Mobile Communications onboard Aircraft

Consultation on the introduction of mobile services on aircraft

Consultation

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Executive Summary

There is increasing interest in the potential for offering communications services to passengers using mobile phones on aircraft – Mobile Communications on Aircraft or MCA. However, a number of issues must be dealt with before such services can be provided, some of which are the responsibility of the communications regulator, Ofcom and some are the responsibility of other regulators.

Aircraft safety is of primary importance, and no services could be contemplated unless safety was assured. The European Aviation Safety Agency (EASA) and the Civil Aviation Authority (CAA) in the UK are responsible for aircraft safety and for the human dimension of passenger safety and welfare. The proposed services would have to satisfy both EASA and CAA requirements before they could be introduced. Ofcom is responsible for the regulation of spectrum and Electronic Communications Services (ECS) and only has a role to play in these fields in relation to MCA services.

Ofcom is aware of concern from some consumers about passenger welfare and safety around the introduction of MCA in the UK. However, it is a matter for the CAA and other regulatory bodies to consider these issues separately. No services can be introduced until the requirements of those bodies have been satisfied. Ofcom's proposals set out in this consultation aim to create the legal and technical conditions in which the services could be launched, but this will only happen if they are approved by the relevant authorities in charge of safety and welfare issues and if airlines take the commercial decision, in the light of passenger demand, to do so.

By their nature, these services are international. Ofcom has therefore always taken the view, supported by the majority of UK stakeholders, that MCA must be considered on a multilateral basis, using standards and procedures agreed across the EU and internationally. Ofcom has been working with other Member States of the EU to create such a mutual regime. We expect this to be enshrined in a binding Decision of the Radio Spectrum Committee (RSC) and an advisory Recommendation of the Communications Committee (COCOM) – by the end of 2007 or early 2008.

Ofcom published a Discussion Document on this subject on 10 April 2006 and received a range of helpful comments from stakeholders. In light of these responses, and the RSC Decision and COCOM Recommendation which is likely to be adopted soon, Ofcom believes that it is timely to consult on how the authorisation and technical management regime for MCA could operate in the UK. As these subjects were previously discussed in the Ofcom Discussion Document, and progress in international forums is proceeding apace, Ofcom believes that the consultation period should be limited to six weeks.

The current proposals cover GSM in the 1800 MHz band only. The great majority of handsets in Europe and elsewhere are compatible with this standard. If the service is successful it might then be possible to consider its extension to further standards, such as 3G, in due course.

This paper sets out Ofcom's proposals for the technical and authorisation approach to be adopted. From a spectrum management perspective the key objective is that MCA systems should not generate any harmful interference to terrestrial networks. A European standard sets technical parameters which should reduce the risk of harmful interference being generated outside the aircraft. This paper summarises the requirements of that standard and consults on its suitability to protect terrestrial networks. This paper also consults on the proposed common approach to authorisations where each EU Member State will recognise

the authorisations of others, so that aircraft registered in any Member State will be able to operate MCA systems in other Member States airspace.

The EU developments could also facilitate the emergence of a global regime for the mutual recognition of authorisations. This might envisage drawing on the technical standards and principles developed in Europe, subject to agreement with countries outside the EU.

The key proposals for consultation are:

- Radio equipment for MCA systems on UK aircraft should be licensed (rather than licence-exempt) under the Wireless Telegraphy Act 2006 (WT Act);

- Licences should be issued to UK aircraft operators on request;

- Licensing should be done through variation of the existing aircraft WT Act licences issued on Ofcom's behalf by the CAA; and should attract no additional fee;

- Mutual recognition should be given to aircraft from other EU Member States which adhere to the common EU technical and authorisation standards;

- The basis of the technical and authorisation regime should be the standards agreed in ECC and ETSI and endorsed by RSC and COCOM;

- MCA systems are Electronic Communications Services, and the standard obligations under the General Conditions of Entitlement apply to them; and

- MCA services should be allocated non-geographic international Mobile Network Codes issued by the ITU for such services.

Section 1

Background

Introduction

1.1 Passenger use of mobile phones is currently prohibited on aircraft because of the risk of interference with the aircraft's communication, navigation and other systems; but also because of the risk of interference to terrestrial mobile networks. A handheld cellular phone left operating at aircraft cruising altitude is capable of illuminating a wide area, placing a significant load on the resources of terrestrial networks.

1.2 Ofcom understands that concerns about the impact of mobile terminals on aircraft systems are being addressed and that the necessary modification of the first aircraft type has been certified by the European Aviation Safety Agency. This is a matter for the authorities responsible for aircraft safety and does not fall within Ofcom's remit.

1.3 This development may open the opportunity for a new market for mobile services on aircraft, building on the ubiquitous usage of GSM handsets and consumers' expectation of being contactable anywhere and at any time. Proponents of MCA systems now believe that such services could have significant consumer and commercial benefits. Ofcom is responsible for regulating spectrum and electronic communication service matters in the UK and therefore has a part to play in relation to the implementation of such services.

Previous Ofcom publications

1.4 Ofcom issued a Discussion Document on 10 April 2006[1] (the "Discussion Document) which set out the background and some of the issues to be considered in relation to the introduction of MCA systems. A number of helpful comments were received and a seminar with stakeholders was held on 9 June 2006[2] where many of the key issues of spectrum and electronic communication service (ECS) authorisations were discussed. The 21 responses were summarised in a further document of 31 October 2006[3] and the non-confidential ones published on our website[4].

Developments in European Forums

1.5 Since October 2006 significant progress has been made in the development of European standards for MCA.

1.6 The CEPT Electronic Communications Committee (ECC) reached a Decision in December 2006 ECC/DEC/(06)07[5]. This Decision covers the free circulation and harmonised usage of MCA systems and sets out the technical limits which must be observed to ensure that MCA systems do not cause any harmful interference. These limits are based on the ECC's Report 93[6] which addresses the compatibility between equipment for MCA on board aircraft and terrestrial networks.

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[1] http://www.ofcom.org.uk/research/telecoms/reports/aircraft/summary/

[2] http://www.ofcom.org.uk/research/telecoms/reports/aircraft/slides.pdf

[3] http://www.ofcom.org.uk/research/telecoms/reports/aircraft/stakeholderviews/

[4] http://www.ofcom.org.uk/research/telecoms/reports/aircraft/responses/

[5] http://www.ero.dk/documentation/docs/doccategory.asp?catid=1&catname=ECC/ERC/ECTRA%20Decisions

[6] http://www.ero.dk/documentation/docs/doccategory.asp?catid=4&catname=ECC/ERC/ECTRA%20Reports

1.7 ETSI has taken this Decision and has developed a harmonised standard (ETSI EN 302 480) for equipment to deliver MCA. This standard went to public enquiry on 18 July 2007, concluding on 16 November 2007[7]. The final vote on the harmonised standard will conclude on 6 May 2008. This work is important for the correct installation of the MCA equipment and adherence to it is likely to be enshrined in two forthcoming European measures.

1.8 The European Radio Spectrum Committee (RSC) is expected to adopt a Decision[8] (the "RSC Decision") to require Member States to make the 1800MHz frequency band available for MCA systems, on a non-protected, non-interference basis according to specified technical conditions. The draft RSC Decision is based on the earlier ECC Decision and also refers to the CEPT Report 016[9] and the harmonised standard developed by ETSI.

1.9 The EU mandated[10] CEPT on 12 October 2006 to undertake all required activities to assess specific technical compatibility issues between the operation of airborne GSM 1800 systems and a number of potentially affected radio services. The present RSC Decision is based on the technical studies undertaken by the CEPT as a result of the EU mandate, as presented by CEPT Report 016. The CEPT Report 016 is based on ECC Report 93.

1.10 The European Communications Committee (COCOM) is in parallel developing a Recommendation[11] (the "COCOM Recommendation") for the coordination and mutual recognition of national authorisations granted for MCA. This text is still under consideration and may be subject to changes: however it currently envisages the authorisation by Member States of MCA services on a licensed or licence-exempt basis. Additional conditions include compliance with the technical conditions referred to in the RSC Decision and the harmonised standard developed by ETSI. It also envisages the creation of a common EU MCA register of aircraft which comply with the agreed conditions, but this is still under discussion and may be subject to change.

