An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Radiodetermination, Air Traffic and Maritime Services Licence Guidelines

Guidelines Document

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1 Introduction

1. Section 3 of the Wireless Telegraphy Act 1926, as amended, prohibits the possession, installation, maintenance, working or use of "apparatus for wireless telegraphy" without a licence granted by ComReg under the same Act.

2. The licensing of apparatus for wireless telegraphy for Radiodetermination, Air Traffic and Maritime Services is governed by the Wireless Telegraphy (Radiodetermination, Air Traffic & Maritime Services) Regulations (S.I. 369 of 2009)[1] ("The Regulations").

3. In this document, the Commission for Communications Regulation ("ComReg") sets out its guidelines for all applicants wishing to apply for Radiodetermination, Air Traffic and Maritime Services licences. ComReg encourages all applicants to read these guidelines carefully before submitting an application.

4. Please note that a wireless telegraphy licence granted by ComReg permits the licensee to possess and operate the apparatus for wireless telegraphy specified in the licence. It does not absolve the licensee from complying with any other statutory obligations (e.g. planning authority, aids to navigation consents etc.).

5. Please further note that this document does not constitute legal, commercial, financial, technical or other advice and the Commission for Communications Regulation shall not, at any time, be bound by the contents of this document which do not necessarily set out the Commission's final or definitive position in any particular matter. The Commission reserves its right to act at all times in accordance with its statutory functions and objectives and this may include reaching a decision or taking an action which is at variance with all or any part of these guidelines.

6. Queries regarding these guidelines or the licensing process can be directed to ComReg's Spectrum Licensing Operations Team:

   Telephone: + 353 (0)1 8049600

   e-mail: licensing@comreg.ie

[1] S.I. No. 369/2009 - Wireless Telegraphy (Radiodetermination, Air Traffic and Maritime Services) Regulations, 2009 (irishstatutebook.ie)

2 Radiodetermination, Air Traffic and Maritime Services – An Overview

7. In accordance with its statutory function and objective to ensure the efficient management of the radio spectrum, ComReg established a licensing regime for Radiodetermination, Air Traffic and Maritime Services in 2009 to protect such services from interference and, along with the relevant national body, and ensure that international obligations are met.

8. The licensing process will be co-ordinated with the Irish Aviation Authority[2] ("IAA") and the Commissioners of Irish Lights[3] ("CIL"), as appropriate please see Annex 2 for the contact details for IAA and CIL.

9. All systems incur a once off licence fee of €500 to cover co-ordination and notification costs and will be licensed for the lifetime of the system. Amendments to a licence will incur a €30 fee.

10. Three distinct categories of service require licensing: Radiodetermination Services, Air Traffic Services, and Maritime Services.

    - "Radiodetermination" is defined by the International Telecommunication Union (ITU) as the determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves.

    - Air Traffic Services describes ground-based equipment and systems utilising apparatus for wireless telegraphy, operating in the aeronautical frequency bands that are used or intended to be used in connection with the safety, security or operation of aircraft in flight or on the ground, and excludes public electronic communications networks and Radiodetermination Services.

    - Maritime Services describes equipment and systems utilising apparatus for wireless telegraphy, operating in the maritime frequency bands not installed on vessels, that are used or intended to be used, in connection with:

        a. the safety, security or operation of vessels; or

[2] https://www.iaa.ie/
[3] https://www.irishlights.ie/

b. the training of personnel in the Maritime Mobile Service, and excludes public electronic communications networks and Radiodetermination Services.

11. There are internationally agreed frequencies set aside for the use of Radiodetermination, Air Traffic Services and Maritime Services. It is within these unique parts of the radio spectrum that ComReg will issue licenses. All frequencies are allocated on either a Primary Service or a Secondary Service[4] basis depending on whether they are sharing the spectrum or not.

12. The management of the Aeronautical spectrum in Ireland is carried out by the IAA while the management of the land based Maritime spectrum is carried out by ComReg.

