

Revision **2**

TBA 2021

Aeronautical Telecommunication Services— Operation and Certification

General

Civil Aviation Authority (CAA) advisory circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable they will be considered for the appropriate AC.

Purpose

This AC provides:

- (a) methods acceptable to the Director for showing compliance with the certification requirements of Part 171 to provide and operate aeronautical telecommunication services and facilities to support air traffic services and air navigation:
- (b) methods acceptable to the Director for the provision and operation of aeronautical telecommunication services and facilities under Part 171:
- (c) guidance material **(GM)** to assist an applicant for, or the holder of, an aeronautical Telecommunication Service Certificate.

Related Rules

This AC relates specifically to Civil Aviation Rule Part 171.

Change Notice

Revision 2 of this AC reflects changes to ICAO Annex 10, includes reference to Safety Management Systems and adds information on new facility types. It also adds sections on surveillance, Multilateration (MLAT) and ADS-B systems.

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Revision 1 introduces changes to this Advisory Circular to reflect the amendments that were made to Part 171 in the reissue dated 24 January 2002, and to reflect changes to ICAO Annex 10, which is now presented in 5 Volumes. Also the types of facilities have been updated to include new technology, and guidance material relating to the rules for facilities that operate in the aeronautical radio frequency band and do not support IFR flight or an air traffic service, has also been added.

The revision also amends the section on Internal Quality Assurance. Guidance material on quality assurance matters is now contained in AC00-3.

Version History

The record of revision(s) to this AC are outlined below:

AC Revision No.	Effective Date	Summary of Changes
AC 171-1	19 April 1993	Initial Issue
ACA 171-1 Rev 1	20 November 2009	Reflects changes in ICAO Annex 10, guidance material for facilities that do not support IFR flight or an Air Traffic Service.
AC 171-1 Rev 2	TBA	Reflects changes to ICAO Annex 10, now in 6 volumes, with information on new facility types, guidance material on surveillance systems and other systems supporting Air Traffic Services.

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Subpart A — General

GM 171.3 Definitions

The definitions section only contains the definition for Exposition as this has a specified meaning for Part 171. All other generally used definitions can be found in Part 1 (Definitions and Abbreviations).

Annex 10 to the Convention on International Civil Aviation has been used as the basis for defining, in Part 1, “Aeronautical Telecommunication Service”, and “Aeronautical Facility” which includes those equipments and systems that support an aeronautical telecommunication service. In this AC “Facility” has the same meaning as “Aeronautical Facility”.

GM 171.5 Requirement for Certificate

Under Part 171, an aeronautical telecommunication service certificate is a prerequisite to providing an aeronautical telecommunication service or to operating any facility that supports an air traffic service or IFR flight.

A certificate may be granted to cover one or more facilities that support the New Zealand air navigation system.

The rule also sets out the conditions for the operation of a facility without an aeronautical telecommunication service certificate. This is intended to cover private facilities operating on an aeronautical radio frequency that do not support an air traffic service or IFR flight.

GM 171.11 Privileges of certificate holder

An aeronautical telecommunication service certificate specifies the types of facilities that the certificate holder is authorised to operate. The types of facilities that may be listed on the certificate include:

1. Communications systems for the aeronautical broadcasting service.

ATIS	Automatic Terminal Information Service
D-ATIS	Digital Automatic Terminal Information Service
AWIB	Aerodrome and Weather Information Broadcast
VOLMET	Routine broadcast of meteorological information for aircraft in flight
FISB	Flight Information Service Broadcast

2. Communications services for the aeronautical fixed service

AFTN	Aeronautical Fixed Telecommunication Network
Direct speech	ATS direct speech circuits
ATN	Aeronautical Telecommunications Network
AMHS	Aeronautical Message Handling System

3. Ground elements of communications systems for the aeronautical mobile service

HF A-G	HF Air-Ground voice communications
VHF A-G	VHF Air-Ground voice communications
UHF A-G	UHF Air-Ground voice communications
HF SELCAL	HF Selective Calling system
HF DL	HF Air-Ground Data Link

VDL	VHF Air-Ground Data Link
UHFDL	UHF Air-Ground Data Link

4. Radio navigation aids for the aeronautical radio navigation service

DME	Distance Measuring Equipment
ILS	Instrument Landing System
MLS	Microwave Landing System
NDB	Non-directional Radio Beacon
VOR	VHF Omnidirectional Radio Range
VORTAC	VOR & TACAN (Tactical Air Navigation)
GBAS	Ground Based Augmentation System
SBAS	Satellite Based Augmentation System (Ground Based Components)

5. Telecommunications and ground systems supporting air traffic services

ADS-C	Automatic Dependent Surveillance - Contract
ADS-B	Automatic Dependent Surveillance - Broadcast
AIDC	ATS Interfacility Data Communication
PAR	Precision Approach Radar
PSR	Primary Surveillance Radar
SSR	Secondary Surveillance Radar
CPDLC	Controller-Pilot Data Link Communications
FDPS	Flight Data Processing System
RDPS	Radar Data Processing System
MLAT	Multilateration systems
SMGCS	Surface Movement Guidance and Control System
A-SMGCS	Advanced - Surface Movement Guidance and Control System
DCL	Digital Departure Clearance
PDC	Pre Departure Clearance
AeroMACs	Aeronautical Mobile Airport Communication System
Digital Tower	Digital Tower

GM 171.15 Renewal of Certificate

So that the renewal process can be accomplished before the certificate's expiry, the certificate holder should apply for renewal at least 30 days before the expiry date.

The application for renewal will normally be subjected to a full entry audit, though the scope of the audit will depend on a review of the conduct of the certificate holder and on the history of the certificated activities.

GM 171.17 Identification codes and call signs

CAA form 24171/02 contains guidance material regarding the selection of identification codes and call signs and is available on the CAA website under the heading *Quick Links, Forms*.

AMC 171.19 Notification of facility information

Aircraft operators and pilots require information on the radio communication and navigation facilities that are available to them to allow proper planning for their flights. Any person operating a facility must therefore convey this information to the provider

of the Aeronautical Information Service (AIS) for publication in the Aeronautical Information Publication New Zealand (AIPNZ).

Any changes to the operational status of the facilities must be promulgated by NOTAM when the change can have an immediate effect on the safety of air navigation.

The facility operator is responsible for the adequacy, accuracy and timeliness of that information.

All operators of radio communication and navigation facilities should consult with the AIS when establishing their procedures.

ICAO Annex 15, Appendix 1 lists the information that is required for publication in the AIPNZ.

Information that the AIS requires from facility operators includes:

- * the name of the person authorised by the operator to approve information for publication by the AIS. If more than one person is authorised to approve such information, all the names must be listed
- * the operator's postal and telegraphic addresses, and telephone and facsimile numbers as applicable
- * the scope of the aeronautical telecommunication services provided by the operator
- * a summary description of the main types of aeronautical telecommunication services and facilities provided by the operator, and
- * the general conditions of use and availability of those services and facilities.

For radio communication and navigation facilities the specific information required by AIS includes:

- * the geographic name of the facility
- * the type of facility and, where applicable, the type of service supported by the facility
- * the call sign or identification code of the facility
- * the type of emission for each frequency
- * the frequency or channel number for ground-to-air and air-to-ground transmissions
- * the hours of operation
- * the latitude and longitude of the transmitting antenna for each radio navigation facility to the nearest second
- * the average radius of rated coverage for each NDB, and
- * details of any known abnormalities or limitations associated with the coverage or navigation information of a radio navigation facility.

Other operational information about the use of a radio navigation facility will be promulgated by AIS as part of any instrument procedures based on the facility.

