Commission for
Communications Regulation

Consultation Paper

Consultation on Mobile Communications On Board Aircraft (MCA)

Document No:	**07/62**
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All responses to this consultation should be clearly marked:- "Reference: Submission re ComReg 07/NN" as indicated above, and sent by post, facsimile, e-mail or on-line at www.comreg.ie (current consultations), to arrive on or before 12.30Hrs, 08 October 2007, to:

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Please note ComReg will publish all respondents submissions with the Response to this Consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24

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1 Executive Summary

This Consultation considers the regulatory approach most appropriate to facilitate the use of mobile phone terminals on board commercial aircraft—while ensuring that the existing terrestrial mobile communications systems are not subject to harmful interference.

It should be noted that the operation of wireless devices on board aircraft and the installation of the MCA systems remains subject to airworthiness certification by the EASA and the IAA and as such are beyond the scope of this consultation.

A brief introduction to the system as proposed and the regulatory approaches undertaken so far in other jurisdictions is outlined in Section 3 of this document. This also includes work done both by European Union (EU) and the European Conference of Postal and Telecommunications Administrations (CEPT[1]).

ComReg's proposed approach is detailed in Section 4 of the consultation. Specifically this section poses questions for respondents on:

- The likelihood of interference and suitability of mitigation methods;
- The probability of any economic impact on Irish MNOs (Mobile Network Operators);
- The legal basis and options for regulating MCA in Ireland, including the following options:
  - Option A General Authorisation[2],
  - Option B General Authorisation and MCA Radio Licence[3],
  - Option C General Authorisation coupled with an Exemption Order for the on Board Equipment or
  - Option D Not licensing the system, prohibiting its use.
- How 'international co-ordination' issues should be handled, and
- Any other issues.

[1] CEPT was established in 1959 by 19 countries and now comprises 48 member countries throughout Europe. In 1988 ETSI (the European Telecommunications Standards Institute) was created by CEPT to produce telecommunication standards.

[2] See;http://www.comreg.ie/publications/conditions_of_general_authorisation.583.101047.p.html and http://www.comreg.ie/publications/guidelines_relating_to_general_authorisations.583.101049.p.html

[3] This would be a restricted service licence in the GSM bands, with a specific frequency band of operation and at much lower power than a conventional GSM licence.

2 Introduction

The Commission for Communications Regulation (ComReg) is the statutory body and National Regulatory Authority (NRA) responsible for the regulation of the electronic communications sector including telecommunications, radiocommunications, broadcasting transmission the postal sector in Ireland.

This includes managing, developing and implementing relevant European and international policy, standards, and legislation governing these sectors including the EU, CEPT and the International Telecommunication Union (ITU[4]). International standards and harmonised use of radio frequencies facilitates the development of sectors in an open and competitive environment and, through this, services such as Mobile Communications On Board Aircraft (MCA) come to fruition.

MCA, installed on a commercial aircraft, is intended to provide communications facilities for mobile terminals allowing users to use their personal communications equipment during the 'in flight' phase of their journey, in much the same way as they would on the widely available terrestrial public mobile networks.

Two key criteria must be met before an MCA system can be authorised, i.e., for obvious safety reasons it must not interfere with the avionics or aeronautical communications of the aircraft, nor must it cause any interference to terrestrial communications networks.

The first criterion is dealt with through airworthiness certification, which, for Irish registered aircraft, is the responsibility of the European Aviation Safety Authority (EASA) and the Irish Aviation Authority (IAA). The second issue has been the subject of developments in CEPT and in the European Commission to develop guidance and criteria for the deployment of MCA. This resulted in a technical report by CEPT (ECC Report 93) on compatibility between the airborne and terrestrial systems and an ECC Decision (ECC/DEC(06)07) which defined the minimum operational altitude (3000 metres above ground level) and the maximum emissions permitted outside the aircraft hull. Both documents are briefly outlined in this paper.

ComReg has actively contributed to the work on MCA from 2004 initially through the CEPT working groups but more recently through the Radio Spectrum Committee (RSCom) of the EU Commission. On the 29 September 2006 ComReg was approached by an MCA operator for a licence for MCA equipment on board Irish Registered aircraft. An initial test licence to enable on the ground testing was issued on 25 April of 2007 and the tests took place on the 30 April and 20 May 2007. All of the MNOs were notified in advance of this test and no interference to terrestrial mobile networks was notified to ComReg.

[4] ITU is the leading United Nations agency for information and communication technologies. As the global focal point for governments and the private sector, ITU's role in helping the world communicate spans 3 core sectors: radiocommunication, standardization and development. ITU also organizes TELECOM events and was the lead organizing agency of the World Summit on the Information Society.
ITU is based in Geneva, Switzerland, and its membership includes 191 Member States and more than 700 Sector Members and Associates.

