS</b>	Instrument Landing System
<b>SARPS</b>	Standards and Recommended Practices
<b>SMS</b>	Safety Management System

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# Chapter 1 Introduction

- 1.1 This Manual of Standards – Aeronautical Telecommunication contains the standards, requirements and procedures pertaining to the planning, operation and maintenance of aeronautical telecommunication facilities.
- 1.2 This Manual is based mainly on compliance with the following ICAO documents:
- (a) ICAO Annex 10 Volumes I to V – Aeronautical Telecommunication;
  - (b) ICAO Annex 11 – Air Traffic Services;
  - (c) ICAO Annex 19 – Safety Management;
  - (d) ICAO Doc 8071 Volumes I to III – Testing of Ground-based and Satellite-based Radio Navigation Systems and Surveillance Radar Systems;
  - (e) ICAO Doc 9859 – Safety Management Manual;
  - (f) ICAO Doc 4444 (ATM/501) – Procedures for Air Navigation Services;
  - (g) ICAO Doc 9868 - PANS-Training; and
  - (h) ICAO Doc 10057 – ATSEP Training Manual
- 1.3 An ANSP shall ensure that the aeronautical telecommunication service that it provides is in conformity with the provisions in this Manual and complies with all the SARPS in ICAO Annex 10 Volumes I to V.
- 1.4 Where there is a difference between a standard in this Manual and that of the above-mentioned ICAO documents, the standard in this Manual shall prevail.
- 1.5 Differences, where they exist, between the standards in this Manual and those contained in the ICAO Annexes shall be published in section GEN 1.7 of the Singapore AIP and also notified to ICAO.
- 1.6 (Reserved)
- 1.7 The ANSP shall ensure that the units of measurement as specified in the Manual of Standards – Units of Measurement to be used in Air and

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Ground Operations are used for the provision of aeronautical telecommunication service.

- 1.8 In addition to the Manual of Standards, the following may also be issued as and when required to supplement the Manual of Standards:
- (a) Safety Directive – this is a mandatory requirement to be complied by the ANSP. It is published for purposes of immediate promulgation of local standards and recommended practices in response to, but not limited to, amendments to ICAO Annexes. The Safety Directives will be incorporated into subsequent amendments of the Manual of Standards.
  - (b) Safety Publication – this is published for purposes of promulgating supplementary guidance materials to the standards and recommended practices in the Manual of Standards. The publications are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the Manual of Standards. Safety Publications may explain certain regulatory requirements by providing interpretive and explanatory materials.
  - (c) Information Circular – this is published for purposes of bringing to the attention of the ANSP educational materials related to aviation safety. The publications could be initiated as a result of ICAO State letters which do not require immediate changes to local regulations, new safety initiatives or international best practices as identified by AAR Division. The ANSP is encouraged to review and adopt the material if practicable. Where appropriate, the material in the publications may be incorporated into subsequent amendments of the Manual of Standards.
- 1.9 When an ANSP is not able to comply with any standards specified or referenced in this Manual, the ANSP shall apply to AAR Division for exemption or deviation from the relevant standards. Applications shall be supported in writing with the reasons for such exemption or deviation including any safety assessment or other studies undertaken, and where appropriate, an indication of when compliance with the current standards can be expected.
- 1.10 Any exemption or deviation granted to an ANSP shall also be recorded in the operations manual. The operations manual shall also contain the details of the exemption or deviation, such as the reason that the exemption or deviation was requested and any resultant limitations or conditions imposed.

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## Chapter 2 Operations Manual

### 2.1 Operations Manual

2.1.1 The ANSP shall develop an operations manual which shall serve to demonstrate how the ANSP will comply with the requirements of the Manual of Standards - Aeronautical Telecommunication. It also serves as a reference document agreed between the ANSP and AAR Division with respect to the standards, conditions and level of service to be maintained for the aeronautical telecommunication service.