Aircraft operators, pilots and air traffic services must also be advised of any change in the operational status of any radio communication or navigation facility that is

normally available to them. For those facilities published in the AIPNZ, the means for notifying operationally significant change at short notice is a NOTAM issued by the NOTAM office. Aeronautical telecommunication service operators are responsible for passing such information to the NOTAM office, and should consult with the NOTAM office when establishing their procedures.

Changes in the operational status of an aeronautical telecommunication service or facility that require the issue of a NOTAM include:

- * the establishment or withdrawal of a facility
- * the interruption or return to normal operation of a facility
- * a change to the published information of a facility (frequency, notified hours of service, identification, location, orientation in the case of directional aids, broadcast schedules or broadcast contents), and/or
- * any irregularity or unreliability of a facility. (Operating without reliable power supply, operating without normal monitoring functions, subject to possible interference because of site infringement or other possible cause.)

The operator is responsible for initiating the issue of the NOTAM, which must include an estimate on the duration of any outage, and for reviewing the NOTAM to ensure that it is cancelled, amended or converted into permanent or long-term temporary information as applicable.

It is important that information published in the AIPNZ or issued in NOTAM is promptly checked for accuracy so that any errors can be corrected without delay.

GM 171.21 Information provided by an aeronautical facility

If a facility is found or suspected to be providing erroneous information, the operator must immediately remove the facility from operational service. This may be achieved by switching off the equipment, or, in the case of a radio navigation aid, by removing the identification code.

Subpart B — Certification Requirements

AMC 171.51(a)(1) Personnel requirements (Chief Executive)

The chief executive may have another designation or title within the organisation.

AMC 171.51(a)(2) Personnel requirements (Senior Persons)

The senior persons nominated in the exposition represent the management structure of the organisation. They should be suitably qualified for the position held and must be ultimately responsible to the chief executive for the provision, operation and maintenance of the facilities listed in the exposition.

Their responsibilities will depend on the size of the organisation and the scope of the facilities operated. Irrespective of the titles used or the number of senior persons nominated, the following areas of responsibility should be addressed:

Engineering

- * Responsibility for ensuring that the engineering, installation and commissioning activities relating to the provision of facilities are carried out in accordance with the procedures specified in the exposition.
- * Responsibility for ensuring the implementation of actions to correct deficiencies in the provision of facilities that are detected during reviews, audits or inspections.

Operation and Maintenance

- * Responsibility for the ongoing operation and maintenance of each facility to ensure that it continues to meet its operational requirements and performance specifications, and is maintained in accordance with the procedures specified in the exposition.
- * Responsibility for ensuring the implementation of actions to correct deficiencies in the operation and maintenance of facilities that are detected during reviews, audits or inspections.

Safety Management ~~Internal Quality Assurance~~

- * Responsibility for the organisation's **Safety Management System** ~~internal quality assurance~~ procedures.
- * Responsibility for monitoring of the organisation's compliance with Part 171, **Part 100** and with its exposition.
- * Responsibility for ensuring the adequacy of the exposition and associated procedures in meeting the requirements specified in Part 171, **Part 100** and in reflecting the organisation's activities.
- * Responsibility for ensuring the implementation of actions to correct deficiencies in the organisation's documentation and procedures that are detected during reviews, audits or inspections.
- * Responsibility for ensuring compliance with any conditions attached to the certificate or to an exemption.

The person who assumes these **Safety Management** ~~quality assurance~~ responsibilities must have direct access to the chief executive on matters that affect the operation and performance of facilities.

The exposition must make it clear to whom these responsibilities devolve.

AMC 171.51(a) Personnel requirements—general

All persons who have control over the exercise of the privileges of an aeronautical telecommunication service certificate are required under section 9 of the Civil Aviation Act (1990) to meet the criteria in section 10 of the Act in respect of being a fit and proper person. This includes the chief executive and the nominated senior persons.

Each nominated senior person, including the chief executive, must be identified on form CAA 24171/01 and must submit form CAA 24 FPP with the application.

GM 171.51(a)(3) Personnel requirements

Where a third party is engaged to operate and/or maintain any facility covered by the certificate, the certificate holder remains responsible for those facilities. This includes compliance with the procedures, including personnel competence, as detailed in the certificate holder's exposition.

AMC 171.51(b) Personnel requirements (Competence Assessment)

The procedures for assessing the competence of personnel who are authorised to place facilities into operational service should specify the levels of training, qualification, and experience that are necessary to ensure the safe operation of the organisation's facilities.

It is expected that maintenance personnel will have at least a basic qualification, such as the National Diploma in Electrotechnology or equivalent, for servicing aeronautical telecommunication equipment. The organisation's initial training programme should cover the procedures to be followed for the operation and maintenance of aeronautical telecommunication facilities.

Maintenance personnel intended to be authorised to return listed facilities to operational service should be given specialised training on the facility type followed by an on-the-job evaluation of their competence for the particular facility and its location. This training should include an examination to assess the person's knowledge of the facility type. The on-the-job evaluation must establish that the person complies with the procedures for the operation and maintenance of the facility and fully understands:

- * the role of the facility within the air navigation system.
- * the functions use and limitations of any built-in executive monitor or self-check system.
- * the use of special test equipment for checking critical parameters.
- * the types of maintenance activity that require detailed safety, specification and parameter checks to be made before the facility is placed into operational service.
- * the requirement for, and the extent of, any site protection areas.
- * any peculiarities of the particular facility.

The competence check must establish that the person can satisfactorily carry out the necessary checks for the facility and complete the documentation for placing the facility into operational service.

It is essential that supervisors and authorised staff have an adequate knowledge of the procedures relevant to their role in the organisation.

On-the-job competence checks should be carried out at regular intervals, with appropriate continuation training as necessary, to maintain the competence level of those persons authorised to place facilities into operational service.

Continuation training should include instruction on changes in regulatory requirements and standards, changes to the organisation's procedures and exposition and changes to the operating requirements of applicable facilities.

The job descriptions for all personnel who carry out, verify and manage any work that can affect the safe performance of a facility should define their responsibilities, their authority and their inter-relationships. This is particularly important for personnel who need the organisational freedom and authority to:

- * initiate action to prevent unsafe situations developing
- * identify and record problems that may affect safety
- * initiate, recommend or provide solutions
- * verify the implementation of solutions, and
- * control further activities following the detection of unsafe situations until deficiencies have been corrected.

The documentation provided to those authorised to place facilities into operational service should clearly identify the types of facilities and the locations that the authorisation covers.

AMC 171.53 Aeronautical facility requirements

The procedures required under this rule are to ensure that each facility listed in the exposition meets the applicable operational specifications. The facility performance must conform to the applicable system characteristics and standards prescribed in ICAO Annex 10 Volumes I, III and IV, with any other applicable requirement prescribed in rule 171.53, and with the additional specifications and requirements in Subpart D of Part 171. The paragraphs in Annex 10 that contain "shall" statements are to be read as requirements to be complied with for the particular facility unless specifically stated otherwise in Subpart D.

Recommendations in Annex 10 Volumes I, III and IV that are not specifically stated as requirements in Subpart D should be complied with wherever possible. Where a recommendation cannot be met, the organisation should advise the Director so that a difference can be notified to ICAO if appropriate.

It is expected that procedures will be established to ensure that:

- * the engineering design of facilities meets the operational requirements and all applicable standards including the values or characteristics for each of the following that apply to the supported service:
 - availability
 - reliability
 - accuracy and data precision
 - integrity
 - update period and probability of detection (as appropriate)

- capacity
 - latency (e.g between detection of a target and display to a controller)
 - Information security (including any 3rd party data entering the system)
- * The hazards and risks identified by the organisation's Safety Management System are mitigated through system design and implementation wherever possible
- * facilities are installed in accordance with applicable standards, and
- * the commissioning of facilities confirms that:
- the necessary ground tests and flight tests have been carried out to verify the performance of the facility
 - documentation is complete
 - operational information has been provided for publication by the AIS, and
 - resources are available to operate and maintain the facility.