Following these tests and the significant amount of work that has been carried out internationally within CEPT and in the RSCom, ComReg believes that it is now appropriate for a consultation on how these services could be regulated on a permanent basis if introduced.

2.1 Brief System Description[5]

An MCA system comprises a Base Station (BTS) and Network Control Unit (NCU) on board the aircraft and a radio link, typically via satellite, to a ground station and then to the public telecommunications networks.

The BTS on board the aircraft operates at low power in the GSM 1800 spectrum (1710-1785MHz and 1805-1880MHz) controlled by the NCU. The NCU not only controls the on-board BTS but also instructs all mobile devices on which band to operate on, what power to use and also produces a signal masking mobile terrestrial networks, not only in the GSM 1800 MHz band but also in the 450, 900 MHz and 3G bands. This prevents mobile terminals from receiving any valid network signal, other than from the on-board BTS. In effect this prevents all mobile devices within specification contacting their respective terrestrial networks and, where phones are multi-band, it forces them to operate at minimum power (0dBm) and only on the GSM 1800 band.

Typically communication to and from the NCU and BTS to the terrestrial mobile and fixed networks is handled by satellite, entering the terrestrial networks at a Ground Gateway (GGN) and nearest Main Switching Centre (MSC or Exchange). A simplified system diagram is shown in *Figure 1 (excerpted from ECC Report 93).*

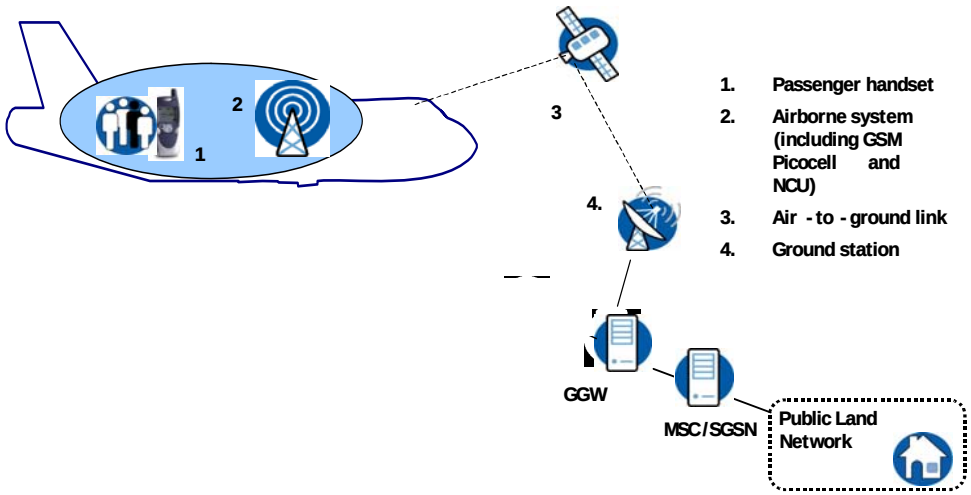

Figure 1: Simplified On Board GSM (MCA) System Diagram

[5] For more technical details regarding the system's operation refer to ECC Report 93 'Compatibility between GSM equipment on board aircraft and terrestrial networks (incl SEAMCAT scenario files)' available at www.ero.dk or examine the outline from this report in Appendix C which includes all relevant frequencies.

2.2 International Developments

2.2.1 Developments in CEPT

Work on MCA was initiated in the CEPT ECC[6] working groups in 2004 and supported by an EC mandate[7] in 2006. This has resulted in two key documents the first of which, ECC Report 93, addresses the compatibility between GSM equipment on board aircraft and terrestrial networks. The report includes the results of compatibility studies based on extensive Monte-Carlo analysis.

The second document issued is an ECC Decision[8], which covers free circulation and the harmonised usage of MCA systems. This document sets the minimum operational altitude and the maximum emissions outside the aircraft hull produced both from the system itself and all of the mobile terminals within the aircraft cabin.

It should be noted that further work on MCA systems is ongoing within the ECC Working Group Spectrum Engineering (WGSE) project team SE7 to examine other frequency bands and in particular the band 2500 – 2690 MHz.

2.2.2 Developments in the European Commission

Following on from the work on MCA at CEPT ECC working groups the European Commission (EC) set about formulating a pan-European regulatory approach led by the Communications Committee (CoCom) and Radio Spectrum Committee (RSCom) to deal with the authorisation and subsequent licensing of such services. This resulted in the Commission Mandate to CEPT of the 12th of October 2006 and work is ongoing in regards to development of a Commission Decision on MCA.