2.1.2 The contents of the operations manual shall contain:

- (a) the information required of the ANSP as mentioned in this Manual;
- (b) an organization chart of the ANSP and its maintenance contractors, if any, that shows the position of each personnel and the name, qualification, experience, duties and responsibilities of personnel who are responsible for ensuring the compliance of the organization with the requirements in sub-paragraph (a);
- (c) an overall operation and maintenance plan for the aeronautical telecommunication service, and for each facility, an operation and maintenance plan, as described in Chapter 6 of this Manual;
- (d) for each facility, information on the compliance of the facility with the applicable requirements of ICAO Annex 10; and
- (e) the system performance target of each facility, such as its availability and reliability.

2.1.3 The operations manual may consist of a main manual covering the main areas that need to be addressed, as well as separate supporting documents and manuals (such as the operation and maintenance plan of each facility) that are referred to in the main manual.

2.1.4 The operations manual is an important document and shall be issued under the authority of the ANSP. The ANSP shall control the distribution of the operations manual and ensure that it is amended whenever necessary to maintain the accuracy of the information in the operations manual and to keep its contents up to date.

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## Chapter 3 Safety Management System

### 3.1 Introduction

#### 3.1.1 The ANSP shall establish a Safety Management System (SMS).

*Note 1- The SMS to be implemented should not be just document or compliance-driven but should be fully integrated with the ANSP's day-to-day operations and should involve its entire staff, including that of its maintenance contractors, if any.*

*Note 2- The key to a successful SMS is that all staff, from managers to engineers and technicians should be trained to understand the need for SMS, and this understanding should permeate to all staff to the lowest levels. It requires a change in attitude from all staff towards safety and the service provider should work towards nurturing a safety culture within the organization and its maintenance contractors.*

### 3.2 SMS Framework

#### 3.2.1 The SMS to be established shall comply with an SMS framework consisting of the following key components:

##### (a) Safety Policy and Objectives

###### (i) Management commitment and responsibility

The SMS shall have a clear definition of the philosophy and fundamental approach the ANSP will adopt for the management of safety within its organization. This includes setting the safety policies and how they relate to the operation and maintenance processes of the service provider. The policies shall also clearly encapsulate the senior management's commitment to improve safety in the organization as a top priority, with the provision of the necessary human and financial resources for its implementation. The safety policy shall be periodically reviewed to ensure it remains relevant.

###### (ii) Safety accountabilities

The SMS shall have clear lines of safety accountabilities within the organization, including a direct accountability for safety on the part of senior management. Safety accountabilities shall be documented and communicated throughout the organization.

(iii) Appointment of key safety personnel

The ANSP shall appoint a safety manager to serve as the focal point and driving force for the implementation and maintenance of SMS activities. However, the safety manager should not be held solely responsible for safety. Specific safety activities and the functional or operational safety performance and outcome are the responsibility of the relevant operational or functional managers and staff.

(iv) SMS implementation plan

The ANSP shall develop and maintain an SMS implementation plan that defines the organisation's approach to manage safety in a manner that meets the organisation's safety needs. The SMS implementation plan shall be endorsed by senior management of the organization.

(v) Documentation

A SMS manual shall be produced as part of the operations manual, as this is the key instrument for guiding and communicating the organisation's SMS approach and methodology to the whole organization. Guidance on the production of an SMS manual can be found in ICAO Doc 9859.

**(b) Safety Risk Management**

(i) Hazard identification process

The ANSP shall develop and maintain a formal process for effectively collecting, recording, acting on and generating feedback about hazards in operations, based on a combination of reactive, proactive and predictive methods of safety data collection.

(ii) Risk assessment and mitigation process

The ANSP shall develop and maintain a formal risk management process that ensures analysis (in terms of probability and severity of occurrence), assessment (in terms of tolerability) and control (in terms of mitigation) of risks to an acceptable level.

**(c) Safety Assurance**

(i) Safety performance monitoring and measurement

- (1) The ANSP shall develop and maintain the means to verify the safety performance of the organization



compared to the safety policy and objectives, and to validate the effectiveness of safety risks controls. A safety incident reporting system shall be set up to collect any information on actual or potential hazards, maintenance errors or deficiencies and other safety incidents which are not normally reported in a formal fault reporting system.