These procedures should reflect the organisation's objectives, policies and practices in providing safe aeronautical telecommunication services and facilities. It is essential that these objectives, policies and practices are understood, carried out and maintained at all levels.

AMC 171.57 Documentation

The organisation must hold relevant copies of manufacturers' equipment manuals, ICAO documents, technical standards and instructions, and any other documentation that may be necessary to ensure that its facilities are installed, maintained and operated so that they will be safe for operational use. The organisation should hold copies of the Volumes of Annex 10 relevant to its facilities.

Depending on the types of facilities operated, the organisation may need to hold copies of the following documents:

ICAO Doc 9694	Manual of Air Traffic Services Data Link Applications
ICAO Doc 9739	Comprehensive Aeronautical Telecommunication Network (ATN) Manual
ICAO Doc 9705	Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN)
ICAO Doc 8071	Manual on Testing of Radio Navigation Aids Volumes I and III
ICAO Doc 8259	Manual on the Planning and Engineering of the Aeronautical Fixed Telecommunication Network
ICAO Doc 9688	Manual on Mode S Specific Services
ICAO Doc 9684	Manual of the Secondary Surveillance Radar (SSR) Systems
ICAO Doc 9713	International Civil Aviation Vocabulary
ICAO Doc 9718	Handbook on Radio Frequency Spectrum Requirements for Civil Aviation
ICAO Doc 9830	Advanced Surface Movement Guidance and Control Systems

ICAO Doc 9804	(A-SMGCS) Manual Manual on ATS Ground-Ground Voice Switching and Signalling
ICAO Doc 9849	Global Navigation Satellite Systems Manual
ICAO Doc 9869	Manual on Required Communications Performance (RCP)
ICAO Doc 9871	Technical Provisions of Mode S Extended Squitter
ICAO Doc 9880	Manual on Detailed Technical Specifications for the Aeronautical Telecommunications Network (ATN) using ISO/OSI Standards and Protocols
ICAO Doc 10019	Manual on Remotely Piloted Aircraft Systems
ICAO Doc 10037	Global Operational Data Link Manual
ICAO Cir 267	Guidelines for the Introduction and Operational Use of the Global Navigation Satellite System (GNSS)
ICAO Cir 326	Assessment of ADS-B and Multilateration Surveillance to Support Air Traffic Services and Guidelines for Implementation
	ITU Radio Regulations Volumes 1,2,3 and 4, Appendices 25 and 26
	Telecommunications (Residual Provisions) Act 1987
	Telecommunications Act 2001
	Radiocommunications Act 1989
	Radiocommunications Regulations 2001

The procedures required by rule 171.57(b) are for the control of the manuals, standards, instructions and other documentation necessary for the provision and operation of facilities. When changes are made to any of this documentation, in particular those documents generated by the organisation, the relevant background information and reasons for the change should be documented and retained. Access to the background information is an important part of the review and approval process. Changes to documents must be reviewed and approved by the same functional positions or personnel who carried out the original review and approval unless specifically designated otherwise. Where practical, the nature of the change should be identified in the document or in appropriate attachments.

Electronic documents may be used provided sufficient controls are established to maintain the integrity of the information held and to provide a level of traceability equivalent to that required for paper documents. All personnel must have ready access to all documents that they require in the performance of their duties.

AMC 171.59 Periodic inspection and testing

Each facility must be periodically inspected and tested to confirm that it meets the operational requirements and performance specifications.

The periodic inspection and testing of each facility must follow the programme established under rule 171.59(c). Aspects to be assessed during an inspection should include:

- * security of the facility and site
- * adherence to the approved maintenance programme

- * upkeep of the equipment, building, site and site services, and
- * adequacy of facility records and documentation.

The periodic testing must include ground tests and, where necessary, flight tests. The procedures and equipment used for these tests must be capable of confirming that the facility is operating within the allowable tolerances.

Periodic tests are particularly relevant to radio navigation facilities, which, in accordance with the requirement of Annex 10, Volume I, Section 2.7, must undergo periodic ground and flight tests. However, some radio navigation facilities may not need periodic flight testing if the organisation can show, with documented evidence, that periodic ground tests can replace the periodic flight tests without affecting the safe operational performance of the facility.

The Director must be notified of any radio navigation facility that is not subjected to periodic flight tests to enable the CAA to file a difference with ICAO.

The tests, and in particular the flight tests, of radio navigation facilities must be able to confirm that the facility continues to meet its operational requirements and that any IFR procedures based on the facility remain within the allowable tolerances.

The periodicity of ground and flight tests of radio navigation facilities is to be based on:

- * information published by ICAO
- * information provided by other aeronautical authorities
- * the proven reliable performance of the facility
- * the proven performance of other similar facilities, and
- * the stability of the facility's operating environment.

Unless proven otherwise by reliability data and the capability of the ground test procedures for a facility, the maximum period between flight tests for radio navigation facilities should be:

- * **VOR**
12 months
- * **DME and TACAN**
As for associated VOR, ILS or MLS; or

24 months if installed with NDB only, provided the periodic ground tests verify the operational performance and stability of the DME.
- * **NDB**
12 months; or

as required, provided the periodic ground tests verify the operational performance and stability of the NDB.
- * **ILS (including localiser, glide path, markers, and DME when installed)**
6 months
- * **MLS**
6 months

A longer period between flight tests may be justifiable if, after an appropriate period of operation, the organisation can show that the periodic ground tests for the facility

provide a reliable correlation with the flight tests and that the operating environment is stable. Any change to the period between tests is to be fully documented with the supporting information and justifications for the change.

If an organisation has existing radio navigation facilities that have had the period between flight tests increased beyond the periods recommended above, then any new facility of the same type may be operated at that increased period provided:

- * the equipment and installation are the same as the existing facilities
- * the new facility is subject to the same operation and maintenance regime as the existing facilities, and
- * two successive flight tests at the initial period listed above confirm the same performance as the existing facilities.

GM 171.59 Periodic inspection and testing

Attachment C to ICAO Annex 10, Volume I, and ICAO Doc 8071 provide guidance information on the ground and flight testing of radio navigation facilities.

GM 171.61 Facility performance

The procedures form part of the safety management quality system. They are required to ensure that all the necessary checks and measurements have been carried out by a competent person before a facility is placed into operational service. The users must have the assurance that the facility is safe to use. To complete the safety management quality process and to provide a traceable history, the facility record must be completed as required by rule 171.71.

AMC 171.63 Inspection, measuring and test equipment

Appropriate inspection, measuring and test equipment must be available for personnel to verify the safe operation of each facility listed in the exposition.

Some facilities, in particular radio navigation facilities, have critical performance parameters that must be set within specified tolerances, and the operating and maintenance instructions for such facilities should detail the test equipment required to check these parameters. The test equipment used must have the necessary precision and known accuracy to set these parameters. This is particularly important for radio navigation facilities not subjected to periodic flight tests. This test equipment must be identified, controlled and calibrated against a known standard in order to achieve the confidence that the critical parameters are set within the allowable tolerances.

Rule 171.107 requires the operating and maintenance instructions for a facility to list the critical performance parameters, the measurements to be made, and the accuracy required.