2.2.3 European Telecommunications Standardisation Institute (ETSI) Developments

Following the work at CEPT, ETSI were mandated by the EC to develop a harmonised standard (European Norm (EN))[9] covering the equipment used in MCA systems. The draft standard has currently been submitted for public consultation and the standardisation process is expected to conclude by Q1 2008.

2.2.4 Advances in Other Countries

2.2.4.1 Australia

In April 2007 Australia[10] licensed a single Qantas domestic aircraft as a trial platform for one year. This operates with similar restrictions to the CEPT ECC Decision but

[6] Electronic Communications Committee

[7] EC Mandate on Mobile Communication Services On Board Aircraft (MCA) 12/10/2006

8 ECC/DEC/(06)07 ECC Decision of 1 December 2006 on the harmonised use of airborne GSM systems in the frequency bands 1710-1785 and 1805-1880 MHz

[9] Draft EN 302-480

[10] MR 37/2007, 18/04/2007, Final stage in place to allow a limited evaluation of mobile telephone services on board a commercial aircraft.

also includes the limitation of the service to data and text only (i.e. no voice), no operation at heights below 6000m and is limited to Australian airspace.

2.2.4.2 Belgium

In August 2006 Belgium gave a trial licence to On-Air of Switzerland, with the operational and technical details corresponding to those contained in the CEPT ECC Decision.

2.2.4.3 Norway

In autumn 2005 Norway licensed the use of specified GSM 1800 channels for on board aircraft usage. The licence limits the operation to Norwegian registered aircraft over Norwegian airspace and operation over the high seas (that is operation over non sovereign waters). Operation over other countries is specifically prohibited unless otherwise provided for in the national law of the affected State. Norway also states that its view is that the system and licensing approach must be harmonised internationally for long term success. It should be noted that this license predates the CEPT ECC Decision and is limited to operation at altitudes of 6000m or above.

2.2.4.4 United Kingdom

Ofcom consulted on the issue in April 2006 and issued its response at the end of October 2006[11]. Its conclusions were that Ofcom is committed to a 'Multilateral approach to mobile services on board aircraft' and to the reciprocal recognition of licensing arrangements between participating states. Ofcom committed itself to holding a further Consultation once the regulatory and technical work was completed both at CEPT and ETSI. No operation on UK registered aircraft is currently allowed.

2.2.4.5 United States (Federal Communications Commission)

The FCC issued a Notice of Proposed Rulemaking[12] in December 2004. While the FCC received many comments on the proposed rulemaking it found that there was insufficient standard technical data to consider the issue further and terminated the notice on April 3 2007[13]. The FCC has proposed to reconsider the issue if and only if appropriate technical data becomes available.

[11] OFCOM 'Mobile Services on Aircraft, Summary of stakeholder views about the introduction of mobile services on board aircraft'

[12] FCC 04-288A1 Notice of Proposed Rule Making; Amendment of the Commission's Rules to Facilitate the Use of Cellular Telephones and other Wireless Devices Aboard Airborne Aircraft.

[13] FCC 07-47A1 Memorandum, Opinion and Order; Amendment of the Commission's Rules to Facilitate the Use of Cellular Telephones and Other Wireless Devices Aboard Airborne Aircraft

3 Regulatory Issues

Under the Policy Directions from the Minister for Communications Marine and Natural Resources[14] ComReg is directed to promote 'sustainable competition between Other Authorised Operators (OAOs) and incumbents across different technical platforms and markets' and furthermore 'remove barriers to market entry'. On the issue of MCA ComReg considers that this is best achieved under the framework set out by ECC Decision ECC/DEC(06)07 which has been developed according to the conclusions of ECC Report 93 on the relevant compatibility studies.

ComReg agrees that internationally there is a need for a harmonised approach to the regulation of MCA systems along with the harmonisation of their use to ensure; the prevention of harmful interference to terrestrial mobile networks, the provision of an uninterrupted service whilst aircraft cross the borders of various countries and to reduce the regulatory requirements placed on administrations, GSM network operators and aircraft operators.

Crucially the ECC Decision recognises that the responsibility for the authorisation of the spectrum utilised by MCA systems onboard an aircraft lies with the country of registration of the aircraft.

This section summarises the relevant generic technical, economic and legal issues that need to be taken account of when considering how best to implement the regulatory environment which can facilitate the operation of MCA systems within Irish territory. Once again, it is emphasised that airworthiness certification issues are not a matter for ComReg and as such are beyond the scope of this consultation.

3.1 Technical Issues

From ComReg's perspective the main technical issue is whether there is a possibility of interference to terrestrial mobile networks from the NCU/BTS or from customers' mobile terminals on board the aircraft. For other technical issues and more technical details please see ECC Report 93.