- (2) The ANSP shall establish the safety performance indicators and targets of its SMS and submit them to AAR Division for agreement. Details on the establishment of safety performance indicators and targets can be found in ICAO Document 9859.

(ii) The management of change

The ANSP shall develop and maintain a formal process to identify changes within the organization which may affect established processes and services. A risk assessment shall be carried out before the implementation of such changes, such as when upgrading or modification is made to an aeronautical telecommunication facility, in order to ensure safety performance.

(iii) Continuous improvement of the SMS

The ANSP shall develop and maintain a formal process to identify the causes of sub-standard performance of the SMS, determine the implications of sub-standard performance in operations, and eliminate such causes, in order to ensure the continual improvement of the SMS.

(iv) Safety investigation

Safety investigation is critical to the effectiveness of an SMS, and it shall be used as a means to improve the service provider's SMS. It is through a systematic safety investigation of incidents that shortcomings of the SMS could be uncovered and rectified. Any serious service failure or safety incident shall be investigated by the service provider as it may be indicative of potentially serious hazards. A systematic investigation may uncover systemic problems which otherwise may remain unnoticed. Requirements for such investigation are found in Section 7.2 of this Manual.

(v) Safety audit

Regular internal safety audits shall be conducted by the service provider to assure the effectiveness of its SMS. The safety audit shall be conducted by a team of trained auditors who are familiar

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with the operation of the aeronautical telecommunication service, but also independent and not involved with the day to day operation of the service. Regular safety audits shall also be conducted on the maintenance contractors to monitor their safety performance and obtain feedback to further improve on their SMS implementation. Records of such safety audits and corrective follow up actions shall be kept.

**(d) Safety Promotion**

**(i) Training and education**

The ANSP shall develop and maintain a safety training programme to ensure that personnel are trained and competent to perform the SMS duties. The scope of the safety training shall be appropriate to each individual's involvement in the SMS.

**(ii) Safety communication**

The ANSP shall communicate and promote the organisation's SMS processes and activities to its entire staff, including that of the maintenance contractors, to ensure that staff is fully aware of the SMS. The ANSP shall develop and maintain formal means for safety communication to ensure that staff is fully aware why particular safety actions and procedures are introduced or changed.

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## Chapter 4 – Personnel, Training, Competency Assessment and Approval Requirement

### 4.1 Personnel Requirement

- 4.1.1 The ANSP shall ensure that it has a sufficient number of competent personnel to perform the operation and maintenance of the aeronautical telecommunication service.
- 4.1.2 The ANSP shall provide in the operations manual an analysis of the number of personnel required to perform the aeronautical telecommunication service for each facility taking into account the duties and workload required.
- 4.1.3 The ANSP shall develop a job description for each of its personnel which shall describe the job purpose, key responsibilities, and outcome to be achieved by each personnel.
- 4.1.4 An ATSEP who performs either of the following –
- (a) system, operational or functional checks, including associated parameter checks and system performance measurements;
  - (b) system, component or software inspection, installation, repair, maintenance and modification;
  - (c) scheduled as well as unscheduled maintenance tasks.
- shall be –
- (i) trained in accordance with paragraph 4.2;
  - (ii) assessed to be competent in accordance with paragraph 4.3; and
  - (iii) approved in accordance with paragraph 4.4.

### 4.2 Training of an ATSEP

- 4.2.1 The ANSP shall develop an ATSEP training programme that is acceptable to the ANS Regulator prior to its implementation.
- 4.2.2 The training programme shall be based on the ICAO Manual on Air Traffic Safety Electronics Personnel Competency-based Training and Assessment (Doc 10057) and the ATSEP competency framework

included in the PANS-Training (Doc 9868). These shall be adapted to suit Singapore's operating environment.