13. Under the ITU Radio Regulations[5] all persons using apparatus for wireless telegraphy for the Air Traffic and Maritime Services must be properly qualified to agreed standards. It is the responsibility of the licensee to ensure that access to, and control of, licensed apparatus is restricted to those persons who are duly authorised and qualified. In particular, all licensed apparatus must not interfere with any emergency or distress system.

14. In common with other licensed radio services, all radio equipment used to provide Radiodetermination, Air Traffic or Maritime Services must comply with The radio equipment directive 2014/53/EU[6] (the "RE Directive") which was transposed into Irish law on 9 June 2017 by S.I. 248 of 2017.[7]

15.

16. Table 1 below details the three different systems that can be licensed under the Regulations.

AIR TRAFFIC	MARITIME	RADIODETERMINATION	
		Radio Navigation	**Radio Location**
Aeronautical Mobile	Coast Stations	ILS	Radar

[4] Secondary services shall not cause interference to Primary Services, nor shall they claim protection from harmful interference from Primary Services but they can claim protection from other stations of the same of other secondary services to which frequencies are assigned at a later date.
[5] Article 37 for the Aeronautical Service and Article 47 for the Maritime Service.
[6] https://ec.europa.eu/growth/sectors/electrical-engineering/red-directive_en
[7] http://www.irishstatutebook.ie/eli/2017/si/248/made/en/print

ATIS	MRCC	DME	Racons
Aeronautical Broadcast (e.g. VOLMET)	VHF Communications	AIS	Loran C
ACARS		Beacons	Loran / eLoran
VHF and Comms		VOR/DVOR	
		Localiser	
		Glide Path	
		MLS	

Table 1: Summary of the different systems within each licence category[8]

[8] See Annex 4 for a complete list of definitions for all these services.

3 Air Traffic Services Licence

18. An Air Traffic Services Licence issued by ComReg is required for the possession and use of apparatus for wireless telegraphy, not installed on aircraft that uses the frequencies assigned to the aeronautical services[9], excluding Aeronautical Radionavigation and Radiolocation.

    - ComReg will issue An Air Traffic Services Licence once the applicant has received provisional approval, including frequency assignment from the IAA in respect of the system, or combination of systems; and
    - The apparatus for wireless telegraphy is owned and operated by a single entity.

19. Persons operating apparatus for wireless telegraphy must be in possession of all necessary qualifications. Each licence issued shall remain in effect for so long as the licensed apparatus is in use.

20. Table 2 below shows some of the systems that require licensing and may be accommodated under an Air Traffic Services Licence[10]. Please contact ComReg if you are using any system other than those mentioned in the table below.

System Type	Type of Service

[9] See https://rfpi.comreg.ie/ , The National Frequency Plan for Ireland details the spectrum allocated for Aeronautical use in Ireland
[10] See Annex 4 for a complete list of definitions for all these services.

Approach Control	Ground to Air to Ground
Aeronautical Mobile	Ground to Air to Ground
Area Control Centres (ACC)	Ground to Air to Ground
Automatic Terminal Information Services (ATIS)	Ground to Air, Ground to Ground
Aeronautical Broadcast including VOLMET	Ground to Air, Ground to Ground
Control Tower	Ground to Air, Ground to Ground
Ground Control	Ground to Ground
Emergency Vehicles / Support Vehicles[11]	Ground to Ground

Table 2: Systems requiring an Air Traffic Service licence.

21. The IAA is responsible for the management of frequency assignments in the aeronautical frequency bands specified in Table 3.