In meeting the requirement to control, calibrate and maintain inspection, measuring and test equipment, the organisation should ensure that:

- * The measuring and test equipment required for the maintenance of each facility is identified, particularly the test equipment required for the measurement of the critical performance parameters of a facility.
- * There are instructions for checking, and where necessary a programme for calibrating, the measuring and test equipment. Test equipment required for the measurement of critical performance parameters must be calibrated

before use or at prescribed intervals. The instructions for checking and calibrating measurement and test equipment should include details of equipment type, identification number, location, frequency of checks, check method, acceptance criteria and the action to be taken when the calibration results are unsatisfactory.

- * All calibrated test equipment is labelled to show the date by which the next calibration is due. It is recommended that test equipment not subject to calibration is labelled accordingly.
- * There are calibration records for each item of measuring and test equipment.
- * The validity of previous test and measurement results are assessed and documented when any item of measuring and test equipment is found to be out of calibration.
- * The environmental conditions are suitable for the calibration, inspections and measurements being carried out.
- * The handling, preservation and storage of inspection, measuring and test equipment is such that the accuracy and fitness for its use is maintained.

Some facilities use software test systems. These software systems must be checked to ascertain their integrity before they are released for use.

AMC 171.65 Notification of facility information

Operators of radio communication and navigation facilities that support air traffic services or the New Zealand air navigation system, or that operate in the aeronautical frequency bands, are required to forward the applicable information to the AIS.

The organisation is responsible for the adequacy, accuracy and timeliness of that information and therefore should identify at least one named senior person [rule 171.51(a)(2)] as having this responsibility and should consult with the AIS when establishing their procedures.

AMC 171.67 Facility check after accident or incident

The investigation of accidents and incidents to determine the contributing factors is an important component of aviation safety. Where an aeronautical telecommunication facility may have contributed to, or been associated with, an accident or incident, it is essential that the facility is checked without delay. The check is to determine the operational status of the facility and its performance at the time of the accident or incident. If the facility is found to be operating outside the allowable tolerance, under rule 171.21 it must be immediately removed from operational service.

Procedures for checking a facility after the notification of an accident or incident should establish who is responsible for co-ordinating the check and what actions are required to determine and record the operational status and performance parameters. Any check of the performance parameters should be made without disturbing the operational adjustments of the facility.

The persons carrying out these checks should not include the last person either to work on the facility or to have placed it into operational service. If this is not practicable, a witness should observe the checks (and if necessary, be given a description of each stage of the checks) and should sign the record accordingly.

All information, including the facility and post-incident check records, relating to the status and performance of the facility at the time of the accident or incident and the

history of its performance prior to the accident or incident, is to be preserved and held in a secure place. This information may be required by CAA or the Transport Accident Investigation Commission (TAIC) for their investigation of the accident or incident.

The requirement under the Act for CAA to investigate all accidents and incidents does not absolve the organisation from conducting its own investigation. Rule 12.59 stipulates the requirement for an aeronautical telecommunication service certificate holder to investigate facility malfunction incidents, security incidents and promulgated information incidents that are serious incidents or are an immediate hazard to the safety of an aircraft operation, unless otherwise advised by the CAA.

GM 171.69 Facility malfunction incidents

The rules governing accidents and incidents, including definitions, are contained in Part 12.

The reporting and investigation of facility malfunction incidents are important components of aviation safety. To be effective, they require both prompt action and the wholehearted co-operation of all parties involved.

A reported incident resulting from a malfunction of a facility would normally come from a user of that facility. Under the requirements of Part 91, pilots are required to report any malfunction or suspected malfunction of an aeronautical telecommunication facility to the ATS unit or air-ground radio station that they are in communication with at the time. After landing, the pilot is required to provide details regarding the malfunction incident to the nearest ATS unit including:

- * name of aircraft operator
- * facility being used
- * date and time when malfunction (or suspected malfunction) was first noticed
- * position of aircraft at the time of the malfunction
- * altitude of aircraft at the time of the malfunction, and
- * details of the apparent malfunction.

The ATS unit will advise the operator of the facility of the malfunction incident and pass on the details.

As facility malfunctions or suspected malfunctions can be caused by problems in various areas, the procedures for investigating reported malfunctions should involve the appropriate people. In addition to the actual facility performance, other areas that can contribute to a malfunction may include flight procedures, air traffic services, aircraft operations and airworthiness. The procedures must ensure that there is a rapid investigation of the problem with information input from each affected area so that immediate action can be taken to remedy any deficiency.

The record for each reported malfunction must include sufficient detail to show the nature of the malfunction, the conclusions of the investigations carried out by the various areas involved, and the actions taken to remove or correct the malfunction to prevent a recurrence.

The organisation must forward a report to the Authority in accordance with the requirements of Part 12 when the malfunction investigation reveals that the information provided by the facility has been outside the allowable tolerances, or that there was the potential for the information to be outside the allowable tolerances.

Where an Aeronautical Telecommunications facility supports an Air Traffic Service or ATS Surveillance Service, the investigation should include an assessment of the requirements of CAR 172.121.

In the case of navigation aid facilities, the potential to provide erroneous information would include the following circumstances:

- * the executive monitor system not being in control of the facility (monitor switched to bypass mode)
- * incorrect adjustment of the monitor system that could allow the facility to operate outside the allowable tolerances, and
- * the executive monitor system not designed for failsafe operation such that a fault in the monitor system may render it incapable of detecting out of tolerance navigation information.

The organisation must also provide a report to the Director whenever the malfunction investigation reveals that there appears to be a recurring cause for the malfunction reports. Such recurring causes could arise from the way that users are trying to use the facility (an operational procedure may need to be changed). There could be a problem associated with a particular aircraft type or avionic package. In these cases, where the problem is not directly associated with the telecommunication facility, CAA needs to be involved to follow the matter further.

The organisation should also inform the Director of any other occurrence associated with the operation of a facility if it is considered that the occurrence should be investigated in the interests of aviation safety.

AMC 171.71 Records

The organisation must maintain records covering:

- * the performance and maintenance history of each facility
- * the establishment of, or change in, the periodic test programmes for each facility
- * each item of test equipment required for the measurement of critical performance parameters
- * each reported or detected facility malfunction
- * each internal quality assurance audit and management review, and
- * each person who is authorised to place facilities into operational service.

Adequate and accurate records are an essential element in the safety of air navigation. The records must be able to show that the prescribed procedures have been followed and that the required level of performance for the facility has been achieved.

Properly executed and retained records can provide the organisation with information essential for the safe and efficient operation of facilities.

Facility records are required to provide a traceable history for each facility. They provide information that is essential for scheduling maintenance, inspections and tests, and for establishing the reliability of a facility.

Each record should provide a complete history of events in chronological order for the facility. Each entry must be clearly distinguishable from any previous entry and should include details of:

- * the date, time and identity of any person carrying out any inspection, test or work on the facility
- * the status of the facility at the time of a person's arrival and departure from the facility
- * the times at which the facility was withdrawn from or placed into operational service, and
- * full details of any work done on the facility, including routine maintenance and fault repairs, and the results of any subsequent inspections and tests.

Corrections to handwritten records (such as maintenance cards, station diaries and logbooks) should be initialled by the person making the change. Any deletions should be by a single line through the deleted material.

Retention of records for at least 3 years should cover sufficient periodic tests to establish a reliable history of a facility's performance. Some facilities, because of less frequent tests, may require the records to be held for a longer period to establish an adequate history.

Records are also required for those personnel who are authorised by the organisation to place facilities into operational service. The records must include the following information:

- * name
- * date of birth
- * position held within the organisation
- * relevant qualifications
- * experience
- * special equipment training
- * facilities covered by the Authorisation, and
- * details of competency checks.

Records may be kept in any format but are to be controlled by a responsible senior person. Access to the record system is to be controlled to ensure that the integrity of the records is maintained. The CAA may require access to any of the records for certification or safety audit purposes.