3.1.1 NCU and BTS Issues

The issue with NCU and Onboard BTS is twofold, consisting of the NCU's noise masking signal, as well as the 1800MHz BTS signal which may be re-using frequencies which are used by a licensed terrestrial GSM system.

The NCU's noise masking signal[15] masks all terrestrially based GSM networks to Terminals on board the aircraft thus preventing them from communicating with terrestrial mobile networks. This device would only become operational once the aircraft reaches a

[14] Directions by the Minister for Communications Marine and Natural Resources to the Commission for Communications Regulation under Section 13 of the Communications (Regulation) Act 2002

[15] A spectrum analyser plot of the NCU output is given in Appendix C

cruising altitude of 3000m. The power output (Effective Isotropic Radiated Power (EIRP)) of the device is a compromise between being powerful enough to mask the terrestrial network but still low enough outside the aircraft hull to minimise any rise in the received noise floor of the terrestrial GSM network.

Table 1: Maximum permissible EIRPs[16] from the NCU and BTS outside the aircraft hull, extracted from ECC Decision ECC DEC (06)07.

Height above ground (m)	Maximum e.i.r.p. produced by NCU/aircraft-BTS, outside the aircraft in dBm/channel			
	Band: 450 MHz	Band: 900 MHz	Band: 1800 MHz	Band: 2 GHz
	Channel Bandwidth=1.25 MHz	Channel Bandwidth=200 kHz	Channel Bandwidth=200 kHz	Channel Bandwidth=3.84 MHz
3000	-17.0	-19.0	-13.0	1.0
4000	-14.5	-16.5	-10.5	3.5
5000	-12.6	-14.5	-8.5	5.4
6000	-11.0	-12.9	-6.9	7.0
7000	-9.6	-11.6	-5.6	8.3
8000	-8.5	-10.5	-4.4	9.5

It should be noted that the limits, defined in Table 1, are dependant on the elevation angle at the victim terminal on the ground. The values contained in the table are for the case where the victim terminal is directly below the aircraft and are therefore conservative.

3.1.2 Mobile Terminal Issues

Mobile terminals would be limited to an EIRP of 0dBm in the GSM 1800 bands as detailed previously in Section 3.1 of this document. There is also the issue of inadvertent roaming by a handset (which may not be fully compliant with the GSM specification) normally operating on network A's preferred channels which then attempts to roam to the same channels, which are used by network B over the airspace of the second administration. In most cases the NCU should prevent this. However, it is possible that a scenario like this may cause a temporary increase in noise floor as the offending handset attempts to contact the victim receiving network. If so, assuming that all of the mobile terminals are forced to operate at 0dBm; then this effect should be minimised as the maximum EIRP, defined outside the aircraft[17]: is as shown in Table 2 below.

16 The values quoted in the tables 2 and 3 correspond to a maximum increase of the receiver noise floor of 1 dB (i.e. I/N ≤ -6 dB) with a high statistical confidence using the most sensitive types of base stations and terminals.

17 The values quoted in the tables 2 and 3 correspond to a maximum increase of the receiver noise floor of 1 dB (i.e. I/N ≤ -6 dB) with a high statistical confidence using the most sensitive types of base stations and terminals.

Table 2; Maximum EIRP Limits (Mobile Terminal/Handset)[18]

Height above ground (m)	Maximum e.i.r.p, defined outside the aircraft, resulting from the GSM mobile terminal in dBm/channel
	1800 MHz
3000	-3.3
4000	-1.1
5000	0.5
6000	1.8
7000	2.9
8000	3.8

It should be noted that the limits, defined in Table 2, are once again dependant on the elevation angle at the victim base station on the ground. Here they correspond to an angle of elevation of 2°, which once again is conservative.

Q. 1. Do you believe that the technical methodology outlined here is sufficient to prevent interference to Terrestrial Mobile networks? If not, what specific improvements should be made? Note; Respondents should refer to ECC Report 93 prior to answering this question and provide reasons for your response.

3.1.3 Numbering Issues

ComReg is cognisant that some regulators have mooted that specific numbers should be allocated to this service. However, ComReg's view is that this is completely unnecessary as it is not normal for BTS to be allocated specific individual E.164[19] telephone numbers[20].

Q. 2. Do you agree with ComReg's view that a numbering methodology for a MCA system is not required? If not please give reasons for your answer.

[18] Extracted from ECC Decision ECC DEC (06)07.

[19] E.164 is the ITU Recommendation governing regular telephone numbers, such as the Irish mobile ranges 085, 086, 087 etc. (or +353.85 etc. in international format).