1.11 The RSC Decision will be binding and is expected to give Member States six months to implement it following its adoption. The COCOM Recommendation is likely to set a similar deadline and, though it is non-binding, Member States will be required to take utmost account of it in formulating their approach to MCA.

1.12 At present the only mobile service under consideration for deployment on aircraft is GSM using frequencies at 1800 MHz, and all the work going on in European forums is focused on this service. This focus on a single band has significantly simplified the technical specification work and will accelerate the introduction of MCA services. Ofcom notes that almost all European mobile phones are compatible with GSM 1800 MHz and services using this band will therefore be available to the great majority of passengers.

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[7] http://webapp.etsi.org/workProgram/Report_Schedule.asp?WKI_ID=25058

[8]
http://ec.europa.eu/information_society/policy/radio_spectrum/docs/ref_docs/rsc21_public_docs/rscom07_52rev1_draft_mca.pdf

[9] CEPT's Report 016 - Report from CEPT to the European Commission in response to the Mandate on Mobile Communication services on board Aircraft (MCA) 12.3.2007 -
http://ec.europa.eu/information_society/policy/radio_spectrum/docs/ref_docs/rsc19_public_docs/rscom07_08_fin_rep_%20mca.pdf

[10] Mandate to the CEPT on Mobile Communication Services on board Aircraft, 12 October 2006 -
http://ec.europa.eu/information_society/policy/radio_spectrum/docs/current/mandates/EC%20Mandate%20to%20CEPT%20on%20MCA%20Oct%202006.pdf

[11] http://circa.europa.eu/Public/irc/infso/cocom1/library?l=/public_documents_2007/cocom07-53_authorisation/_EN_1.0_&a=d

1.13   The next meetings of these committees will discuss, respectively, the Decision and Recommendation. Ofcom expects both to be formally adopted either at the end of 2007 or very early 2008.

1.14   In parallel, the authorities responsible for air safety have been making progress. The first airworthiness certificate for MCA was issued by EASA on 19 June 2007 for the Airbus 318, and Ofcom understands that other aircraft types have been submitted for approval. The further stage of submitting on-board operational procedures for approval by the national aviation authority of the aircraft's country of registration, has begun, but is not yet complete.

Ofcom approach

1.15   Ofcom has always made it clear that its preference was to work in concert with other European authorities in order to create a coherent pan-European regime for MCA. It will be desirable for this to develop into a global regime in due course. The responses to the Discussion Document strongly supported this approach.

1.16   Other European Member States and the European Commission have also taken this view and Ofcom has supported work to develop a pan-European regime for authorisations and the mutual recognition between Member States which will facilitate the free movement of MCA-equipped aircraft in the EU. The mutual recognition of spectrum authorisations from outside the EU will also be facilitated by this approach.

1.17   In light of the encouraging progress of work in European forums, and the RSC Decision and COCOM Recommendation likely soon to be adopted, we believe that it is now timely to consult on the next steps towards implementing an appropriate UK regime for MCA. This consultation makes proposals for authorising the use of radio equipment for MCA within the jurisdiction of the UK and for ECS purposes.

1.18   The consultation will be for six weeks, as the issues covered have been discussed in a previous discussion document (10 April 2006) and the views of stakeholders have already been expressed. The main purpose of this consultation is to propose arrangements for the authorisation and mutual recognition of authorisations across Europe in conformity with the draft RSC Decision and COCOM Recommendation.

1.19   MCA systems can only be operated if they are certified safe, including airworthiness and operational procedures. This is the responsibility of other regulatory authorities: authorisation by Ofcom for spectrum or ECS purposes does not in any way pre-judge the outcome of those safety authorisation processes.

Consumer issues

1.20   A number of commercial organisations are now considering MCA and several airlines have pre-announced plans to launch it.

1.21   Ofcom is aware of negative views about MCA from some consumers – including four responses to the Discussion Document from individuals who raised concerns about behavioural issues if passengers were allowed to use mobile phones on board. Since then, there has been further comment in the UK press about the impact of unconstrained use of mobile phones on aircraft on the comfort and welfare of passengers. Ofcom has statutory duties to further the interests of citizens and consumers in relevant markets. Ofcom also has responsibilities to ensure the optimal use of spectrum and to regulate the operation of communications networks. In this

case, the decision about whether and how to launch MCA services rests with airlines, whose commercial decision will take into account the needs and preferences of their customers. Ofcom's priority is therefore to remove regulatory barriers so that MCA can be made available if desired by users. This subject is discussed further in the attached Impact Assessment.

1.22   The approach taken by Ofcom and other EU National Regulatory Authorities (NRAs) is to create a common structure of mutual recognition between Member States' authorisations of MCA. This mutual recognition will also apply to the operational procedures for managing passenger behaviour which will be approved by the CAA and similar organisations in other countries. This implies that aircraft registered in other States, while adhering to the common technical and communications authorisation regime, may be operating MCA in UK airspace applying different operating procedures on board from those in use on UK aircraft.

1.23   Consumers with concerns about the deployment of these systems and aircraft safety and security should contact the relevant aircraft operator and/or CAA (www.caa.co.uk / email: infoservices@caa.co.uk).

Do you have any comment in relation to the authorisation of MCA systems on the basis of a common European approach?

Competition issues

1.24   In response to the Discussion Document there were few concerns expressed about competition issues.

1.25   One response pointed out that the choice of service providers is likely to be limited and that the charges for MCA might therefore be kept arbitrarily high, as there would be very few installers and operators in this niche segment.

1.26   Ofcom notes that the operation of MCA can only be done at the active initiative of the aircraft operator. In the licensing scheme proposed the aircraft operator will also be the spectrum licensee. In such circumstances, the aircraft operator will be able to choose the service provider with whom it collaborates.

1.27   At the retail level the tariffs for MCA services may be higher than those charged for terrestrial services. However higher prices may well reflect the higher costs of providing the service. It will be a matter for the providers of MCA to agree interconnect rates with the terrestrial mobile networks, and for the terrestrial networks (or other retail providers of mobile services) to determine the end-user tariffs they charge to their customers. Ofcom has powers to investigate and address any complaints of excessive charges and any other abuses of competition which lead to consumer detriment. These powers can be used, once the MCA services are in operation, if overcharging or other problems appear.

Section 2

Technical issues

Background

2.1   As explained in the previous Discussion Document, the proposed MCA system consists of an on board pico-cell base station; an on-board Network Control Unit (NCU); and the mobile handsets used by the passengers.

2.2   To enable the GSM system on the aircraft to connect to the terrestrial network a backhaul link – most likely provided by satellite - will be required. Regulatory arrangements for backhaul to the ground and the network arrangements on the ground are already in place and are not further addressed in this document.

2.3   Figures 1 and 2 show an overview of these components. More details of the proposed system were set out in the Discussion Document.

1.   Passenger handset
2.   Airborne system (including GSM Picocell and NCU)
3.   Air - to - ground link
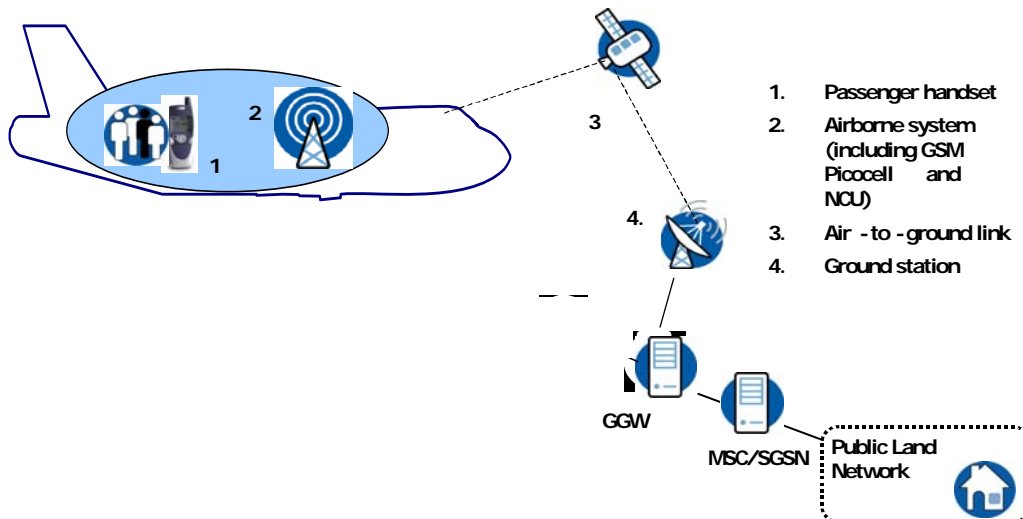4.   Ground station