As covered under rule 171.67, records may be required by the CAA or TAIC for the investigation of an aircraft accident or incident.

AMC 171.73 ~~Internal Quality Assurance~~ Safety management

The organisation must have a Safety Management System internal quality assurance procedures and carry out regular reviews of its activities. These procedures form part of the quality management system and The Safety Management System must include the internal checking and correction procedures that are necessary to ensure compliance with, and the adequacy of, the procedures, practices and standards required by Part 171.

~~AC00-3, Internal Quality Assurance, provides detailed guidance on the role of QA in aviation systems.~~

GM 171.75 Communication procedures

The operating procedures for facilities must be in accordance with the applicable communication procedures prescribed in ICAO Annex 10, Volume II to ensure that the operation of a facility does not create a potential safety hazard, particularly by interfering with other legitimate users.

AMC 171.77 Organisation exposition

The purpose of the organisation's exposition is to set forth the procedures, means and methods of the organisation. The exposition will only be accepted if it meets the requirements of Part 171. Its acceptance is a prerequisite for the issue of an aeronautical telecommunication service certificate.

The exposition is the means by which the organisation defines its operation. It shows both the employees and CAA how the organisation will conduct its day-to-day business. The exposition is intended to be a tool to assist management in the operation of the service.

Rules 171.77(a)(1) to (a)(7) specify the management part of the exposition and should normally be contained within one document. It should commence with the corporate commitment by the chief executive. The remaining parts of the exposition may be produced as any number of separate manuals; these should be cross-referenced in the management part of the exposition and must be controlled by the procedures listed under rule 171.77(a)(12).

Senior persons should hold copies of those parts or manuals that affect their areas of responsibility and staff should be familiar with the parts of the exposition that affect their activities.

The following paragraphs in rule 171.77 address the individual requirements of the exposition:

(a)(1) The organisation is responsible for ensuring that its operation is planned, organised, carried out, maintained, developed and documented according to applicable regulatory requirements, standards and operating specifications.

As part of its quality system of management, the organisation should establish goals and objectives for its operation, including its safety standards.

The statement signed by the chief executive as required by rule 171.77(a)(1) is accepted by the Director as a corporate commitment by the organisation. The statement should clearly address the organisation's goals and objectives in respect of the safety requirements prescribed by Part 171, and may also contain its goals and objectives in respect of its commercial activities. The exposition should be a tool of management to present the organisation's operation to its staff and customers, and to the Director.

(a)(2) and (3) are expanded in the comments made against rule 171.51 "Personnel Requirements".

(a)(4) The exposition must show the lines of responsibility and communication between the chief executive and the staff. The organisation chart should also show the

relationship between the central body of the organisation and any satellite locations where staff are permanently based.

(a)(5) The summary of staff employed by an organisation, and their location, provides the Director with an indication of the size of the organisation for assessing the application and establishing an audit programme.

(a)(6) The facility types that may be listed on the certificate are shown under the paragraph relating to rule 171.11 of this AC. If a facility is not covered in this list, the exposition must provide details of its characteristics and its compatibility with the air navigation system.

(a)(7) The exposition should provide information about the scope of work covered by each location where staff are based to provide and maintain the organisation's facilities. The information should include the types of facilities to be maintained, the operational services that they will support and the level of the maintenance support for those facilities.

(a)(8) The exposition must include the following information for each listed facility:

- * type of facility (NDB, ILS, VHF A-G, and so on)
- * location. For navigation aid facilities, this is to be given as latitude and longitude to the nearest second. The location is to include any associated components, such as those for ILS, and should include their location in relation to airport layout and associated runway in the case of instrument approach facilities.

The location of other facilities is to be given as latitude and longitude to the nearest second, map grid reference to nearest 100 metres, or location name.

- * identification code or call sign, and
- * operating frequency or channel number where applicable.

Each facility operated by the organisation must be listed in the exposition.

(a)(11) These procedures provide the working documents for controlling activities that can directly affect the safe operation of facilities. They may be separate manuals and should provide a concise description of the means to control the technical standards and practices that may affect the design, installation, commissioning, operation and maintenance of facilities. The procedures may include references to other internal technical instructions and must include the quality assurance procedures which are an essential element of the safety quality management system.

The headings are generally self-explanatory and must be addressed to the extent that they apply to the particular scope of intended activity. More detailed information will be found under the paragraphs that call for the procedure.

(a)(12) The exposition control procedures should be similar to those required in rule 171.57 for controlling, amending and distributing the organisation's documentation.

171.77(b) The acceptance of the exposition by the Director is the final step in the authorisation process for a person to operate a facility in support of an air traffic service or IFR flight.

Subpart C—Operating Requirements

GM 171.101 Continued compliance

After obtaining an aeronautical telecommunication service certificate, it is the responsibility of the certificate holder to ensure that the organisation continues to meet the requirements for certification. The means of meeting these requirements are contained in the exposition. Therefore, a copy of the exposition, or at least each applicable part of it, must be available to all personnel who need access to the information to carry out their work. A complete copy of the exposition must be held at each major location covered by the exposition. Smaller satellite locations may however only need those parts that directly apply to their scope of activities.

AMC 171.107 Operating and maintenance instructions

Operating and maintenance instructions are to be provided for each facility listed in the exposition. Instructions must be available at each site for ready use by personnel working on the facility. The instructions may be in electronic form.

Operating and maintenance instructions may include references to other documentation and should include the following:

- * the name of the facility (for instance Wellington VOR)
 - * the function of the facility in relation to associated air navigation services
 - * the hours of operation of the facility
 - * the facility identification code or call sign
 - * the operating frequency and power output of any radio equipment
 - * the standard operating conditions for the facility
 - * the location of the facility. The location of navigation aid facilities should be given as latitude and longitude to the nearest second and should include any associated components, such as for ILS, and their location in relation to airport layout and runway for instrument approach facilities
- The location of other facilities should be given as latitude and longitude to the nearest second, map grid reference to nearest 100 metres, or location name
- * instructions on the security programme requirements for the facility
 - * details of any critical site protection areas where the presence of metallic objects such as wire fences, power or telephone lines and the movement of machines, vehicles, and aircraft must be controlled or prevented to protect the integrity of the facility
 - * an explanation of the kinds of activity such as construction or grading near the facility that may require shutdown or certification checks
 - * details of any licensing requirements for the facility and for maintenance personnel
 - * instructions on the posting of licences and signs
 - * instructions on keeping the facility and other technical records
 - * procedures for the operational monitoring of the facility to ensure that it continues to meet the minimum performance levels

- * the names, addresses, and telephone numbers of persons to be notified in an emergency
- * procedures to be followed to determine the performance of the facility and the preservation of information following an accident or incident
- * procedures to be followed to obtain the release of the facility from operational service for maintenance. This should include, where applicable, the coordination of the release with Air Traffic Control and the issue of an appropriate NOTAM
- * the detailed and specific maintenance procedures for the facility including
 - frequency of inspections and tests
 - limitations on the scope of maintenance work permitted where performance checks are limited to the capabilities of an executive monitor system
 - detailed performance check procedures to be carried out before the facility is returned to operational service where the scope of maintenance work has exceeded the limitations in the item immediately above.
- * procedures for conducting and recording any applicable ground inspections and tests of the facility
- * procedures for conducting and recording any applicable flight tests of the facility, and
- * a description of any critical parts of the facility that may not be changed, adjusted or repaired without an approved certification check to confirm that the facility performance meets the operational requirements.

The maintenance procedures must identify, and set tolerances for, the parameters (critical performance parameters) that can directly affect the safety of the facility.