4.2.3 As a minimum, the training programme shall comprise three levels as described below:

- (a) Level 1 (Basic training). This shall comprise training on the basic CNS/ATM systems operating in Singapore and their impacts on the safety of aircraft operations. The ANSP shall ensure every ATSEP undergoes the basic training.
- (b) Level 2 (Qualification training). This shall comprise training on knowledge and skills on CNS/ATM systems within one of these domains - Communications, Navigation, Surveillance and ATM systems. The ANSP shall ensure each ATSEP is trained in one or more domains depending on his job scope.
- (c) Level 3 (Specialised training). This shall comprise training on specific CNS/ATM systems installed in Singapore, followed by on-the-job training. The ANSP shall ensure every ATSEP described in paragraph 4.1.4(a), (b) and (c) undergoes specialised training.

4.2.4 The ANSP shall conduct a yearly review of the training plan for each ATSEP at the beginning of the year to identify any gaps in competency or changes in training requirements and prioritise the type of training required for the coming year.

4.2.5 The ANSP shall keep record of individual ATSEP training, competency assessment and approval history, where applicable, and associated documents. The record shall be kept at least until the CNS/ATM system of which the ATSEP was trained on is no longer in use with the ANSP.

4.2.6 The individual training records for each of ATSEP shall include a training plan detailing the courses completed as well as the time-frame for attending future courses as required under his/her training plan.

### **4.3 Competency Assessment of an ATSEP**

4.3.1 The ANSP shall develop an assessment methodology to determine the competency of an ATSEP in accordance with the competency framework developed in PANS-Training and which shall be adapted to suit the local context.

4.3.2 The ANSP may select a person to be a competency assessor only if the person –

- (a) is an ATSEP approved in accordance with paragraph 4.4 for the particular CNS/ATM system; and

- (b) has received adequate training in the conduct of competency assessment, practical checks and oral questionings.

4.3.3 A competency assessor shall not conduct a competency assessment on an ATSEP who is under the direct supervision of the competency assessor, unless the assessment is done in the presence of a second independent assessor.

4.3.4 The assessment methodology shall include a process for on-going competency checking and refresher training to ensure retention of competence.

#### **4.4 Approval of an ATSEP**

4.4.1 The ANSP shall identify a unit (approval unit) to be responsible for the approval of an ATSEP before the ATSEP is allowed to undertake any functional checking and maintenance work on the CNS/ATM systems.

4.4.2 The approval unit shall be a unit that is involved in the planning, operations and/or maintenance of aeronautical telecommunication facilities and is independent of other operational departments in the ANSP.

4.4.3 The approval unit shall develop an approval process that is acceptable to the ANS Regulator prior to its administration.

4.4.4 The approval unit may approve an ATSEP only if the ATSEP has –

- (a) completed the three levels of training as described in paragraph 4.2.3; and
- (b) been assessed to be competent and suitable to perform the role of an approved signatory for works done on the CNS/ ATM system which the ATSEP has been trained on.

4.4.5 The approval unit shall –

- (a) issue an approval document to each approved ATSEP;
- (b) exercise appropriate administrative or remedial actions towards approval holders in event of negligence, incompetence or non-conformance; and
- (c) ensure that the approval holder is current in the respective CNS/ATM system before deploying him to perform functional checking and maintenance of the respective system.

## Chapter 5 – Commissioning of New Facility

### 5.1 Commissioning Procedures

5.1.1 The ANSP shall establish procedures to ensure that each new facility:

- (a) is commissioned to meet the specifications for that facility; and
- (b) is in compliance with the SARPS prescribed in ICAO Annex 10, where applicable.

5.1.2 The ANSP shall ensure that the system performance of the new facility has been validated by the necessary tests, and that all parties involved with the operations and maintenance of the facility, including its maintenance contractors have accepted and are satisfied with the results of the tests.

5.1.3 The ANSP shall ensure that procedures include documentation of tests conducted on the facility prior to the commissioning, including those that test the compliance of the facility with the applicable ICAO Annex 10 SARPS and any flight check required in compliance with ICAO Doc 8071.