GGW

MSC/SGSN

Public Land Network

Figure 1: Overview of the MCA system and associated terrestrial components (taken from ECC Report 93[12], Figure 1)

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[12] http://www.ero.dk/documentation/docs/doccategory.asp?catid=4&catname=ECC/ERC/ECTRA%20Reports
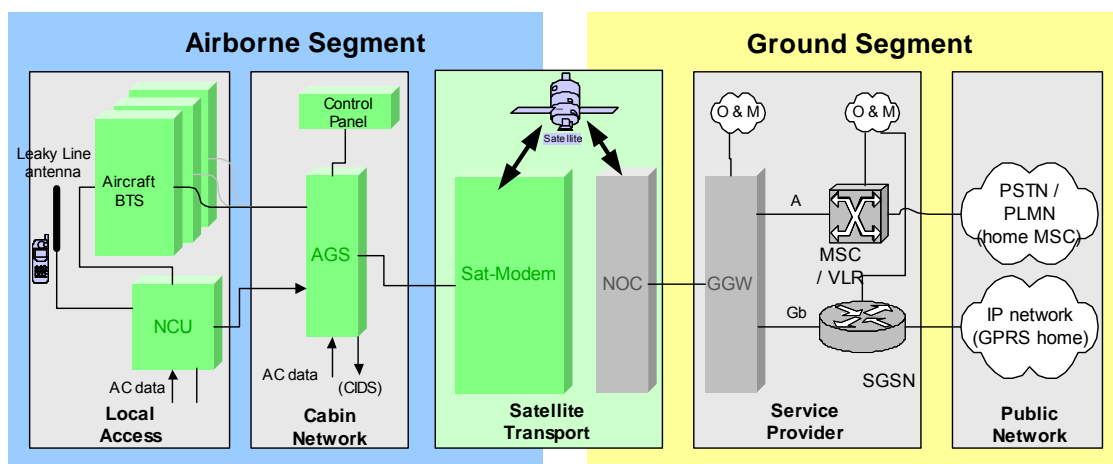
Figure 2: Overall end-to-end architecture of a complete GSMOB system (taken from ECC Report 93, Figure 2)

Key for Figures 1 & 2:	A	-	Access Link
	AGS	–	Aircraft GSM Server
	BSC	-	Base Station Controller (Terrestrial)
	BTS	-	Base Transceiver Station
	CIDS	-	Connection Identifier
	Gb	-	Gb Interface
	GGW	-	Ground Gateway
	GPRS	-	General Packet Radio Service
	IP	-	Internet Protocol
	MSC	-	Mobile Switching Centre
	NCU	-	Network Control Unit
	NOC	-	Network Operation Centre
	O & M	-	Operations & Maintenance
	PSTN	-	Public Switched Telephone Network
	PLMN	-	Public Land Mobile Network
	SAT-Modem	–	Satellite Modem
	SGSN	-	Serving GPRS Support Node
	VLR	-	Visitor Location Register

See Glossary for definitions.

Interference to terrestrial networks

2.4 Responses to the Discussion Document showed that UK stakeholders support the deployment of MCA systems on the condition that they do not create harmful interference to terrestrial networks. For spectrum management purposes the risk of harmful interference to legitimate users is a key consideration and technical limits have been specifically set in relation to MCA to reduce the risk of harmful interference, in particular to terrestrial networks.

2.5 This principle of non-interference forms the basis for the technical work in ECC and ETSI, and we believe the Report 93 and standards created by these bodies are adequate to reduce the risk of interference to terrestrial networks. The RSC Decision and COCOM Recommendation (both currently in draft) require MCA systems not to create harmful interference, and they make reference to the CEPT Report 016 and ETSI harmonised standard as the basis for guaranteeing this.

2.6 Nevertheless MCA systems are new and an innovative development and therefore are untested in a "live" environment. If they were to generate harmful interference this could potentially do serious harm to terrestrial networks. Ofcom expects that the necessary standards and technical conditions specified in the Annex of ECC/DEC(06)07 will be complied with and that all the necessary precautions will be taken to ensure harmful interference does not arise. Ofcom will monitor the deployment of these systems and take the relevant action should harmful interference be reported.

2.7 Mobile handsets and devices switched on during flight have the potential to interfere with numerous terrestrial base stations. Mobile handsets on the ground are normally only a metre or two above ground height and terrestrial clutter will ensure that only a small number of base stations will be in the served area of a mobile at any one time. Mobiles in an aircraft, on the other hand, can detect numerous base stations at any time as they try to register with the closest of them. Given the long distances covered by aircraft, this could increase co-channel interference beyond that assumed by the network planners and thereby degrade the quality of service on the ground. The potential interference scenario is shown in figure 3.

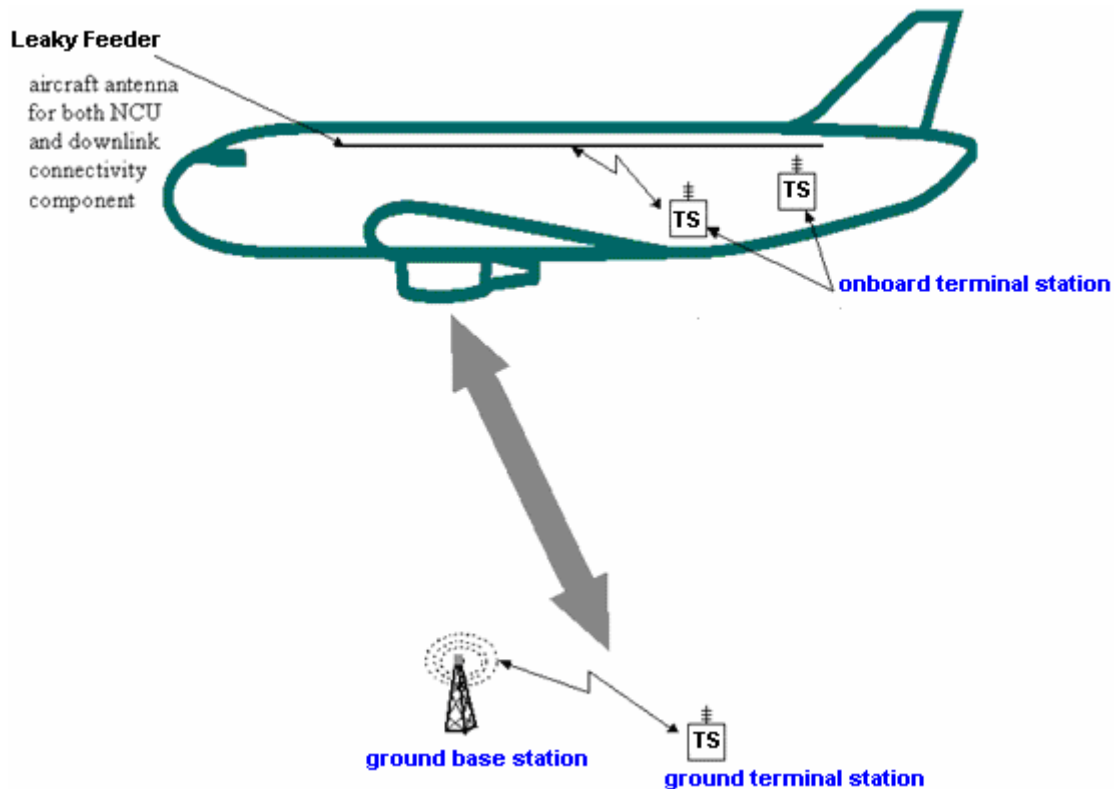**Figure 3: GSMOB and terrestrial cellular system interference scenario (based on ECC Report 93, Figure 4)**

2.8 The ECC Decision ECC /DEC(06)07 sets a number of requirements for the MCA system. These include:

2.8.1 The absolute minimum height above ground for any transmission from the system in operation shall be 3,000 metres. However, this minimum height requirement could be set higher, in particular:

- In order to comply with the maximum permissible emissions from the MCA installation and onboard terminals measured at the outside of the aircraft.