Any specialised and calibrated test equipment required for the measurement of these critical performance parameters should also be listed with details of accuracy, certification, and recalibration requirements.

GM 171.109 Deviations

There may be occasions when an organisation can assist during an aircraft emergency by operating a facility that does not comply with the requirements of Part 171. Rule 171.109 allows such a deviation from the normal requirements, provided the person operating the facility can be satisfied that there is no reason to suspect the integrity of the information provided by the facility. The emergency must require immediate action to be taken for the protection of life or property involving carriage by air. A report on the deviation must be forwarded to the Director within 14 days.

An example of a deviation might be the operation of a navigation aid without the required monitor system in order to assist an aircraft in distress.

AMC 171.111 Temporary facility

Where a temporary facility is operated for the purpose of a site test, it need only comply with rule 171.53(b) and (c) of Subpart B.

AMC 171.113 Limitations on certificate holder

Facilities may not be operated if the certificate holder has any reason to suspect the integrity of the information being provided by the facility. Although the monitoring system of a navigation aid may indicate that the facility is operating normally, other external influences may be causing or may have the potential to cause interference to the information being received by the user. Such external influences could be the infringement of the critical site area of the facility or the construction of a power line or a building that could cause reflections of the radiated signal. If any such conditions exist, the performance of the facility must be checked, with a flight check if necessary, to verify the integrity of the information provided.

New Zealand Radio Regulations prohibit the installation, operation and use of apparatus for the transmission of radio communication without the authority of a written radio apparatus licence. The [Radio Spectrum Management Group](#) of the Ministry of [Business, Innovation and Employment](#) ~~Economic Development~~ manages the assignment of aeronautical radio frequencies on behalf of the CAA and issues all radio apparatus licences. Appendix 1 of this AC provides detailed information on frequency allocation.

Although an organisation may be authorised to operate various types of facilities, no individual facility may be operated unless the requirements of rule 171.113(c) are met. The applicable published information for a facility includes any information promulgated by NOTAM.

The requirement for the periodic tests to be completed in accordance with the prescribed programme for the facility includes periodic ground tests as well as periodic flight tests. In many cases ground tests have significantly extended the period between flight tests, and in some cases have replaced them completely. The periodic ground tests are thus an essential element in maintaining the operational integrity of a facility, and rule 171.113(c)(5) applies equally to ground tests.

GM 171.115 Changes to certificate holder's organisation

The exposition is intended to be a living document to reflect the organisation's activities and its means to carry out those activities. Therefore, as the organisation's activities, means, methods and facilities change, the exposition must be changed accordingly. The Director must be kept informed of these changes and therefore a copy of each amendment to the exposition must be forwarded to the Director.

Any changes to the organisation's procedures or standards that may affect the safe operation of facilities must be properly documented with background information and reasons for the change. Such documentation should be retained to provide an audit trail.

Rule 171.115(a)(5) allows the Director to require changes to be made to the exposition if such changes are considered necessary in the interests of aviation safety. An example of such a change would be a temporary change to the certificate holder's security programme that the Director considered necessary to deal with a known or suspected threat to the organisation's facilities and the associated services.

Rule 171.115(b) specifies the changes to the exposition that require the prior acceptance of the Director. This includes changes to the senior personnel or to the security programme, and changes that require a change to the certificate. The Director may also specify conditions that may be necessary because of a change in these items.

The conditions may be transitional to allow the organisation to continue to operate while arrangements are made to incorporate permanent changes.

Subpart D—Facility Specifications and Requirements

AMC 171.201 Additional specifications and requirements

The following interpretations to the specified paragraphs in ICAO Annex 10 should be applied:

Non-directional Beacon (NDB)

The standards and recommended practices for NDB are contained in Annex 10, Volume I, Chapter 3, section 3.4.

The numbers below are the paragraph numbers in section 3.4 of Annex 10, Volume I—

- 3.4.2.3 “Materially different” should be taken to mean a variation of more than 25 per cent in the rated coverage in significant sectors.
- 3.4.4.1 The portion of the spectrum available for NDB frequencies is 190 to 415 kHz. However, where it can be shown that a frequency in this band cannot fulfil the operational requirement, a frequency between 1 605.5 and 1 632 kHz may be approved.
- 3.4.4.4 Locators that serve the opposite ends of a single runway are to be assigned separate frequencies.
- 3.4.5.1 NDB for general use will normally be assigned a two-letter identification code. Those restricted on operational grounds to specific users will be assigned a three-letter identification code.
- An NDB that is restricted by its owner to a specific user or group of users on commercial grounds will be regarded as a general use facility for assigning an identification code.
- A transmission rate of seven words per minute corresponds to a dot length of 180 milliseconds.
- 3.4.5.2 & On/off keying of the carrier for beacon identification is not acceptable.
- 3.4.5.2.1 Refer rule 171.201(1)(i).
- 3.4.5.4 A modulating tone of 400 Hz is not acceptable. Refer rule 171.201(1)(i).
- 3.4.6.1.1 Paragraph is not applicable as on/off keying of the carrier is not acceptable.
- 3.4.6.6 To meet the requirements of the ITU Radio Regulations, the level of spurious emissions should be at least 40 dB below the mean power level and not more than 40 milliwatts.
- 3.4.8.2 & 3.4.8.4 These NDB monitoring recommendations are adopted as mandatory standards in New Zealand.

UHF Distance Measuring Equipment (DME)

The standards and recommended practices for DME are contained in ICAO Annex 10, Volume I, Chapter 3, section 3.5. Reference should also be made to Annex 10, Volume

I, Chapter 2, paragraph 2.2.2.1 which requires additional standards for DME/N equipment first installed after 1 January 1989.

The numbers below are the paragraph numbers in section 3.5 of Annex 10, Volume I:

- 3.5.3.3.3 DME operating channels bearing the suffix 'Y' in Table A will not be approved.
- 3.5.3.6.3(a) To avoid possible decoding errors in the aircraft interrogator, the beacon code identity signal is not to be transmitted more than twice every 40 seconds. Refer to rule 171.201(2)(i).
- 3.5.3.6.3(b) A dot length of between 100 and 160 milliseconds corresponds to a sending speed of between 12 and 8 words per minute respectively.
- 3.5.4.7.2.3 This recommendation is adopted as a mandatory standard for DME to avoid potential system errors with airborne equipment using second pulse timing. Refer to rule 171.201(2)(ii).

GM 171.201 Guidance material for other facility types

VHF Omnidirectional Radio Range (VOR)

The standards and recommended practices for VOR are contained in ICAO Annex 10, Volume I, Chapter 3, section 3.3.

The numbers below are the paragraph numbers in section 3.3 of Annex 10, Volume I:

- 3.3.2.1 Frequencies in the band 108.0 MHz to 111.975 MHz will not be approved for VOR use. A channel spacing of 100 kHz is to be used for all installations.
- 3.3.5.7 This paragraph is not applicable as 50 kHz channel spacing will not be used.
- 3.3.6.5 & 3.3.6.5.1 VOR will be assigned a two-letter identification code which should be transmitted at least 3 times every 30 seconds, spaced equally within that period and at a speed corresponding to approximately 7 words per minute identification will not be acceptable.

A sending speed of 7 words per minute corresponds to a dot length of 180 milliseconds.
- Voice The implementation of 3.5.3.6.4 for the identification requirements of an associated DME increases the VOR identification rate to between 8 and 12 words per minute, "160 to 100 millisecond dot length", and introduces a break in the VOR identification sequence once every 40 seconds to accommodate the DME identification.
- 3.3.6.8 This paragraph does not apply to VOR ground equipment.
- 3.3.8 This section does not apply to VOR ground equipment.