### 5.2 Safety Case

5.2.1 The ANSP shall ensure that for safety critical systems, including automated ATC systems, IVCS and ILS, the commissioning of such systems shall include the conduct of a safety case or equivalent, e.g. Bowtie risk analysis method.

*Note 1 – A safety case is a structured and comprehensive analysis and documentation of the safety objectives, safety risk assessment and risk management of a system, starting from the definition of the operational requirement to the commissioning and commencement of operation of the system. It involves the identification of all the hazards associated with the system that provides the operational service, risk assessment of the hazards and the establishment of the necessary controls to ensure that the risks are managed. The end result is that all possible failures and fault modes have been identified and controls put in place to ensure that safe operation of the system is preserved under all modes.*

*Note 2 – A bow-tie analysis is a strategic risk management tool, whereby hazards and threats are identified on one side as a prelude to a top event and the consequences of the occurrence of a top event are also identified on the other side. A top event is an undesirable event with potential for*

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*harm or damage. Preventive controls are then identified to prevent threats from reaching the top event. Escalation factors which are issues that could compromise the*

*effectiveness of the preventive controls are further defined together with escalation controls to control these escalation factors. Please refer to Appendix 1 which shows a chart of the bow-tie analysis.*

- 5.2.2 The safety case report shall be submitted to AAR Division for comments and acceptance at least 1 month before the commencement of operation of the safety critical system.

### **5.3 Human Factors**

- 5.3.1 The ANSP should ensure that human factors principles are observed in the design, operation and maintenance of ATE facilities.

*Note – Guidance material on human factors principles can be found in the ICAO Human Factors Training Manual (Doc 9683) and Circular 249 (Human Factors Digest No. 11 – Human Factors in CNS/ATM Systems).*

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## Chapter 6 – Operation and Maintenance Plan

### 6.1 Safety Requirements for Overall Operation and Maintenance Plan

6.1.1 The ANSP shall establish an overall operation and maintenance plan for the aeronautical telecommunication service, which shall as a minimum meet the following safety requirements as stipulated in ICAO Doc 4444 (ATM/501), Chapter 2.

6.1.2 All facilities shall:

- (a) be tested for normal operations on a routine basis; and
- (b) meet the required level of reliability and availability.

6.1.3 In addition, the overall operation and maintenance plan shall:

- (a) provide for the timely and appropriate detection and warning of system failures and degradations;
- (b) include documentation on the consequences of system, sub-system and equipment failures and degradations; and
- (c) include measures to control the probability of failures and degradations.

### 6.2 Details of Operation and Maintenance Plan for Each Facility

6.2.1 In addition to the overall operation and maintenance plan, the ANSP shall establish an operation and maintenance plan for each facility. The plan shall include:

- (a) a procedure for the periodic inspection and testing of each facility to verify that it meets the operational and performance specifications of that facility;
- (b) details of flight test, if necessary, such as the standards and procedures to be used and flight test interval, which shall be in compliance with guidelines to ICAO Doc 8071 or any other appropriate ICAO document ;
- (c) the interval between periodic inspection and flight test and the basis for that interval. Whenever the interval is changed, the reasons for such change should be documented;
- (d) the operation and maintenance instructions for each facility;



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- (e) an analysis of the number of personnel required to operate and maintain each facility taking into account the workload required;
  - (f) the corrective plan and procedures for each facility, including such as whether the repair of modules and component are undertaken in-house or by equipment manufacturers; and
  - (g) the spare support plan for each facility.

### **6.3 Test Equipment**

6.3.1 The ANSP shall ensure that appropriate inspection, measuring and test equipment are available for staff to maintain the operation of each facility. The ANSP shall ensure the control, calibration and maintenance of such equipment so that they have the precision and accuracy necessary for the measurements and tests to be performed.

### **6.4 Interface Arrangement for Support Services**

6.4.1 The ANSP should formalize interface arrangements where applicable with external organisations in the form of service level agreements, detailing the following:

- (a) interface and functional specifications of the support service;
- (b) service level of the support service such as availability, accuracy, integrity and recovery time of failure of service; and
- (c) monitoring and reporting of the operational status of the service to the service provider.