LF/MF	255 – 495 kHz and 505 – 526.5 kHz	NDB and Locator
HF	2.8 MHz - 22 MHz	High frequency bands allocated to the aeronautical mobile (R) service
VHF	108 – 117.975 MHz 117.975 – 137 MHz	ILS localizer (below 112 MHz), VOR and GBAS Air-Ground communications
UHF	225 - 400 MHz 328.6 – 335.4 MHz 960 – 1215 MHz 2700 – 3100 MHz	UHF Communications ILS Glide Path DME Radio Location (Primary Surveillance Radar)
SHF	5030 – 5150 MHz	MLS

[11] Where standard PMR (Private Mobile Radio) frequencies are used then a Business Radio Licence is required, see https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/business-radio/

Table 3: Aeronautical frequency bands managed by the IAA

3.1 Air Traffic Services Application Requirements

22. Before applying to ComReg for an Air Traffic Services Licence, all applicants must first contact the IAA to obtain a Frequency Assignment Document.

23. IAA frequency assignments are conditional on the applicant applying to ComReg for an Air Traffic Services Licence within 30 days of the receipt of the assignment. Frequency assignments are considered invalid after 30 days if an Air Traffic Services Licence application is not received by ComReg.

24. The Frequency Assignment Document, as obtained from the IAA, must accompany all Air Traffic Services Licence applications to ComReg. This document will be inserted as Part 2 of the eventual Air Traffic Services Licence granted by ComReg.

25. To obtain a Frequency Assignment Document, please contact the IAA at: AeronauticalFrequencyAssignments@iaa.ie

26. The appropriate ComReg Licence Application Form, ComReg Document 11/07b, must then be completed in respect of the system or systems in place. These forms can all be found on ComReg's website:

    https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/radiodetermination-services/

27. Applications should be submitted in sufficient time to allow processing prior to any required date or event.

4 Maritime Services Licence

28. A Maritime Services Licence is required for the possession and use of apparatus for wireless telegraphy on the frequencies assigned to the maritime services[12], where such apparatus is not located on board vessels[13] but is used for shore based operations excluding apparatus covered under Maritime Radionavigation and Radiolocation. (See Sections 5.1 and 5.2)

29. A single Maritime Services Licence will cover a specific geographical location irrespective of the number of systems at that location, provided that all such systems are in the possession of a single person or body. For example, if several systems are located at a particular location and all are owned and operated by one person, then that person will require one Maritime Service Licence which shall cover all of those systems. On the other hand, if a person operates several systems which are located at different locations, then the person will require a Maritime Service Licence for each location.

30. Persons operating apparatus for wireless telegraphy must be in possession of all necessary qualifications. Each licence issued shall remain in effect for so long as the licensed apparatus is in use.

31. Table 4 below shows some of the systems that require a Maritime Services Licence[14]. Please contact ComReg if you are using any system other than those mentioned in the table.

Type of Systems
Commercial vessel movement and coordination
National Search and Rescue Centres
National Search and Rescue Monitoring and Support
Multiple Systems for Training
Private Marina / Race Control

Table 4: Shore based maritime services requiring a Maritime Services Licence.

32. The spectrum assigned to services under a Maritime Services Licence falls into two categories:

[12] See ComReg Document 08/90R2, Radio frequency Plan for Ireland for details of the spectrum allocated for Maritime use.
[13] The licensing of Wireless Telegraphy equipment on board vessels is carried out by the Department of Transport.
[14] See Annex 4 for a complete list of definitions of these services

- Land based Maritime Mobile, or
- Land Based Private Maritime

4.1 Land Based Maritime Mobile

33. Land Based Maritime Mobile has an international ITU allocation and is shown in ComReg's Radio Frequency Plan for Ireland.[15] Usage of such spectrum must be licensed under a Maritime Services Licence[16].