[20] If regular telephone numbers were deemed necessary, these could be under the International code for Ireland +353 (or 272, as appropriate), with the MCA Service provider negotiating an interconnect agreement with a suitable terrestrially based Irish operator. In effect this means that the MCA base station will then form a de facto part of the selected MNO's network.

3.2 Economic and Legal Issues

3.2.1 Economic Issues

A key objective for ComReg in proposing to authorise or license MCA is to ensure that the rights of use of existing licensees are protected. However, one of ComReg's main policy objectives as set down in legislation is to encourage innovation, which necessarily means new technologies and new equipment supplanting or modifying older equipment and generating benefits for consumers, in turn leading to an increase in competition.

In this case and if the new technology as proposed complies with ECC/DEC/(06)07 then there should be no discernable interference to ground-based calls. As such, ComReg holds that it is reasonable to conclude that there would appear to be little risk to the MNO's existing business in Ireland. Notwithstanding this, ComReg would state again that, even if there was it should not necessarily mean that the technology would not be authorised or otherwise licensed. However, ComReg is pleased to receive any views on this issue, though it would ask that, should MNOs feel that their business would be negatively affected, they should provide clear evidence and supporting data of the extent of any such effect.

Q. 3. Do you agree that the licensing or Authorisation of MCA systems will not have any adverse effect on the market for Irish Mobile Network Operators? If not please give reasons for your answer and support with appropriate figures or estimates.

3.2.2 Legal issues

The legal basis in Ireland for the provision of networks and services is the Authorisation Regulations[21] (SI no 306 of 2003) made by the Minister for Communications, Marine and Natural Resources. Under these Regulations, there is a general entitlement to provide electronic communications networks[22] (ECN) or electronic communications services[23] (ECS) subject to compliance with standard conditions set out in a General Authorisation. Before providing networks or services to third parties, operators are required to submit a notification to ComReg, for the purposes of compiling a register of such operators.

Where the operation of an ECN involves spectrum use, an operator must normally obtain an appropriate licence or use equipment which is exempted[24] from licensing under the appropriate Regulations issued under Section 6 (1) or Section 3 of the Wireless Telegraphy Act 1926, No. 45 of 1926 as amended respectively. This includes any radiocommunications apparatus and/or any ECN on board Irish registered aircraft. In licensing or exempting such services ComReg must take into account the prevention of interference to existing and planned services as well as ensuring such processes are carried out in an objective, transparent and proportionate manner.

ComReg is cognisant of the ever increasing demand from consumers to use mobile communications regardless of location. However, to ensure the successful operation of any such system there is a need to establish a regulatory basis both here and internationally

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[21] European Communities (Electronic Communications Networks and Services)(Authorisation) Regulations 2003, SI No. 306 of 2003

[22] "electronic communications network", means transmission systems and, where applicable, switching or routing equipment and other resources which permit the conveyance of signals by wire, by radio, by optical or by other electromagnetic means, including satellite networks, fixed (circuit- and packet-switched, including Internet) and mobile terrestrial networks, electricity cable systems, to the extent that they are used for the purpose of transmitting signals, networks used for radio and television broadcasting, and cable television networks, irrespective of the type of information conveyed

[23] "electronic communications service", means a service normally provided for remuneration which consists wholly or mainly in the conveyance of signals on electronic communications networks, including telecommunications services and transmission services in networks used for broadcasting, but excludes (a) a service providing, or exercising editorial control over, content transmitted using electronic communications networks and services, and (b) an information society service, as defined in Article 1 of Directive 98/34/EC, which does not consist wholly or mainly in the conveyance of signals on electronic communications networks.

[24] Regulation 9 (1) of the Authorisation Regulations provides ComReg must exempt apparatus from the Wireless Telegraphy Acts where it considers that:

The risk of causing harmful interference, arising out of the use, for the provision of an electronic communications network or service of any class or description, of apparatus for wireless telegraphy is negligible; and

The effective and appropriate management of the radio spectrum would not be adversely affected thereby.

Regulation 9 (2) of the Authorisation Regulations provides that where ComReg exempts apparatus from the Wireless Telegraphy Acts, it may specify conditions for use of the apparatus.

to allow their use, while ensuring in this instance that interference to existing terrestrial GSM systems is minimised. The system under consultation allows passengers to use voice, text and data services on board a suitably equipped aircraft.

As mobile phone terminals are already exempt from licensing[25], it is envisaged that the MCA provider would operate under a General Authorisation. This consultation deals with the regulatory issues raised by the use of an ECN in the form of an on-board Base Station (BTS) Network Control Unit (NCU) and provision through this of ECS. It should be noted that it does not deal with the backhaul over the air to ground segment which is either licensed under the aircraft's Wireless Telegraphy licence or in the case of satellite communications may be exempt from licensing[26].