- Depending on the terrain and related network deployments in a country.

2.8.2   The total e.i.r.p. defined outside the aircraft resulting from the NCU/aircraft-BTS shall not exceed the values set out in Table 1[13].

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
3,000	-17.0	-19.0	-13.0	1.0
4,000	-14.5	-16.5	-10.5	3.5
5,000	-12.6	-14.5	-8.5	5.4
6,000	-11.0	-12.9	-6.9	7.0
7,000	-9.6	-11.6	-5.6	8.3
8,000	-8.5	-10.5	-4.4	9.5

Table 1[14]

2.8.3   The e.i.r.p, defined outside the aircraft, resulting from the GSM mobile terminal transmitting at 0 dBm shall not exceed the values in Table 2.

Height above ground (m)	Maximum e.i.r.p, defined outside the aircraft, resulting from the GSM mobile terminal in dBm/channel
	1800 MHz
3,000	-3.3
4,000	-1.1
5,000	0.5
6,000	1.8
7,000	2.9
8,000	3.8

Table 2[15]

2.8.4   The aircraft-BTS shall control the transmit power of all GSM mobile terminals, transmitting in the GSM 1800 band, to the minimum nominal value of 0 dBm at all stages of communication, including initial access.

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

[14] It should be noted that the limits, defined in table 1, are dependent on the elevation angle at the victim terminal on the ground (see ECC /DEC(06)07)). The values contained in the table are for the case where the victim terminal is directly below the aircraft, and are therefore conservative (taken from ECC/DEC/(06)07, Table 2)

[15] It should be noted that the limits, defined in table 2, are dependent on the elevation angle at the victim base station on the ground (see ECC /DEC(06)07)). The values contained in the table correspond to an angle of elevation of 2º, which are conservative (taken from ECC/DEC/(06)07, Table 3)

2.9   The ETSI Technical Committee ERM GSMOBA[16] (Electromagnetic Compatibility (EMC) and Radio Spectrum Matters – GSM Onboard Aircraft) is currently developing a harmonised standard (EN 302 480) for the correct installation of the MCA equipment on aircraft and a technical specification (TS 102 576) which will give guidelines on how the output power from the antenna port of the MCA equipment relates to the power limits outside the aircraft.

2.10   Ofcom and a number of UK stakeholders have contributed to the development of the ECC Report 93 and standards during an extended period of work in ECC and ETSI. Ofcom believes that they represent a safe limit which would be expected to adequately protect the operators of terrestrial networks from harmful interference. The technical criteria specified in the ECC Decision are proposed as the basis for authorising MCA and these standards are referred to in the draft RSC Decision and COCOM Recommendation. All MCA systems would be expected to operate in conformity with this specification – including the requirement to only operate when more than 3,000 metres above ground level.

Network Control Unit

2.11   The MCA equipment would have to meet the power limits outside the aircraft set in the ECC Decision. How this is achieved has been left technology neutral in the ECC Decision. The most likely approach to be implemented is to use a Network Control Unit (NCU).

2.12   The NCU is used to prevent the mobile stations within the cabin from accessing terrestrial networks and ensure that the mobile stations do not transmit any signal without being controlled by the onboard GSM system. The NCU achieves this by raising the radio frequency noise floor within the mobile frequency bands to a level that blocks the signal from terrestrial networks. As the mobile terminal cannot receive a terrestrial control channel it will not be able to register, therefore it will remain in an idle state and not transmit. When the mobile receives an MCA control channel, which is transmitted at a higher level than the NCU signal, it will come out of its idle state.

2.13   The NCU is currently specified to block the bands and technologies set out in Table 3 below (taken from ECC/DEC/(06)07, Table 1). Further work is currently being carried out in WGSE PT-SE7 to include the 2500 to 2690MHz band.

Frequency band (MHz)	Considered systems on the ground[17]
460-470	CDMA2000, FLASH OFDM
921-960	GSM, WCDMA
1805-1880	GSM, WCDMA
2110-2170	WCDMA

Table 3

2.14   The NCU transmits a band limited noise signal in the base station transmit band of the mobile network, at a power higher than the expected terrestrial network signal. An example of this type of signal is shown in Figure 4,

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[16] http://portal.etsi.org/Portal_Common/home.asp
[17] The parameters of the considered victim systems were used when defining the limits described in this annex; see ECC report 93 for the values assumed in the studies.

Output Spectrum
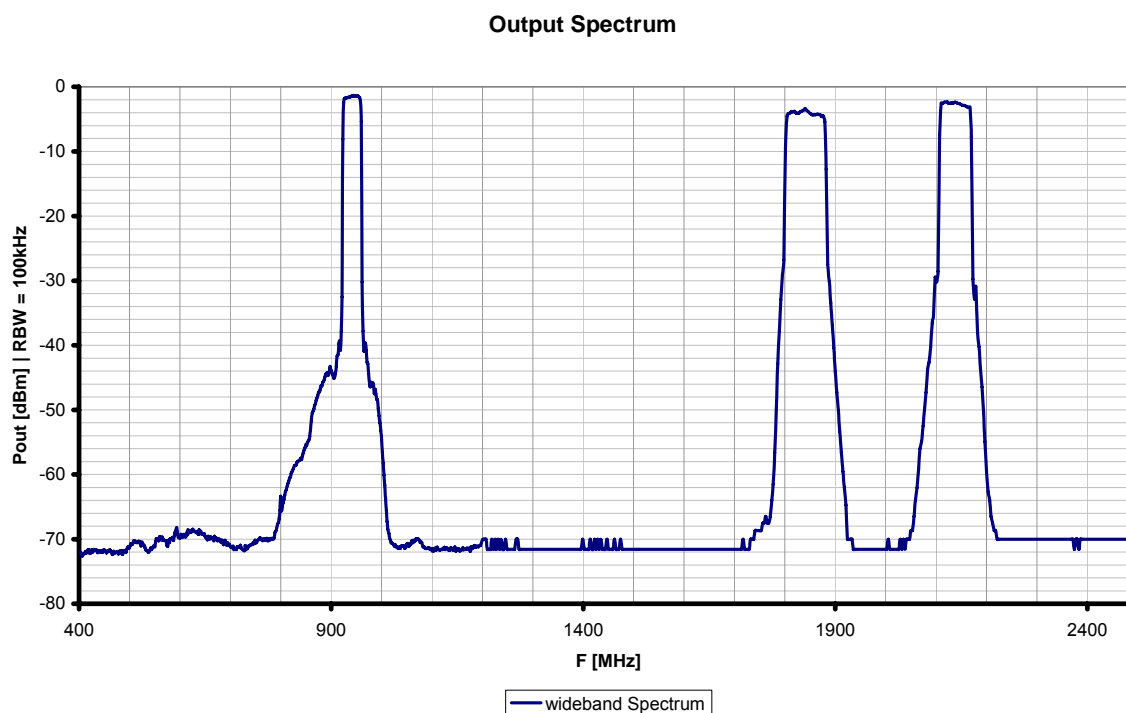
RBW = Reference Band Width.

Figure 4: Spectral characteristics of a NCU prototype (taken from ECC Report 93, Figure 3)

2.15   Two responses to the Discussion Document questioned the legal status of the NCU comparing its operation to that of a "jammer", use of which is prohibited in terrestrial locations. The NCU is referred to in the draft RSC Decision and is an essential component of the MCA systems that operates to protect terrestrial networks and reduce the risk of harmful interference. These systems are provided only for use on aircraft and operate only above 3,000m. The European Commission's Telecommunications Conformity Assessment and Market Surveillance Committee (TCAM)[18] advised that the NCU is a control device rather than a jammer; its purpose is to prevent interference between different mobile systems and is intended to facilitate mobile communications and enable both airborne and terrestrial GSM systems to co-exist. Ofcom is therefore content to authorise the NCU.