Instrument Landing System (ILS)

The standards and recommended practices for ILS are contained in ICAO Annex 10, Volume I, Chapter 3, section 3.1.

The numbers below are the paragraph numbers in section 3.1 of Annex 10, Volume I:

- 3.1.3.9.3 Identification codes for ILS will be two Morse code letters preceded by the letter “I”.
- 3.1.4 This section does not apply to ILS ground equipment, but operators of ILS ground equipment should be aware of the possible interference from VHF FM broadcast signals.

Surveillance systems and other systems supporting Air Traffic Services – general

In order to support a selected Air Traffic Management application, the surveillance system or other system supporting Air Traffic Services shall meet a minimum level of performance suitable for the operational requirements of the selected application. The operational requirements of the application shall be derived in part by conducting hazard identification and risk assessment process in accordance with existing Part 100 SMS systems, in conjunction with appropriate international standards and guidance.

Performance criteria of such systems shall be appropriate to the chosen application and the air traffic services provided in the airspace concerned, and the required performance shall be met throughout the coverage volume where the service is provided. This performance shall be monitored and maintained through the life of the surveillance system, and the Hazard Analysis should be updated at system changes (e.g. System Upgrades and Maintenance), in accordance with the Part 100 Change Management Procedures in the organisation’s SMS.

Failure of surveillance systems must be catered for by provision and publication of operational and engineering contingency arrangements and procedures. Suitable redundancy mechanisms shall be identified, and the ANSP shall ensure that an acceptable level of safety is maintained during system unavailability or during times when the redundancy or contingency measures are in place.

Any surveillance system shall not be permanently withdrawn from service unless all ATSUs using the system can demonstrate that the traffic demand and complexity can be safely handled using procedural control or remaining surveillance systems.

Data items

Certain surveillance applications may require additional data items depending on the operational requirements (e.g. for safety nets). Data items essential for safe operation and data items that are deemed as beneficial for additional functions (such as safety nets) shall be identified with an indication of their criticality for a safe operation. Loss of each data item shall be analysed for operational significance. Where loss of such data has a safety impact (e.g. loss of a safety net) necessary measures shall be in place for maintaining an acceptable level of safety.

The tolerable frequency of corruption of aircraft sourced data items shall be derived based on a safety assessment of the significance of the data items to the application.

System failure handling

Annex 11 to the International Convention on Civil Aviation requires that a procedure be in place that informs ATS units of the operational status of the equipment used for

controlling take-off, departure, and approach to land. The system shall report any failures that will put restrictions on the performance or abilities of the equipment. How the system achieves this shall be defined, and the system shall enable the operator to select the correct course of action to maintain safe operation.

Link handling

The local or remote surveillance data feed shall provide complete and uncorrupted data such that the safety of the Air Traffic Service utilising it is not compromised. The performance characteristics of the data transmission link shall be capable of meeting the overall performance requirements necessary for the intended application, and the link bandwidth shall be determined and shown that it has sufficient capability of transmitting the data required to satisfy the Operational Requirements, even when in a fallback or redundancy mode. The system shall provide status information to advise the controller of an overload or failure situation on the links that affects the provision of the service.

Multiple sources of data

The methodology for the integration of positional information from different sources to obtain an overall fused position shall be clearly defined.

The methods used to integrate positional information from multiple surveillance sources may introduce undesirable effects that may impact on the accuracy and the ability to apply certain Air Traffic Service standards (e.g. Separation). The impact of these effects on the ability to support the defined operation shall be assessed.

Such effects may include:

- Lag in turns
- Track discontinuities, e.g. across the boundaries between sensor sources
- Track jumps
- Track deviations
- Split Tracks, and
- False Tracks

Data loss impact Analysis

The impact of the loss of data from individual surveillance sensors or systems on the accuracy and the ability to provide surveillance data to meet the operational requirement shall be assessed. Where it is necessary to use surveillance data from multiple surveillance sensors for the continued service provision, the strategy for continued operation including any back up plans in the event of unavailability of a sensor shall be defined and justified.

Where the unavailability of one or more surveillance data chain(s) results in reduced service levels, procedures shall be in place for the safe handling of traffic during the transition period.

Multilateration Systems (MLAT)

Suitability of an MLAT surveillance system to be used for the intended purpose shall be assessed and justified taking the following into account:

1. The certified equipage levels of the intended aircraft
2. The quality and integrity of the selected data items, and
3. The ability of the system to meet the required performance criteria.

Where the MLAT system is used as a replacement to radar, the MLAT system shall meet at least the same performance criteria met by the radar system subject to replacement.

Where an ANSP intends to use ADS-B positional data or other data items transmitted in ADS-B messages, such data items shall be identified with their intended use and considered as part of the hazard analysis in accordance with the Part 100 SMS of the organisation.

The geographic distribution of sensor locations shall be such that the required probability of detection and coverage can be obtained at all levels where the service will be provided. Specifically, the coverage and the probability of detection in the low levels of altitude shall meet the performance requirements necessary for the intended application in the lower levels of the defined coverage area.

Siting

The system should be installed and optimised such that the loss of data from any single receiver or interrogator does not cause a loss of the required coverage. Accordingly, the system should comprise of at least one additional sensor to the minimum number of sensors required for obtaining a 2D or 3D solution throughout the required coverage area.

Failure handling

In the case of more than one sensor failure, the suitability of the system to continue operation should be decided based upon the achievable coverage and the accuracy levels. The operational strategy in such situations shall be defined including operational procedures.

The MLAT system shall use a method of Remote Field Monitoring for on-going system integrity and end-to-end performance monitoring. The system shall be capable of indicating to controllers when the MLAT system performance is suitable for operational use and when the system performance does not permit its use for providing the intended service.

The system shall also be capable of indicating to the engineering staff the current operational status of the sensor network and any failures to enable remedial action to be undertaken to restore the required level of service.

Automatic Dependent Surveillance – Broadcast (ADS-B) Systems

All ADS-B receiver stations shall be capable of receiving the ADS-B messages defined in AC 91-24 transmitted via version 2 of the Mode S Extended Squitter message transmission protocol.

The ANSP shall define the required ADS-B data items and the specific purpose for which the ADS-B data items will be used.

A comprehensive system safety assessment shall be performed prior to the introduction of ADS-B including identification of failure modes and the probabilities of the ADS-B ground system, and airborne sources providing each required data item to be transmitted in the ADS-B message, in accordance with organisations' Part 100 SMS systems.

ADS-B based surveillance service shall only be provided to targets having certified ADS-B equipment that meet the required performance criteria.

Suitability of ADS-B surveillance system to be used for the intended purpose shall be assessed and justified taking the following into account:

1. The certified equipage levels of the intended aircraft fleet being served
2. The quality and integrity of the selected data items, and
3. The ability of the system to meet the required performance criteria.

The ADS-B system shall maintain a reporting rate that ensures at least an equivalent degree of accuracy, integrity and availability as for a radar system that is used to provide a similar Air Traffic Management service, in accordance with ICAO Circular 326.

The vertical position information shall be processed by the ground-based surveillance system equivalent to processing Mode C information from SSR. This is to ensure same level of data integrity is maintained by the ground system when processing altitude information received from ADS-B equipment. Likewise, the vertical tolerances for ADS-B level information should be consistent with those applied to Mode C level information.

All safety net features should possess at least the same responsiveness as equivalent radar safety net features.

The navigation source(s) (e.g. GNSS) that will be used for reporting of aircraft position shall be identified and included with the hazard analysis.

The risk analysis of the proposed ADS-B system shall determine and consider:

- the likelihood that the position information will not meet the accepted accuracy and integrity criteria for the intended application, and
- the likelihood that data from aircraft participating in ADS B surveillance becomes unavailable or corrupted during operation.