4.2 Land Based Private Maritime

34. In addition to section 4.1, 39 channels in the range 157.450 – 163.0 MHz (part of the Land Mobile spectrum) have been designated as private maritime channels. These channels do not have an ITU allocation for maritime use but they have been co-ordinated by ComReg for use by marinas, yacht clubs and other like groups, to assist in the co-ordination and operation of sailing regattas, competitions and other such localised events. Use of private maritime spectrum must also be licensed by ComReg under a Maritime Services Licence. (See Annex 3 for Channel Listing)

4.3 Maritime Services Application Requirements

35. The appropriate Licence Application Form, ComReg document 11/07e must be completed in respect of the system or systems in place. These forms can all be found on the ComReg's website:

    https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/radiodetermination-services/

36. The Applications should be submitted in sufficient time to allow processing prior to any required date or event.

[15] https://rfpi.comreg.ie/
[16] The management and coordination of the Maritime Mobile Spectrum for Ireland is under the aegis of the Dept. of Transport.

5 Radiodetermination

37. A Radiodetermination Services Licence is required for the use and possession of apparatus for wireless telegraphy on the frequencies assigned for Radionavigation and Radiolocation.

38. As defined by the ITU, “Radiodetermination” is the determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves.

39. A Radiodetermination Services Licence will only be granted by ComReg if the appropriate approval, including co-ordination, has been given by the relevant body (the IAA or the CIL).

40. A single Radiodetermination Services Licence will be granted in respect of any of the Radiodetermination Services system, or combination of systems, set out in Table 4 below, where the system or combination of systems is at one specific location and is owned and operated by a single person or body. The exception to this is AIS or Radar, which will be licensed as a single national network.

41. Appropriate approvals from the IAA or CIL may be required in respect of the Radiodetermination Services systems to be licensed. Where such approval is required, a copy of this approval must accompany your application. Please contact IAA and or CIL in relation to the appropriate approvals required.

5.1 Radionavigation

42. Radionavigation is defined by the ITU as Radiodetermination used for the purposes of navigation, including obstruction warning.

43. For licensing purposes, Radionavigation systems fall into two categories: systems employing aeronautical spectrum (aeronautical radionavigation), and systems employing maritime spectrum (maritime radionavigation).

Aeronautical Radionavigation

44. The operation and maintenance of wireless telegraphy systems for air navigation in Ireland is subject to approval by the IAA and is subject to international regulations, standards and recommended practices as detailed in Annex 10 to the Convention on International Civil Aviation.

Maritime Radionavigation

45. The CIL is responsible for the provision, superintendence and management of maritime aids to navigation (i.e. lighthouses, buoys, radio and radar beacons, leading lights etc.) throughout the island of Ireland and its adjacent seas and islands. All maritime radio aids to navigation in Ireland must be operated with the permission of the CIL, granted by issuance of a Statutory Sanction.

46. Two categories of Radiodetermination Services are being licensed by ComReg:

- Radionavigation Systems, and
- Radiolocation Systems

47. Table 5 lists some of the systems that will require a Radionavigation licence from ComReg. At present, these include Automatic Identification Systems (AIS), ILS, DME, Loran, and VOR/DVOR. Parties with any queries in relation to systems other than those listed below should contact ComReg directly. ComReg reserves the right to amend this table to take into account new systems which may be brought into service in the future.

System Type	Service
Instrument Landing System (ILS)	Aeronautical
Microwave Landing System (MLS)	Aeronautical
Distance Measuring Equipment	Aeronautical
AIS	Maritime
VOR / DVOR	Aeronautical
Localiser	Aeronautical
Glide Path	Aeronautical
Loran	Aeronautical / Maritime
Differential GPS	Aeronautical / Maritime
Non Directional Beacons	Aeronautical / Maritime

Table 5: Radionavigation Systems requiring a licence.

48. Whilst Maritime radionavigation incorporates, many different types of systems, AIS systems, because of their complex nature, are dealt with in Section 5.3.

5.2 Radiolocation

49. The ITU defines Radiolocation as Radiodetermination for purposes other than those of radionavigation. Several Radiolocation systems fall under the Radiolocation category for licensing by ComReg, including Radar, Racon, Loran C and Loran / eLoran. Radiolocation systems may operate within the aeronautical or maritime bands. Accordingly, the appropriate co-ordination and approvals must be confirmed by the relevant body prior to licensing.