2.16   Ofcom also notes that the current design of the NCU principally addresses frequencies and standards used in Europe. Other frequency bands are used for mobile communications elsewhere and handsets using these frequencies will be carried on MCA equipped aircraft. Extension of the range of frequencies handled by the NCU will be possible in the light of operational experience and implementation of new mobile terrestrial frequency bands.

Equipment authorisation

2.17   Several responses to the Discussion Document emphasised the requirement for equipment to be compliant with the relevant EU Directives. MCA equipment installed

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[18] European Commission TCAM 19 (05) 86 -
http://circa.europa.eu/Public/irc/enterprise/tcam/library?l=/public_documents/tcam_19/communication
_systemsdoc/_EN_1.0_&a=d

on aircraft must meet minimum requirements under the Radio and Telecommunications Terminal Equipment (RTTE) Directive 1999/5/EC to reduce the risk of harmful interference. The RTTE Directive has been implemented into UK law by the Radio Equipment and Telecommunications Terminal Equipment Regulations 2000 (SI 2000/730) as amended. Compliance with the ETSI harmonised standard presumes that the equipment conforms with the essential requirements of the RTTE Directive.

Onboard procedures

2.18   A fundamental way in which the technical standards ensure no harmful interference to terrestrial networks is by setting a minimum height above ground level below which the systems must be switched off. Ofcom believes that this minimum height of 3,000 metres will be effective in reducing the potential risk of interference. However this approach does place a key responsibility on the operators of MCA systems to ensure that the equipment is switched off during the take-off and landing phases of flight (and at all other times as directed by the crew of the aircraft); and that the passengers' handsets are not used during this time. Responsibility for approving the operational procedures on board lies with the national aviation authorities of the aircraft's country of registration: in the UK this is the CAA. Ofcom also expects the aircraft operator will ensure that the importance of this limit is fully reflected in the procedures.

Enforcement

2.19   Should harmful interference be detected and reported to Ofcom, we will investigate in as timely and proportionate a manner as possible to determine whether the interference came from an aircraft; and if so which one. If it is proven that an individual system or a cumulative effect causes harmful interference Ofcom will take the necessary action.

2.20   If the aircraft is from an overseas administration, Ofcom has the power under the Wireless Telegraphy (Visiting Ships and Aircraft) Regulations 1998 (SI 1998/2970) to require the offending apparatus to be switched off immediately. These Regulations require that the apparatus for wireless telegraphy on board a visiting aircraft shall be so used so as not to interfere with the emitting and receiving of any wireless telegraphy by others.

2.21   The draft COCOM Recommendation currently envisages the creation of an EU register of aircraft authorised in conformance with the ECC and ETSI standards. This element of the COCOM Recommendation is still under discussion and may be subject to change. Such a register would provide enforcement agencies with the necessary data to determine the licensing authority of any offending aircraft and to take appropriate action to end the interference. Ofcom will cooperate with overseas NRAs if they complain about the performance of a UK registered aircraft. Ofcom proposes that UK registered aircraft should be licensed to use the spectrum; under this proposal details will be recorded in Ofcom licensing records which will facilitate the investigation and identification of breaches whether or not an EU register exists.

> *Do you agree that the ECC Decision and associated technical requirements and limits will adequately protect terrestrial networks?*

Section 3

MCA services and wireless telegraphy licensing

Introduction

3.1   This section sets out Ofcom's principal proposals for authorising the equipment for MCA services (aircraft BTS and NCU).

Licensed or licence-exempt

3.2   Article 5(1) of the EU Authorisation Directive (2002/20/EC) states that Member States shall, where possible, in particular where the risk of harmful interference is negligible, not make the use of radio frequencies subject to the grant of individual rights of use but shall include the conditions for usage of such radio frequencies in the general authorisation. This policy is also reflected in Section 8.3 of the Wireless Telegraphy Act 2006 (WT Act).

3.3   Section 8 of the WT Act requires that a licence be obtained prior to establishing, using or installing wireless telegraphy stations or apparatus unless they are licence-exempt. Wireless Telegraphy Act licences are granted to aircraft operators and they detail the frequency ranges of the radio equipment on board the aircraft.

3.4   The Discussion Document raised the point as to whether the equipment for MCA should be licensed or made licence-exempt. Several respondents argued that licence exemption would be suitable for MCA, given that it does not cause harmful interference to other systems. However other respondents argued that a policy of licensing would be more appropriate given the uncertainty surrounding the performance of these systems in operation and the substantial risks to terrestrial networks if they were the victims of interference.

3.5   Ofcom sees some merit in the argument concerning the uncertainty of potential interference. We therefore propose that equipment for MCA should be licensed rather than made licence-exempt. We believe that the process for licensing will not be onerous (see section 3.11 below) and if any enforcement action is necessary this may be more easily taken under a licensed approach than under a licence-exempt approach. Ofcom does not currently envisage any additional fees being charged for the use of the spectrum as a result of its being licensed.

3.6   It is much harder to bring licence-exempt equipment into a licensed regime than it is to exempt previously licensed equipment as records would not normally be held for exempt equipment. A move to a deregulated environment could be taken in the future if the risk of interference is proved negligible.

3.7   The draft COCOM Recommendation currently acknowledges that both licensed and licence-exempt approaches might be adopted in different Member States. In both cases the current draft of the COCOM Recommendation includes arrangements for a European register of authorised MCA systems, although this provision is still under discussion. Such a registration scheme would involve the submission of details of MCA installations on each aircraft that is equipped, with details of the aircraft registration number, country of origin and other details. These requirements are very similar to those of a simple licensing scheme.

> *Do you agree that the initial authorisation regime for MCA should be via licensing rather than licence-exemption?*

Who should be licensed?

3.8   If MCA systems are to be licensed rather than made licence-exempt there are two principal options for who should be granted the licence. This section sets out the arguments for each of these approaches. The options are:

- Service providers, for example those whose business is installing MCA systems and providing the related network service;

- Operators of aircraft with MCA systems installed.

3.9   **The service providers** have been instrumental in driving forward the service and are likely to provide expertise in installation of systems on board and in the operation of the networks to provide worldwide connectivity. Providers like OnAir and AeroMobile, could be important partners to airlines launching MCA services. These and other respondents to the Discussion Document argued that expertise in installing the equipment will be the key qualification for taking responsibility for regulatory accountability and compliance.

3.10 Ofcom has considered these arguments carefully. However we note that the actual operation of MCA equipment is not done by the service provider but by the crew on board the aircraft. It is the avoidance of harmful interference and the correct operation of the equipment which is the critical concern of stakeholders; but it appears that the service providers would have little responsibility in this area. The role of the service provider is therefore less relevant so far as spectrum responsibilities are concerned. Service providers will, on the other hand, have greater responsibility for fulfilling the obligations under ECS regulation (see Section 4).

3.11 **The aircraft operators** already have many other certificates and authorisations for each of their aircraft – e.g. for safety and airworthiness - and hold wireless telegraphy licences for the many other radiocommunications systems which they use on board. The Chicago Convention 1944[19], the international convention that governs all civil aviation requires for instance that all radio equipment on an aircraft should be licensed and that the aircraft must carry a copy of this licence[20]. All these certificates and authorisations are acquired and maintained by the current aircraft operator; and are passed on to new operators when the aircraft is transferred. Where required new radio equipment is generally added to the aircraft licence by a "Notice of Variation" (NoV). Wireless telegraphy licences for aircraft are distributed by the CAA on behalf of Ofcom. In licensing a new radio use on board there would be little additional burden on aircraft operators if this approach continued and operators of individual aircraft were licensed for MCA.

3.12 No MCA systems could be installed without the active participation of the aircraft owner; and they can only be operated by the aircraft's crew. Further, Section 105 of the WT Act provides that the captain of an aircraft is responsible (without prejudice to

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[19] http://www.caa.is/2000/s-bok/S-1-2A.pdf
[20] The requirements of the Chicago Convention are incorporated into UK law by way of the Air Navigation Order 2005 (SI 2005/1970).

the liability of any other person) if there is a breach of some dispositions of the Act. Granting licences to the aircraft operator (which employs the captain and the crew) therefore appears to have merit.