For environments expected to receive ADS-B messages from avionics that have not compensated for latency, the determination of required accuracy and integrity criteria shall take the uncompensated latency into account.

ADS-B ground processing system requirements

The quality indicators used/supported by the ground system for determining the suitability of the positional information transmitted by aircraft shall be identified.

These shall include accuracy and integrity containment parameters and their associated quality indicators from all aircraft using GNSS or non-GNSS positional information involved in the ADS-B surveillance application.

The ground system shall only use the ADS-B data for the provision of an ATC service if the quality indicators from the participating aircraft meet the required criteria.

For aircraft using non-GNSS systems as the source of positional information, the ground systems shall expect equivalent criteria to that of the GNSS for the accuracy and integrity quality indicators. The accuracy and integrity containment parameters and their associated probabilities shall also be consistent with the HPL/HFOM used in GNSS systems.

An indication shall be provided to the controller on the display whether the surveillance quality of a particular aircraft is acceptable for the application, the data is being used. The display system shall also indicate whenever the quality of the surveillance data falls below the acceptable criteria for the application.

Indication that an aircraft is transmitting an emergency status shall be displayed to the controller in a clear and efficient manner.

ADS-B system performance monitoring

The system shall clearly indicate to the controller if an aircraft fails to meet the required accuracy and integrity criteria during operation (including an aircraft of which initial ADS-B messages were acceptable and used for the provision of service)

Ground ADS-B receivers shall be subject to status monitoring. The system shall be capable of indicating to controllers when the ADS-B system performance is suitable for operational use, and when the system performance is insufficient for providing the intended service in part or all of the service volume.

The ADS-B system shall also be capable of indicating to the engineering staff the current operational status of the sensor network and any failures to enable remedial action to be undertaken to restore the required level of service.

Satellite Based Augmentation Systems (SBAS)

SBAS systems must meet the requirements of Annex 10, Volume 1, Chapter 3, section 3.7.2.4. In accordance with Attachment D, the ground-based components of an SBAS system must be appropriate in terms of operational characteristics, deployment, monitoring, maintenance, and availability to meet these requirements.

In addition, suitable operational status reporting and NOTAMs for the SBAS service are required for the airspace within which an SBAS is deployed, in accordance with Annex 10 Volume 1 Attachment D, Sections 6.2.4 and 6.2.6

APPENDIX 1

Assignment of Aeronautical Radio Frequencies

The **Radio Spectrum Management Group** of the Ministry of **Business, Innovation and Employment** ~~Economic Development~~ manages the assignment of frequencies in the aeronautical radio frequency bands on behalf of CAA. Applications for the assignment of a radio frequency should be made direct to the Ministry of **Business, Innovation and Employment** ~~Economic Development~~. Frequency assignments in the aeronautical radio frequency bands will be in accordance with the requirements contained in ICAO Annex 10 to the Convention on International Civil Aviation, the ITU Radio Regulations, and agreements between CAA and the Ministry of **Business, Innovation and Employment** ~~Economic Development~~.

The use of aeronautical frequencies below 30 MHz is to be in accordance with the requirements in Annex 10, Volume V, Chapter 3.

The use of aeronautical frequencies above 30 MHz is to be in accordance with the requirements in Annex 10, Volume V, Chapter 4 except that where options are available, the assignments are to be in accordance with the applicable notes below.

The following frequency bands are to be used for the applicable aeronautical services.

Service	Frequency Band	Annex 10 Reference
ILS Localiser	108 – 111.975 MHz	Vol I, 3.1.3.2.1
ILS Glide Path	328.6 – 335.4 MHz	Vol I, 3.1.5.2.1

1. As there are only a few ILS installations in New Zealand, localiser frequencies and the paired glide path frequencies are to be selected sequentially for each aerodrome from the list given in Annex 10, Vol I, paragraph 3.1.6.1.1.

2. Where separate ILS installations serve the opposite ends of a single runway, or different runways at the same aerodrome, separate frequency pairs are to be assigned to each installation.

VHF Marker Beacon	75 MHz	Vol I, 3.1.7.2.1 Vol 1, 3.6.1
VOR	111.975 – 117.975 MHz	Vol I, 3.3.2.1

1. Frequencies for VOR are to be selected in accordance with Annex 10, Vol V, paragraph 4.2.3(a) and (b).

2. Criteria for the geographical separation of VOR on the same and adjacent frequencies is given in Annex 10, Vol V, paragraph 4.2.5.

NDB	190 – 415 kHz 1 606.5 – 1 632 kHz	Vol I, 3.4.4.1
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Although Annex 10 allocates the band 190 to 1 750 kHz to NDB, ITU Radio Regulations (RR8) and agreement between the CAA and the Ministry of Economic Development restrict the use of the band to 190 – 415 kHz, except that when a frequency in this band cannot fulfil an operational requirement a frequency between 1 606.5 – 1 632 kHz may be assigned.

DME	960 – 1 215 MHz	Vol I, 3.5.3.2
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1. Interrogate and reply frequencies for DME operating Channels are to be selected from the "X" channels listed in Table A at the end of Section 3, Annex 10, Vol I. (Reference Annex 10, Vol I, paragraph 3.5.3.3.3).

2. The pairing of DME Channels for operation with ILS, VOR, or ILS/MLS is to be in accordance with Table A of Annex 10, Vol I, Section 3. (Reference Annex 10, Vol I, paragraph 3.5.3.3.5).

3. The frequency 978MHz is allocated to the Universal Access Transceiver (UAT) system for the transmission of ADS-B reports and the broadcast of ground-based aeronautical information.

SSR		
Interrogation frequency	1 030 MHz	Vol IV, 3.1.1.1.1
Reply frequency	1 090 MHz	Vol IV, 3.1.1.2.1
MLS Angle and data Channel pairing with DME	5 031.0 - 5 090.7 MHz	Vol I, 3.11.4.1.1 Vol I, 3.11.4.1.2
VHF Air-ground	117.975 – 136 MHz 136 – 137 MHz	Vol III, Part 2, 2.1.1.3 Vol III, Part 2, 2.1.1.3

1. Frequencies for the Aeronautical Mobile (R) Service are to be selected from those listed in Group A, Annex 10, Vol V, paragraph 4.1.8.1.2. When the number of frequencies exceeds those listed in Group A, assignments will be made from Group B. (Reference Annex 10, Vol V, paragraph 4.1.8.1.1). Where possible, frequencies should be selected to follow the general allotments in the VHF Frequency Utilisation Plan given in Appendix E to ICAO Doc. 9404 ASIA/PAC/2 Regional Air Navigation Plan.

2. Frequencies for other air-ground services are to be selected from those listed in Group C or Group D, Annex 10, Vol V, paragraph 4.1.8.1.2.

3. Frequencies from 136.9 to 136.975 MHz are reserved for air-ground data link communications (Annex 10, Vol V, 4.1.1.1).

HF SSB	Aero	2.8 MHz – 22 MHz	Vol III, Part 2, 2.4.1.1.1
Mobile			

Frequency assignments will be in accordance with the requirements and allotments of the ITU Radio Regulations and Annex 10, Vol V, section 3.1.

Survival Radio equipment	121.5 and 406 MHz	Vol III, Part 2, 5.1.1
Aircraft ELT	121.5 and 406 MHz	Vol III, Part 2, 5.1.1
Search and Rescue	3 023 and 5 680 kHz	Vol V, 2.2.1
Survival Radio Equipment	243 MHz	Military
Aircraft ELT	243 MHz	Military
Auxiliary frequency SAR	123.1 MHz	Vol V, 4.1.1