5.3 Automatic Identification System (AIS)

50. An Automatic Identification System (AIS) is a broadcast transponder system operating in the VHF maritime mobile band. AIS transponder equipment is used on ships and aids to navigation by Vessel Traffic Services (VTS) and by Maritime Authorities. These aids may be located on shore, such as in a lighthouse, or on the water, on platforms or buoys.

AIS - Aids to Navigation (AtoN):

51. This transponder equipment may be located on shore, such as in a lighthouse, or on the water, such as on platforms or buoys. They allow the transmission of positional information to ships and to shore, as well as certain additional information such as the nature and status of the AtoN, meteorological and hydrological information.

52. Statutory Sanction under section 653(2) of the Merchant Shipping Act of 1894 is required for all AtoN including AIS AtoN. Statutory Sanction is also required to alter or discontinue an AtoN.

AIS - Non-Aids to Navigation (Non AtoN):

53. This transponder equipment is used in shore-side infrastructure by Vessel Traffic Services and Maritime Competent Authorities, and allows them to monitor AIS-fitted vessel movements, to communicate with all AIS transponder equipment types, and if suitably authorised, to perform management functions upon the AIS VHF Data Link (VDL).

AIS - Mobile Aids to Navigation (MAtoN):

54. A Mobile Aid to Navigation ("MAtoN") is defined as a non-fixed or un-moored Aid to Navigation (AtoN); it does not include a fixed or moored buoy that is adrift from station, temporarily or otherwise.

55. A MAtoN can be fitted with an Automatic Identification System (AIS) device transmitting message 21.

56. Statutory Sanction under section 653(2) of the Merchant Shipping Act of 1894 is required for all MAtoN including AIS MAtoN. Statutory Sanction is also required to alter or discontinue an AtoN.

AIS - Frequencies, Approvals and Licensing:

57. The frequencies 156.525 MHz (channel 70), 161.975 MHz (AIS 1) and 162.025 MHz (AIS 2) may also be used by autonomous maritime radio devices Group A that enhance the safety of navigation, using digital selective calling and/or AIS technology. Such use should be in accordance with the most recent version of Recommendation ITU-R M.2135[17].

58. Any person or body applying to ComReg for a Radiodetermination Services Licence, permitting them to possess or use an AIS system, must have an MMSI (Maritime Mobile Service Identity), a Time Slot[18], and for AtoN/MAtoN, a Statutory Sanction. A Statutory Sanction is granted by the CIL and Time Slots are co-ordinated between the CIL and the Irish Coast Guard (IRCG). Applicants must have obtained Statutory Sanction from CIL before applying to ComReg for a Radiodetermination Licence. MMSI numbers are assigned by ComReg as part of the licensing process. Licence applications which do not include proof that such authorisations are properly in place will not be processed by ComReg.

[17] RECOMMENDATION ITU-R M.2134-0 - Receiver characteristics and protection criteria for systems in the mobile service in the frequency range 27.5-29.5 GHz for use in sharing and compatibility studies

[18] Time slots are only issued if the licensee requests the use of Fixed Access Time Division Multiple Access (FATDMA) scheme, and suitable arrangements have been put in place to reserve these slots for exclusive use.

59. An AIS AtoN or MAtoN system licence issued by ComReg will only remain valid for so long as its associated Statutory Sanction is in force i.e. if the associated Statutory Sanction is suspended, revoked or withdrawn then the corresponding licence shall automatically cease to be valid. Similarly, if the licence is suspended, revoked or withdrawn then the corresponding Statutory Sanction shall automatically cease to be valid.

60. As stated above, the required approvals must be in place prior to submitting an application to ComReg for a Radiodetermination Licence, therefore;

- AtoN/MAtoN applicants must contact the CIL to obtain conditional approval (which incorporates Statutory Sanction and slot allocation). This approval is conditional on the applicant applying to ComReg for a wireless telegraphy licence within 30 days of receipt of the approval. The approval is invalid after 30 days if an application is not received by ComReg.