In terms of spectrum rights of use ComReg considers the legislation in force to be quite clear in this matter, in that the owner of the Radio Spectrum is the Irish State. As the Irish NRA for the Radio Spectrum, ComReg administers the spectrum and licenses particular operators to operate a given radio service on a piece of spectrum for the duration of their licence. The fact that the operator is licensed on a particular piece of spectrum does not imply that the operator owns the spectrum detailed in their licence, merely that they have the right of use of that spectrum subject to certain conditions.

There are there are several licensing regimes which ComReg may consider in authorising and or licensing ECS and ECNs provided on board aircraft and these are detailed below;

Option A	General Authorisation[27],
Option B	General Authorisation and MCA Radio Licence or
Option C	General Authorisation coupled with an Exemption Order for the on Board Equipment.
Option D	The final alternative is that of not licensing the service and therefore prohibiting its use in Irish Airspace.

Under the current EU licensing framework ComReg would need to have extremely strong reasons for adopting Option D

Furthermore it should also be noted that ComReg is mindful of the work involved in licensing such a system and notes commercial failures in this area previously. Therefore, and in order not to unnecessarily sterlise spectrum, a trial or shorter licensing period may be considered.

[25] Wireless Telegraphy Act, 1926 (Section 3) (Exemption of Mobile Telephones)(Amendment) Order, 2003: S.I. No. 158 of 2003, Wireless Telegraphy Act, 1926 (Section 3) (Exemption of DCS 1800 Mobile Terminals) Order, 1999 (S.I. No. 107 of 1999), Wireless Telegraphy (Mobile Telephones) Exemption Order, 1997 (S.I. No. 409)

[26] Wireless_telegraphy_act__1926_(Section_3)_(Exemption_of_Low_Power_Aircraft_Earth_Stations)_Order, 2004: S.I. No. 505 of 2004

[27] See;http://www.comreg.ie/publications/conditions_of_general_authorisation.583.101047.p.html and http://www.comreg.ie/publications/guidelines_relating_to_general_authorisations.583.101049.p.html

Q. 4. What are your views on the legal basis outlined here?

Q. 5. In order to prevent interference to terrestrial Mobile networks what, in your view, is the most appropriate licensing approach based on those detailed above, i.e., Option A, B, C or D? Please provide reasons for your answer.

3.3 International Issues

3.3.1 International Coordination

While ComReg proposes to adopt ECC Decision (06)07 and ECC Report 93 to allow for the operation of MCA systems while preventing harmful interference, the prima facie international issue that must still be considered is that of international coordination of the use of radio frequencies. This is the methodology by which adjacent administrations share the frequency spectrum along joint border areas. In general there are three basic methods: international treaties such as the Radio Regulations of the ITU, collective agreements under the auspices of regional organisations such as CEPT and finally bilateral agreements between Sovereign States.

In the case of MCA the basis for international coordination is compliance with the technical and operational requirements in CEPT Decision ECC/DEC(06)07 and authorisation by the country of registration of the aircraft. Administrations are also urged to take all necessary measures to monitor that the MCA system and its installation conforms to the relevant technical parameters given in the Annex to the Decision. Nevertheless, despite measures to ensure avoidance of harmful interference it may be necessary for administrations to assist each other with the resolution of reports of interference in a timely manner, in accordance with appropriate ITU procedures.

Q. 6. In regulating MCA are there other issues, not covered in the consultation that should be taken into account? If so please indicate what they are and give reasons?

4 Submitting Comments

All comments are welcome, however it would make the task of analysing responses easier if comments were referenced to the relevant question numbers from this document.

The consultation period will run from 27 August 2007 to 08 October 2007, during which the Commission welcomes written comments on any of the issues raised in this paper.

Having analysed and considered the comments received, ComReg will review the [subject matter of the consultation] and publish a report in [month anticipated for issue of report] on the consultation which will, inter alia summarise the responses to the consultation.

In order to promote further openness and transparency ComReg will publish all respondents' submissions to this consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24. We would request that electronic submissions be submitted in an-unprotected format so that they can be appended into the ComReg submissions document for publishing electronically.

Please note

ComReg appreciates that many of the issues raised in this paper may require respondents to provide confidential information if their comments are to be meaningful.

As it is ComReg's policy to make all responses available on its web-site and for inspection generally, respondents to consultations are requested to clearly identify confidential material and place confidential material in a separate annex to their response

Such Information will be treated subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24

Appendix A; List of Consultation Questions

Appendix B Operational Description of a GSMOB (MCA) system (excerpt from ECC Report 93)

Introduction

The GSMOB system provides visited network access for GSM subscribers wishing to make or receive mobile communications during approved stages of flight. In this section, an example implementation of a system using a NCU is described.
This section focuses on one possible implementation of a GSMOB system. Other possible implementations of the GSMOB could be deployed by operators in order to achieve GSM coverage of an aircraft by using for example multiple leaky feeder configurations.