3.13   Ofcom's proposal is therefore that, given the aeronautical licensing regime that already exists, it should be the aircraft operator that should be licensed to use 1800 MHz spectrum on board. Ofcom proposes to allow the use of MCA systems through issuing a Notice of Variation (NoV) to the existing aircraft WT Act licence. The aircraft operator will therefore be responsible for the installation, operation of the onboard MCA radio equipment and the avoidance of interference to terrestrial (and avionic) systems.

3.14   Annex 5 provides an indicative outline of the proposed NoV. This also sets out the technical conditions under which MCA systems would be licensed for operation in UK aircraft.

Do you agree that the aircraft operator should be the licensee of the radio equipment used for MCA?

The MNOs

3.15   A number of UK mobile network operators have been granted national licences to use 1800 MHz spectrum. Licensees include the long-established service providers O2, Orange, T-Mobile and Vodafone; but also include the companies who acquired licences in the award of spectrum at 1781 MHz in 2006[21].

3.16   Some respondents to the Discussion Document argued that the GSM 1800MHz spectrum has already been licensed in the UK and expressed concerns about interference. We have considered these arguments carefully and we note that avoiding harmful interference to other users is the foundation of the technical specification for MCA, and the technical limits have been set specifically to avoid the risk of harmful interference, in particular to terrestrial networks. For the reasons set out above, Ofcom is proposing that the radio equipment for MCA should be licensed to aircraft operators.

3.17   The draft COCOM Recommendation proposes that MCA authorisations should be distinct from authorisations for terrestrial services and most EU Member States have agreed with this conclusion.

Process for licensing

3.18   The installation and operation of an on board .MCA system is completely under the control of the aircraft operator. Under the proposal outlined above it would be simple and effective to license the aircraft operator to operate the MCA system via the issuing of an NoV to the existing aircraft radio licence. This has the further advantage that an aircraft is already licensed for numerous wireless telegraphy devices, and the MCA system could simply be an addition to this licence. WT Act licences for aircraft are distributed by the CAA on behalf of Ofcom; adding MCA to the list of devices which have schedules on the aircraft licence would be a relatively simple task.

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[21] http://www.ofcom.org.uk/radiocomms/spectrumawards/completedawards/award_1781/

3.19   The aircraft operator will also determine which service provider they will use, so no competition concerns should arise from granting NoVs on request to the aircraft operators.

Do you agree that the authorisation of radio equipment for MCA in the 1800 MHz spectrum band should be granted via an NoV to the existing aircraft licence?

Fees

3.20   In relation to WT Act licences for aircraft, fees are currently charged on the basis of the aircraft's take off weight. Ofcom does not at this stage propose to charge an additional fee for MCA above the existing aircraft WT licence fee as there does not appear to be a spectrum management justification or need to do so.

Do you agree that under the current licensing framework no additional fee should be payable for MCA spectrum authorisation?

Mobile terminal use

3.21   Mobile phones used on the ground are exempt from individual licences because they are associated with licensed terrestrial networks. Ofcom intends to amend the Wireless Telegraphy (Licence Exemption) Regulations 2003 (S.I. 2003/74)[22] to extend this exemption to mobile phones connected to onboard MCA systems.

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[22] http://www.opsi.gov.uk/stat.htm

Section 4

MCA and the regulation of electronic communications services

Authorisation issues

4.1   According to the draft COCOM Recommendation, operators of MCA will be providing Electronic Communications Services (ECS). As a result, such services will fall within the scope of the regulatory framework for electronic communications network and services, in particular the Authorisation Directive (2002/20/EC). The underlying principle behind the Authorisation Directive is the establishment of a general authorisation regime (as opposed to specific operating licences) for providers of ECS.

4.2   In the UK, providers of ECS do not generally need a specific operating licence but are subject to the General Conditions of Entitlement (GCs) which are adopted by Ofcom under the Communications Act 2003.

4.3   OnAir, AeroMobile and other companies seeking to offer ECS services on planes which are subject to Ofcom's jurisdiction have to comply with the relevant GCs. Which GCs apply exactly to which type of service depends on the precise nature of the ECS.

4.4   Questions may arise about the applicability of certain GCs for MCA, for example in relation to the provisioning of access to emergency organisations via "112" and "999" or certain interconnect obligations. The applicability of these conditions will depend on the type of ECS which is being operated, and Ofcom recommends that providers seek their own advice about which one applies to their particular service parameters. An outline of the GCs of the various categories of ECS is set out on the Ofcom web site at http://www.ofcom.org.uk/telecoms/ioi/g_a_regime/

4.5   Some of the MCA proponents have suggested that none of the obligations under the GCs should apply to them. However, where operators of MCA provide ECS (as is suggested for MCA in the draft COCOM Recommendation) the current GC regime applies to those operators in the UK as it would to any other provider of ECS. Should a COCOM Recommendation in the future provide a common basis for all Member States in this respect, Ofcom may, if appropriate, consult on which detailed conditions should apply. Following such consultation Ofcom may, where required, amend or modify existing GCs accordingly.

Roaming regulation

4.6   One particularly important question will be that of whether MCA systems must comply with EC Regulation on roaming charges on public mobile telephone networks in the Community (EC No. 717/2007[23]). We understand that the business models of the operators of these systems and their airline partners depend on higher end-user charges than are normal when roaming.

4.7   While the Regulation makes no explicit mention of services on aircraft, Recital 16 to the Regulation states *"A common approach should be employed for ensuring that*

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[23] http://eur-lex.europa.eu/LexUriServ/site/en/oj/2007/l_171/l_17120070629en00320040.pdf

*users of **terrestrial** public mobile telephone networks when travelling within the Community do not pay excessive prices for Community-wide roaming services[…]"* (emphasis added). Article 2 of the regulation goes on to define the home network (provider), the visited network and roaming customer, by reference to provision of 'terrestrial' services.

4.8   This wording seems to suggest that MCA services, if they fall outside the definition of "terrestrial public mobile telephone network", also fall outside the scope of the Regulation. Ofcom will only be able to reach a final view on this matter when all relevant information is available.

In your opinion do you think that MCA services would fall within the scope of the EC Regulation on roaming? Please explain why you think that MCA services would or would not fall within the scope of this regulation.

Numbering

4.9   The planned approach to MCA envisages passengers' handsets roaming onto the onboard network when flying above 3,000 metres. In these circumstances it will be necessary to allocate a Mobile Country Code (MCC) and Mobile Network Code (MNC) to the onboard network, which will provide connectivity to the onboard users. One MNC would be needed for each service provider rather than for each aircraft.

4.10   Responses to the Discussion Document gave strong support for the use of international MNCs for on-board systems. It was considered by many to be both practical and logical to adopt a non-geographic international MNC for these services and that the use of an international MNC will enhance transparency for consumers when roaming by ensuring billing and tariff clarity.

4.11   In this scenario the allocation of national network codes is neither practical nor desirable. Due to the international nature of the service it would be difficult to establish national codes and it was strongly advocated by respondents to the discussion document that international codes administered by the ITU should be used.

4.12   Ofcom agrees that international MCC's and MNCs should be allocated through the ITU to MCA service providers. The following web link details the process for obtaining an MCC and MCA from the ITU: http://www.itu.int/rec/T-REC-E.212/en.

Section 5

Issues outside Ofcom's remit

Air safety

5.1   Installation of MCA systems and operation of mobile wireless terminal equipment on board an aircraft is subject to airworthiness certification by the European Aviation Safety Agency (EASA) and the CAA. These matters are outside the remit of Ofcom.

5.2   Aircraft operate in a potentially hazardous environment and many of their systems are safety devices intended to reduce the risks of operating in that environment. Airworthiness certification for the proposed MCA systems will require demonstration that the GSM base stations and handsets have no adverse effect on aircraft systems.

5.3   Responsibility for ensuring that no adverse effects are possible rests with the European Aviation Safety Agency (EASA), the International Civil Aviation Organisation (ICAO) and the International Air Transport Association (IATA) in parallel work streams. UK expertise in these groups is provided by the CAA.