- Non-AtoN applicants must also contact the CIL in advance of making application to ComReg, in order to ensure that there are no difficulties with the proposed system. ComReg will be advised by CIL prior to licensing such systems.

5.4 Radiodetermination Application Requirements

61. The appropriate Licence Application Form, ComReg document 11/07a for AIS, ComReg document 11/07c for Radiolocation and ComReg document 11/07d for Radionavigation and must be completed in respect of the system or systems in place. These forms can all be found on the ComReg's website:

https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/radiodetermination-services/

62. Applications should be submitted in sufficient time to allow processing prior to any required date or event.

6 Licence Information

6.1 The Licensee

63. The licensee must be a legal entity; an individual or a registered company.

64. Additionally, it is the responsibility of the licensee to ensure at all times that the details included in its licence application (e.g. names, registered business address, contact details, services to be provided under the licence) are valid and updated. Any changes to the licence details must be notified to ComReg in writing.

6.2 The Licence

65. A Radiodetermination, Air Traffic Services or Maritime Services Licence does not confer any right of ownership of the frequency spectrum assigned there under. A licence permits the possession and use of the apparatus for wireless telegraphy described therein, in accordance with the conditions set out in the licence and in the Regulations, and this includes a right to use the assigned frequency spectrum. The conditions attached to a Radiodetermination, Air Traffic and Maritime Service licence are detailed in the Regulations.

66. Licensees are responsible for ensuring that they comply with all of the conditions set out in their licences and in the Regulations.

6.3 Licence Duration

67. With the exception of temporary licences, Radiodetermination, Air Traffic Services and Maritime Services Licences are granted for the lifetime of the apparatus for wireless telegraphy specified in the Licences, and Licences shall remain in effect for so long as the licence details are correct or until such time as the licence is either withdrawn, suspended or revoked by ComReg or surrendered by the licensee.

68. In accordance with the Regulations, all licensees are required to inform ComReg immediately of any substantive change to the details of their licence. As part of ComReg's 5-year notification process, licensees must also confirm to ComReg every five years from the original date of granting of the licence, that their licence details are still correct. If ComReg does not receive confirmation from the licensee as part of the 5-year notification process, then the licence will be deemed to be not required by the licensee and will be revoked by ComReg.

6.4 Licence Fees Payable

69. The granting of a Radiodetermination, Air Traffic Services or Maritime Services Licence is subject to payment of the following prescribed fees to ComReg:

    - New application - €500 fee; and
    - Amendment or transfer of a licence - €30 fee.

70. Note: Licence fees must be submitted to ComReg together with the ComReg Application Form.

6.5 Amendments to a Licence

71. Under the Regulations, it is the responsibility of the licensee to inform ComReg of any licence amendments as soon as they occur but no later than 28 days after such changes. A licence amendment occurs when the details on the licence document are no longer valid and therefore need to be updated. Any changes to licence details should be submitted to ComReg on the appropriate application form.

6.6 Cancellation of a Licence

72. A Radiodetermination, Air Traffic Services and Maritime Services Licence may be cancelled at the written request of the licensee and there shall be no entitlement to any refund of licence fees in the event of any such cancellation.

6.7 Suspension, Withdrawal or Revocation of a Licence

73. ComReg may suspend, withdraw or revoke a Radiodetermination, Air Traffic Services or Maritime Services Licence in the event of non-compliance by the licensee with any condition of the licence. There shall be no entitlement to any refund of the licence fee in the event of any such action.