*Note – Interface arrangements are arrangements that an ANSP has with other external organizations that provide support services which interconnect or interface with the aeronautical telecommunication service. Support services include leased circuit for voice or data communication, datalink services, radar, ADS-B or other electronic data sources of operational information.*

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# Chapter 7 – Facility Malfunction Incident and Radio Interference Reporting

## 7.1 Facility Malfunction Incident Reporting

7.1.1 The ANSP shall establish procedures for the reporting, collection and notification of facility malfunction incidents and safety incidents.

7.1.2 Reports of such incidents should be compiled and reviewed periodically by the ANSP with its maintenance contractors to:

- (a) determine the cause of the incidents and determine any adverse trends;
- (b) implement corrective and preventive actions where necessary to prevent recurrence of the incidents; and
- (c) implement any measures to improve the safety performance of the aeronautical telecommunication service

## 7.2 Safety Investigation

7.2.1 Any serious service failure or safety incident shall be reported to AAR Division within 24 hours of occurrence and be investigated by the ANSP. The purpose of the investigation should be to understand how and why the incident happened, including possible organizational contributing factors and to recommend actions to prevent a recurrence.

7.2.2 A copy of the investigation report shall be forwarded to AAR Division within 6 weeks of occurrence. The lessons learnt from such investigation should also be disseminated to relevant staff to raise their safety awareness.

*Note – Depending on the circumstances of the serious service failure or safety incident, such as whether the ANSP has violated any regulatory requirements, AAR Division may conduct its own investigation in addition to that conducted by the ANSP.*

## 7.3 Management of Aeronautical Radio Spectrum

7.3.1 The ANSP shall establish a procedure for the management and protection of aeronautical radio spectrum. Any frequency allocation within the aeronautical radio spectrum shall be centrally controlled by a designated responsible person to ensure that there will be no conflict and interference

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to any radio stations or facility. Updated records shall be kept of all allocated frequencies.

#### **7.4 Radio Interference Reporting**

7.4.1 The ANSP shall ensure that there is no wilful transmission of unnecessary or anonymous radio signals, messages or data by any of its radio stations. Procedures shall also be established with the local telecommunication authority to address occurrence of radio frequency interference. Any frequency interference occurrence shall be reported, investigated and follow-up actions taken to prevent recurrence.

#### **7.5 Notification of aeronautical telecommunication facility status**

7.5.1 The ANSP shall, as soon as possible

- (a) forward to the Aeronautical Information Services
  - (i) information on the operational details of any new facility for publication in the Singapore Aeronautical Information Publication; and
  - (ii) information concerning any change in the operational status of any existing facility, for the issue of a Notice to Airmen; and
- (b) ensure that the information forwarded under sub-paragraph (a) has been accurately published.

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## Chapter 8 – Documentation and Records

### 8.1 Documents and Records to be Maintained

8.1.1 The ANSP shall maintain all documents and records which are necessary for the operation and maintenance of the service. Copies of these documents shall also be made available to personnel where needed. These documents should include:

- (a) the Manual of Standards - Aeronautical Telecommunication;
- (b) the ANSP's operations manual;
- (c) ICAO Annex 10 Volumes I to V, Doc 8071, Doc 9859 and other relevant ICAO document;
- (d) records of hazard logs and risk assessments done;
- (e) records of malfunction and safety incident reports;
- (f) records of internal audit reports;
- (g) records of investigation into serious incidents; and
- (h) records of job description, training programme and plan of each staff.

### 8.2 Document Control

8.2.1 The ANSP shall establish a process for the authorization and amendment of these documents to ensure that they are constantly updated. The process shall ensure that:

- (a) the currency of the documentation can be readily determined;
- (b) amendments to the documentation are controlled in accordance with established quality management principles; and
- (c) only current versions of documents are available.

8.2.2 The ANSP shall ensure that where documents are held as computer based records and where paper copies of computer based records are made, they are subjected to the same control as paper documents.



APPENDIX 1

**BOW TIE ANALYSIS CHART**