5.4   These bodies are responsible for ensuring that all reasonable measures must be taken to ensure that no electronic device, including the aircraft base station, NCU and mobile telephones, can adversely affect the performance of the aircraft or its systems. These issues will be addressed through the airworthiness certification process, administered in the UK by the CAA on behalf of the EASA. It is essential that these issues are fully resolved before MCA systems could be allowed on any aircraft but this, as noted above, does not fall within Ofcom's remit.

On board procedures and human factors

5.5   The CAA and similar bodies in other countries are responsible for accepting the procedures which airlines adopt for use on board aircraft during flight. These procedures ensure that equipment is operated correctly and that passenger welfare and safety is protected. Some consumers have raised concerns about the potential for discomfort and agitation among passengers as a result of others using mobile phones and this will need to be considered in the operational procedures. In the UK the CAA is responsible for considering these issues and accepting the procedures proposed by airlines to deal with them.

5.6   Further information concerning the EASA's and the CAA's responsibilities may be found on the EASA's and the CAA's websites: www.easa.eu.int and www.caa.co.uk.

Section 6

Summary of questions

Questions

Do you have any comment in relation to the authorisation of MCA systems on the basis of a common European approach?

Do you agree that the ECC Decision and associated technical requirements and limits will adequately protect terrestrial networks?

Do you agree that the initial authorisation regime of equipment for MCA should be via licensing rather than licence-exemption?

Do you agree that the aircraft operator should be the licensee of the radio equipment used for MCA?

Do you agree that the authorisation of radio equipment for MCA in the 1800 MHz spectrum band should be granted via an NoV to the existing aircraft licence?

Do you agree that under the current licensing framework no additional fee should be payable for MCA spectrum authorisation?

In your opinion do you think that MCA services would fall within the scope of the EC Regulation on roaming? Please explain why you think that MCA services would or would not fall within the scope of this regulation.

Annex 1

Responding to this consultation

How to respond

A1.1   Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 30 November 2007**.

A1.2   Ofcom strongly prefers to receive responses using the online web form at http://www.ofcom.org.uk/consult/condocs/mca/, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.

A1.3   For larger consultation responses - particularly those with supporting charts, tables or other data - please email **Richard.young@ofcom.org.uk** attaching your response in Microsoft Word format, together with a consultation response coversheet.

A1.4   Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Richard Young
Office of Communications (Ofcom)
03:111 - Mobile and Broadband Team
Riverside House
2A Southwark Bridge Road
London SE1 9HA

Fax: 020 7783 4303

A1.5   Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

A1.6   It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together in Section 6. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7   If you require further information on this consultation, or need advice on the appropriate form of response, please contact Richard Young on 020 7783 4373.

Confidentiality

A1.8   We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether

all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

A1.9   If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.10   Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at http://www.ofcom.org.uk/about/accoun/disclaimer/

Next steps

A1.11   Following the end of the consultation period, Ofcom intends to publish a statement in early 2008.

A1.12   Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

A1.13   Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.

A1.14   If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.

A1.15   If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Vicki Nash, Director Scotland, who is Ofcom's consultation champion:

Vicki Nash
Ofcom
Sutherland House
149 St. Vincent Street
Glasgow G2 5NW

Tel: 0141 229 7401
Fax: 0141 229 7433

Email vicki.nash@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened version for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will normally allow ten weeks for responses to consultations on issues of general interest.

A2.6 There will be a person within Ofcom who will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organizations interested in the outcome of our decisions. This individual (who we call the consultation champion) will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why. This may be because a particular issue is urgent. If we need to reduce the amount of time we have set aside for a consultation, we will let those concerned know beforehand that this is a 'red flag consultation' which needs their urgent attention.

After the consultation

A2.8 We will look at each response carefully and with an open mind. We will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

A3.1   In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.

A3.2   We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.

A3.3   The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.

A3.4   We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.

A3.5   Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐   Name/contact details/job title ☐

Whole response ☐   Organisation ☐

Part of the response ☐   If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is
non-confidential (in whole or in part), and you would prefer us to
publish your response only once the consultation has ended, please tick here. ☐

Name   Signed (if hard copy)

Annex 4

Impact Assessment

Introduction

A4.1   The analysis presented in this Annex represents an impact assessment, as defined in section 7 of the Communications Act 2003 (the Act).

A4.2   You should send any comments on this impact assessment to us by the closing date for this consultation. We will consider all comments before deciding whether to implement our proposals.

A4.3   Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making. This is reflected in section 7 of the Act, which means that generally we have to carry out impact assessments where our proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. However, as a matter of policy Ofcom is committed to carrying out and publishing impact assessments in relation to the great majority of our policy decisions. For further information about our approach to impact assessments, see the guidelines, Better policy-making: Ofcom's approach to impact assessment, which are on our website:
http://www.ofcom.org.uk/consult/policy_making/guidelines.pdf

The citizen and/or consumer interest

A4.4   In light of the progress made within the relevant European forums and the RSC Decision and the COCOM Recommendation likely to be adopted soon, Ofcom is proposing to authorise the use of spectrum on board aircraft in flight so that passengers can use their mobile phones to make and receive calls while flying. The business opportunity seen by proponents of MCA for airlines, specialist operators and the mobile phone networks is based on the expectation that customers will find the service sufficiently valuable to use and pay for it.

A4.5   Some consumers have suggested that the use of mobiles during flight will irritate other passengers and compromise their comfort and welfare. They argue that aircraft in flight are one of the few places where mobile phones are not permitted and that this immunity should be preserved. Some of their concerns stem from the prospect of a long journey sitting next to someone speaking loudly on their mobile.

A4.6   However there are many ways in which some passengers can annoy others, and in these cases it is a matter for airlines and aircraft operators how to balance the services they offer to their passengers with the impact that they have. An example is the serving of alcohol on board, which can lead to disruptive behaviour. Airlines have developed procedures for dealing with negative consequences of alcohol; but many have decided that, with these safeguards, alcohol remains a valued part of their service. It is likely that similar procedures will be developed to deal with any negative impact of mobile phone use. The CAA in the UK and similar organisations in other countries assess and certify the effectiveness and suitability of onboard procedures like these.

A4.7   The installation of MCA radio equipment is entirely under the control of the airline. Airlines therefore have the choice of whether to offer MCA services or not. They will

be better placed than any regulator to understand and reflect the preferences and requirements of their customers. The air transport market is generally highly competitive and in the case of significant public dislike of MCA the airlines are likely to be able to respond flexibly to their customers' preferences.

A4.8   The tariffs for these in-flight MCA services might be higher than those charged for terrestrial services due to the differing costs of MCA compared to terrestrial networks. The pricing of these services will be subject to the relevant regulations, under which Ofcom has the power to investigate and address cases of consumer detriment. However these services are in their infancy and it would be premature to predict serious problems at this stage.

Ofcom's policy objective

A4.9   Under the Communications Act 2003 Ofcom must have regard to the desirability of encouraging investment and innovation in relevant markets as well as to further the interests of citizens and consumers. MCA systems represent a potentially valuable innovation and the development of a new market for mobile communications. Establishing a regulatory framework in which MCA systems can be deployed would be in line with the development of a co-ordinated approach to MCA across Europe which will emerge following the adoption of the RSC Decision and the COCOM Recommendation. This is expected to allow for the mutual recognition of Member States' authorisations for MCA on the basis of common technical and authorisation requirements.

A4.10   Ofcom expects the European framework to be in place early in 2008 and therefore aims to have the appropriate UK measures in place in a similar timescale.

Options considered

A4.11   There are three issues whose impact needs to be assessed for Ofcom's authorisation of MCA:

- The authorisation of MCA services based on the EU common approach;

- Whether the authorisation of MCA radio equipment should be via individual authorisation (i.e. licences) or via general authorisation (i.e. licence-exempt);

- If MCA services are licensed via specific authorisation then who should hold the licence.

Authorisation of MCA and the EU common approach

A4.12   Mobile phone use on aircraft has always been prohibited because of concerns about potential interference to safety-critical aircraft systems. Similar rules about other electronic devices (e.g. laptops and games consoles) have been relaxed in recent years and these are now generally permitted except during the take-off and landing phases of flight.