Annex: 1 Contact Details

Irish Aviation Authority

Technology Directorate

The Times Building

11-12 D'Olier Street

Dublin 2

Telephone: 00 353 1 6718655

Fax: 00 353 1 6792934

Email: AeronauticalFrequencyAssignments@iaa.ie

Commissioners of Irish Lights

Harbour Road

Dun Laoghaire

County Dublin

Telephone: 01 2715400

Email: info@cil.ie

Annex: 2 Land Based Private Maritime Channels

Base (MHz)	Mobile (MHz)
162.05	157.45
162.075	157.475
162.1	157.5
162.125	157.525
162.15	157.55
162.175	157.575
162.2	157.6
162.225	157.625
162.25	157.65
162.275	157.675
162.3	157.7
162.325	157.725
162.35	157.75
162.375	157.775
162.4	157.8
162.425	157.825
162.45	157.85
162.475	157.875
162.5	157.9
162.525	157.925
162.55	157.95
162.575	157.975

Base (MHz)		Mobile (MHz)
162.6		158
162.625		158.025
162.65		158.05
162.675		158.075
162.7		158.1
162.725		158.125
162.75		158.15
162.775		158.175
162.8		158.2
162.825		158.225
162.85		158.25
162.875		158.275
162.9		158.3
162.925		158.325
162.95		158.35
162.975		158.375
163		158.4
	Amphibians - 4 Channels	158.425
		158.45
		158.475
		158.5

Annex: 3 Definitions

Aeronautical mobile (OR) [off-route] service means an aeronautical mobile service intended for communications, including those relating to flight coordination, primarily outside national or international civil air routes.

Aeronautical mobile (R) [route] service means an aeronautical mobile service reserved for communications relating to safety and regularity of flight, primarily along national or international civil air routes.

Aircraft Communications and Reporting Systems (ACARS) means while in the air, aircraft send digital data as to their operation to the ground. Information is exchanged in relation to the business of the airline, crew requirements etc. This is carried out using a Data Link over VHF or HF.

Approach Control: Approach Control Service. Air traffic control service for arriving or departing controlled flights

Area Control Centres: A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.

Automatic Identification Systems (AIS): A short range coastal tracking system used on ships and by Vessel Traffic Services (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships and VTS stations.

Automatic Terminal Information Service (ATIS): A continuous broadcast of recorded non control information in busier terminal (i.e. airport) areas and contains essential information, such as weather information, which runways are active, available approaches, and any other information required by the pilots.

Data Link (VHF or HF) (VDL or HFDL): The transmission of digital information between two stations for the purpose of information exchange or control. Links can be between ground stations or in the case of VDL Mode 4 between aircraft in flight. Aeronautical VDL use the band 117.975 - 137 MHz, Aeronautical HFDL operates between 3016 kHz and 17946 kHz.

Differential Global Positioning System (DGPS): To enhance and augment GPS a network of fixed known land based stations transmit data to receivers in the 284 – 293 kHz band

Distance Measuring Equipment (DME): This is a transponder-based radio navigation technology that measures distance by timing the propagation delay of radio signals.

Emergency Vehicles, Support Vehicles and systems: Within an airport, various organisations provide support services to the operation of aircraft from loading baggage to cleaning the aircraft. Emergency Services also operate within the airport boundaries. The movement of all these systems is coordinated for the safety of aircraft in flight and on the ground and all will be using VHF Communications.

Ground Based Augmentation System: The Ground-Based Augmentation System is a safety-critical system that augments the GPS Standard Positioning Service and provides enhanced levels of service. It supports all phases of approach, landing, departure, and surface operations within its area of coverage.

Ground Control: Ground Control sometimes known as Ground Movement Control or Surface Movement Control is responsible for the airport "movement" areas. This generally includes all taxiways, inactive runways, holding areas, and some transitional aprons or intersections where aircraft arrive, having left the runway or departure gate.

Instrument Landing System (ILS): The Instrument Landing System is a ground-based instrument approach system that provides precision guidance to an aircraft approaching a runway, using a combination of radio signals and consists of an ILS Glide Path, Localiser and Marker Beacons.