General architecture

The GSMOB BTS (ac-BTS) and the NCU are operational during the top of ascent, cruise and commencement of descent phases of the flight. These are the stages of the flight where the aircraft is not less than 10000 feet (3000 m) above ground level.
The complete GSMOB system including terrestrial elements typically consists of an airborne and a ground segment, subdivided in two domains, see Figure 1.

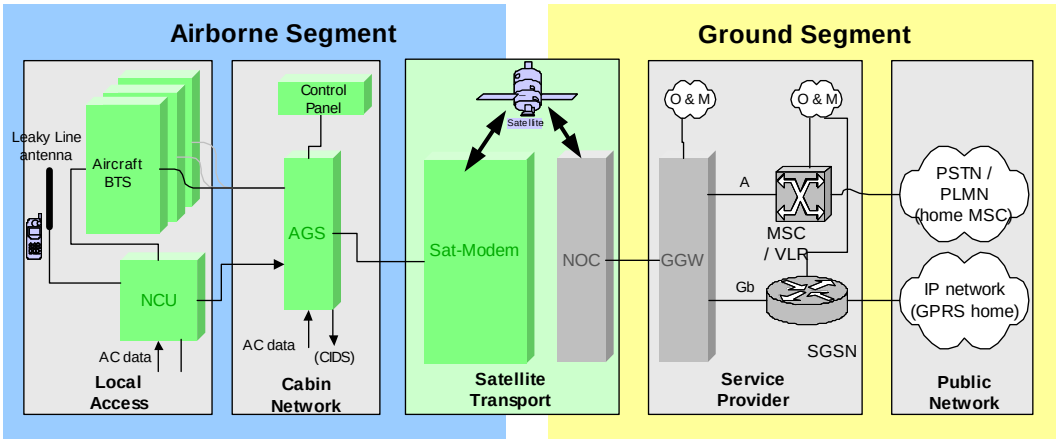

Figure 1: Overall end-to-end architecture of a complete GSMOB system

The airborne segment consists of the local access domain and the cabin network domain:

- The local access domain contains the ac-BTS providing GSM access for passengers' mobile terminals (ac-MS) and the NCU. The purpose of the NCU in conjunction with the GSM pico-cell is to prevent ac-MS/UE from accessing terrestrial networks and to control the radio frequency emissions of all ac-MS/UE transmitting in GSM and WCDMA/UMTS in 900 MHz band, GSM and WCDMA/UMTS in 1800 MHz band, WCDMA/UMTS in 2 GHz band and CDMA in 450 MHz band;
- The cabin network domain contains an Aircraft GSM Server (AGS), which is the interface between the main modules onboard, i.e. the ac-BTS, the NCU and the Sat-Modem.

The ground segment consists of a service provider domain and the public network domain:

- The service provider domain hosts communication controller functions that act together with the AGS functions in the aircraft. For this purpose, a Ground Gateway (GGW), and GSM visited network components (VMSC and SGSN) are required. Their main features are to perform the routing towards the aircraft, and to connect the aircraft traffic with terrestrial backbone networks of the Public Network Domain;
- The public network domain provides the interconnection of the call, data or signalling communication to the relevant public network end points.

The satellite transport link connects the airborne and the ground segments.
Note that the system description only describes the elements related to the GSMOB and does not include aircraft systems, such as the avionics, as these are out of scope of this report.

System components of the airborne section

The following describes the main components of the GSMOB system installation onboard aircraft.

Cabin Antenna

The cabin antenna is used to transmit and receive the RF signals within the cabin. The antenna is typically a leaky feeder, installed along the entire cabin behind the ceiling panels. The ac-BTS and NCU share the same antenna.

AGS – Aircraft GSM Server

The AGS is in charge of handling the transmission and reception of the data streams between the ac-BTS and the ground. The AGS manages the satellite link communication, controls the ac-BTS, monitors the NCU output power level and manages the Operations and Maintenance (O&M) functions.

GSMOB Control panel

The GSMOB control panel is the physical interface where the GSMOB system can be manually accessed for control functions. The control panel will display relevant system information, including the status indication (on/off, major or minor failure).

CIDS: Cabin Intercommunication Data System

CIDS is the Cabin Intercommunication Data System on board the aircraft including but not limited to cabin lights, seatbelt signs, and passenger announcements.

AC Data: Aircraft Data

The aircraft data contains aircraft information for the GSMOB system including but not limited to altitude, aircraft position and flight phase.