ILS Glide Path: A glide path operates at the end of certain runways to enable aircraft to approach the runway avoiding any mountainous terrain. This is two differently modulated (90 and 150Hz) signals to provide a narrow path down to the runway.

Localizer: The localizer provides for ILS facility identification by periodically transmitting a 1020 Hz Morse code identification signal.

Marker beacons: On most installations 3 marker beacons operating at a carrier frequency of 75 MHz are provided. These are vertical fan markers and can only be received when the aircraft is above them. The Outer Marker modulation is repeated Morse-style dashes of a 400 Hz tone. The Middle Marker is modulated with a 1300 Hz tone as alternating dots and dashes. The Inner Marker modulation is Morse-style dots at 3000 Hz.

Loran LoranC / e-Loran: Loran-C is a hyperbolic radionavigation system which covers most of the Northern Hemisphere. The system uses groups of at least three ground transmitter stations called chains. Each chain comprises one Master and two or three Secondary stations, several hundred kilometres from the Master station. The repeatable accuracy of Loran-C is impressive, allowing a return to a marked position with greater accuracy time and time again. E-Loran is an enhanced version that integrates the data from GPS into the system to increase accuracy and consistency.

Microwave Landing Systems (MLS): This is a general upgrade to the ILS system allowing for a greater number of channels and multi path navigation. The benefit to navigation is that it allows approaches to be made around terrain and for multiple installations at the one airport.

Non-Directional Beacon (NDB): A Non-Directional Beacon is a radio transmitter at a known location, used as a navigational aid. As the name implies, the signal transmitted does not include inherent directional information, in contrast to newer navigational aids.

RACON (Radar Beacon): In their basic form they receive signals from radars which trigger the Racon to emit a characteristic signal which is in turn received by the radar. This characteristic signal is in the form of a series of response pulses which will show up on a ship's radar as a Morse coded trace and allow easy identification of the particular Racon being interrogated. Racons can be placed on any navigational mark (eg: lighthouses, beacons, buoys, etc). The return on the ship's radar will clearly identify the mark from surrounding targets and allow the mariner to accurately measure his range and bearing.

Radar means an object detection system that uses electromagnetic waves to identify the range, altitude, direction, or speed of both moving and fixed objects such as aircraft, ships, motor vehicles, weather formations, and terrain.

To safely monitor and co-ordinate the movement of aircraft or ships a number of different Radar systems are used. These can be short range, (Surface Movement Radar) medium or long range (Primary Radar). Some radar are operated by the airport or port and some are operated by a national authority

- Primary Radar is a passive receiver of echoes with no target information. Any information gained is based on differences between the location of the target at initial contact and subsequent contacts.

- Approach Control Radar is used to detect and track aircraft at altitudes below 25,000 feet (7,620 meters) and within 40 to 60 nautical miles

- Secondary Surveillance Radar operates in interrogator mode transmitting a pulse and receiving a reply from the aircraft encoded with identity and height. This requires the aircraft to have the appropriate type of equipment on board.

- Surface Movement Radar is a millimetric, single or multi head radar located around an airport. This provides for runway incursion, foreign object detection and movement control of ground vehicles.

Vessel Traffic Service (VTS): A marine traffic monitoring system established by harbour or port authorities, similar to air traffic control for aircraft. Typical VTS systems use radar, closed-circuit television (CCTV), VHF radiotelephony and Automatic Identification System to keep track of vessel movements and provide navigational safety in a defined geographical area.

VOLMET: The broadcast of meteorological information for aircraft in flight.

VOR or DVOR (Doppler VOR): VOR, short for VHF Omni-directional Radio Range, is a type of radio navigation system for aircraft. VORs broadcast a VHF radio composite signal including the station's Morse code identifier (and sometimes a voice identifier), and data that allows the airborne receiving equipment to derive a magnetic bearing from the station to the aircraft (direction from the VOR station in relation to the Earth's magnetic North at the time of installation).