Onboard Satellite components

The on board satellite components consist of the satellite modem and the external aircraft satellite antenna. The satellite antenna receives and transmits the signals from/to the satellite.

Network Control Unit (NCU)

The NCU[28] is designed to ensure that ac-MS/UE within the cabin can not access terrestrial networks and that they do not transmit any signal without being controlled by the GSMOB system by raising the noise floor inside the cabin.
The NCU is assumed to have the following characteristics:

- No transmissions below 3000 m above ground;
- The signal generated is a band-limited noise;
- The NCU transmits at dedicated minimum power to screen terrestrial networks inside the aircraft and only transmitted above a certain altitude (power value dependent on frequency band and altitude);
- The power level may be reduced with increased altitude because of the decreased signal strength received in the aircraft from terrestrial networks;
- Covers entire GSM, UMTS and CDMA2000 BTS/Node B/BS to Mobile (downlink) bands:
    - GSM- and WCDMA/UMTS-900 (921-960 MHz);
    - GSM- and WCDMA/UMTS-1800 (1805-1880 MHz);
    - UMTS UTRA-FDD 2GHz (2110 – 2170 MHz);
    - CDMA-450/FLASH-OFDM (460 - 470 MHz).

An example of the noise power radiated by a NCU prototype in the 900 MHz, 1800 MHz and 2 GHz bands is shown in Figure 2.

[28] The legal status of the NCU is outside the scope of this report.

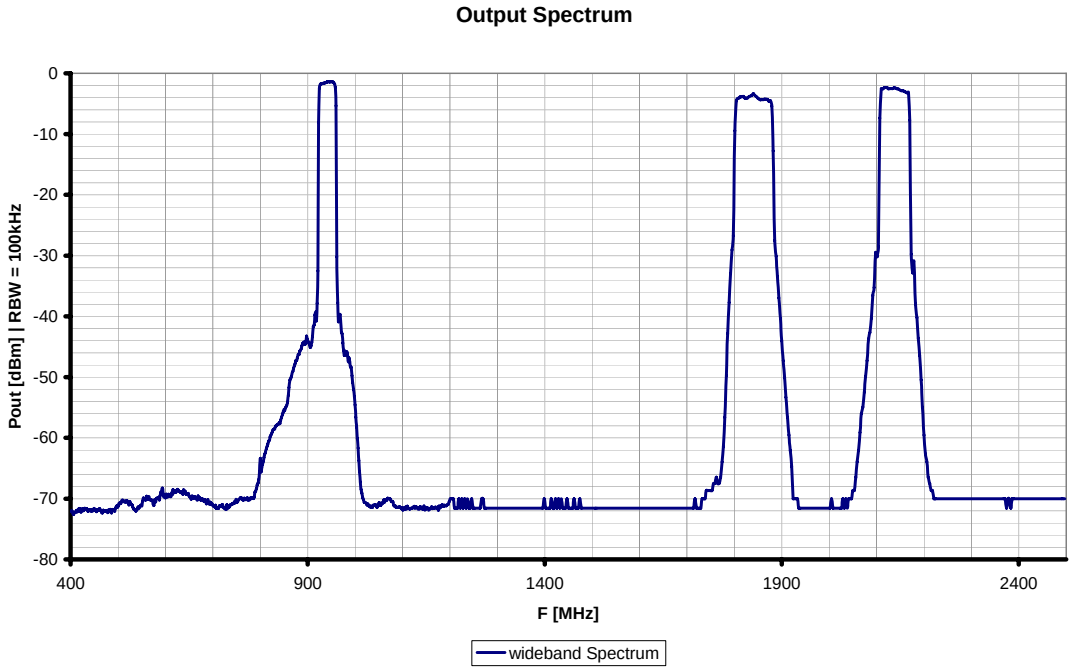

Figure 2: Spectral characteristics of a NCU prototype

The GSMOB connectivity component (ac-BTS)

The GSMOB connectivity component is the ac-BTS, which provides the communication access to the ac-MS and supports all necessary system features like radio access and radio resource management. Given that the NCU transmits contiguously across the whole band, the ac-BTS will have to transmit at a higher power level per channel.
The ac-BTS is assumed to have the following characteristics:

- Support of standard GSM and GPRS services;
- Operating in the 1800 MHz frequency band over Europe;
- Operating at a sufficient power level (at least 9 dB over the NCU power level per channel).

Aircraft Mobile Station (ac-MS)

The ac-MS are the onboard Mobile Terminals able to operate with the ac-BTS; they have the following characteristics:

- GSM access in the 1800 MHz frequency bands for communication;
- Nominal radiated power (uplink) set to the minimum possible power level, i.e. 0 dBm.