A4.13   At the EU level, the technical work has now been done which will allow a similar relaxation of the rule against using mobile phones on board. The consensus among technical experts in Europe and elsewhere is that technical standards might be defined to allow for MCA services.

A4.14   European bodies have set out the common technical requirements for MCA and are developing a harmonised standard to reduce the risk of possible interference to terrestrial networks. Ofcom believes that these standards will be adequate to protect the terrestrial networks. However MCA systems are a new and innovative development and they are untested in a "live" environment. There is therefore the possibility that they may generate interference, either singularly or cumulatively, which may harm terrestrial radio systems. Ofcom expects the necessary precautions to be taken to ensure this situation does not arise, so that the terrestrial networks do not suffer interference.

A4.15   Proponents of MCA argue that such systems offer additional value to passengers. Their business cases rest on the assumption that passengers will pay for the service. There are likely to be significant costs for installing MCA systems, unlike, for example, mobile services on trains or buses which use the existing terrestrial networks. If MCA services are not valued by consumers, they will not be used and few installations will be made. We can therefore rely on the market to determine the degree to which MCA services are rolled out.

A4.16   EU Member States and the European Commission have initiated work to define the technical and authorisation parameters which will allow MCA to be launched across Europe. The outcome of these initiatives is now expected to be a mandatory requirement for Member States to make 1800 MHz spectrum available for MCA. Such a requirement could not be disregarded and Member States will be expected to authorise MCA in the near future. Further, if the UK did not participate in this approach, it might be argued that UK businesses and consumers would be disadvantaged in not having access to these innovative services. The competitive position of UK airlines compared to those of the other states might be damaged. At the same time UK consumers' ability to choose airlines which offer the services they want would be reduced.

A4.17   In light of these factors, and in particular the RSC Decision and COCOM Recommendation soon to be adopted, Ofcom believes that an appropriate framework for MCA services based on the EU common approach should be developed.

Should MCA be licence-exempt or licensed?

A4.18   MCA could be individually licensed or made licence-exempt. The principal issues which arise and the respective impact of the two options are set out in the following table.

Issue	Licence-exempt	Licensed	Conclusions
Avoidance of interference to terrestrial networks	The ECC technical Report 93 calculates that MCA systems which meet it will most likely not interfere with terrestrial networks. The relevant exemption regulations would include this as part of the specification which must be met by equipment which was to be licence-exempt. If such	Licensed systems would be required to conform to the ECC specification and their use would be in breach of their licence if they ceased to do so. As such they would be subject to enforcement action.	No effective difference between the two approaches

	equipment deviated from this specification then it would be in breach of the exemption regulations and would be subject to enforcement action.		
Enforcement where interference is detected	Enforcement action can be taken against licence-exempt equipment which causes harmful interference. This would apply to MCA systems in UK airspace whether on a UK or foreign aircraft. Enforcement action will be facilitated if a common European Register of MCA equipped aircraft is maintained so that individual breaches can be investigated and dealt with quickly and effectively. In case of harmful interference then the individual items of equipment which were outside their operating parameters could be shut down.	Enforcement action can be taken against licensed installations which cause harmful interference. UK registered aircraft with licences for MCA will be recorded in Ofcom licensing records which will facilitate the investigation and identification of breaches whether or not an EU Register exists. In case of harmful interference sanctions may be applied and in the extreme the licence for that aircraft or group of aircraft could be revoked.	Licensing gives additional knowledge to the enforcement agency about the location and description of devices. Actions such as revocation of the licence are available where licences are issued.
Fees	No fees are payable for spectrum use by licence-exempt equipment.	No additional fees would currently be payable for spectrum use if the equipment is licensed under the existing aircraft licence, which is charged for at a flat rate.	No effective difference between the two approaches
Competition	Installation of MCA systems is entirely under the control of airline operators. Choosing the service provider for any aircraft will therefore be a matter for the airline. Exemption of the MCA equipment from individual spectrum licensing will not alter this and competition will be no greater or less depending on the approach relied on for	Installation of MCA systems is entirely under the control of airline operators. Choosing the service provider for any aircraft will therefore be entirely a matter for the airline. Licensing the MCA equipment will not alter this and competition will be no greater or less depending on the approach relied on for	No effective difference between the two approaches

	authorisation.	authorisation.	
Regulatory compliance overhead	There would be no compliance costs if the system were licence-exempt. However it is proposed in Europe that there should be a Register of aircraft equipped with MCA. If this proposal is adopted then operators will be obliged to provide information similar to that for licensing.	Licensing MCA systems would require licensees to provide information about the installation. However Ofcom's proposal is to add the MCA licence on request, to the existing WT licence held by each aircraft. This would represent a minimal addition to the administration of the numerous licences and certificates held by each aircraft.	Minimal effective difference between the two approaches

A4.19 The principal difference in practice between a licence-exempt and a licensed approach lies in the ease with which harmful interference from MCA systems can be dealt with. While harmful interference to terrestrial networks is not expected, these systems are novel and the interference they might generate is untested and potentially harmful. Given that it is easier to move from licensing to licence-exemption than vice-versa it is therefore preferable to begin with a licensed approach to MCA and to review it once it has been in operation for a period or if circumstances change. This approach is acknowledged as an option in the current draft COCOM Recommendation.

Should operators or airlines be licensed?

A4.20 If MCA systems are to be licensed we must decide who should be the holder of the spectrum licence. Specialist operating companies are emerging who aim to install MCA equipment on board aircraft and to provide the end-to-end connectivity for passenger calls, roaming agreements with passengers' home networks, the associated billing services etc. Examples of these companies are OnAir and AeroMobile. Alternatively, it would be possible to license airlines for the aircraft they control.

A4.21 It is important to distinguish between spectrum licensing and the authorisation of electronic communications services (ECS).

A4.22 Operation of ECS is authorised under the Authorisation Directive (2002/20/EC): in the UK this means that anyone can operate an ECS, subject to the General Conditions. Ofcom expects the end-to-end service provision for MCA to be delivered by companies like OnAir and AeroMobile who would be the ECS providers. This approach will also facilitate the provision of services on aircraft registered outside the EU while in EU airspace. It is consistent with the activities and expertise of the service providers whose focus is on providing telecoms services and end-to-end connectivity.

A4.23 Spectrum authorisation might be associated with the individual aircraft. It is the aircraft operator who chooses the company to install MCA on board, and it is the aircraft operator who (through the Captain and crew) operates the MCA equipment. Further, the aircraft operator is already responsible for a number of wireless telegraphy devices under the WT Act licence which each aircraft must have for the

safe and interference-free operation of these systems. In the event of harmful interference the aircraft operator will be in a position to know where the aircraft was at the time and is likely to be the recipient of any complaints. MCA operators like OnAir and AeroMobile, by contrast, will not operate MCA equipment. They are not the recipient of WT Act licences for the aircraft and they will not be aware of the aircraft's movements or its impact on terrestrial networks.

A4.24   For these reasons it would be more effective and straightforward for the radio equipment of MCA to be incorporated into the WT Act licence already held for each aircraft.

Conclusion

A4.25   Ofcom considers that the equipment for MCA should be licensed rather than licence-exempt and that the appropriate licensee for WT Act purposes is the airline operator.

Annex 5

Draft Notice of variation (NoV) to aircraft licence

WIRELESS TELEGRAPHY ACT 2006

**NOTICE OF VARIATION OF AIRCRAFT RADIO LICENCE
FOR THE PURPOSE OF THE INSTALLATION AND USE OF AN AIRCRAFT-BASE
TRANSCEIVER STATION (PUBLIC CELLULAR BASE STATION) AND A NETWORK
CONTROL UNIT ON BOARD AN AIRCRAFT**

1   Licence reference details

Sector/class/product	**XXXXXX**
Licence number	**[system generated licence number]**
Aircraft Registration	**[taken from AC Reg field]**
Aircraft Type	**[taken from Aircraft Type field]**
Licensee Name	**[Licensee name]**
Licensee address	**[Licensee address]**
Date of issue	**[date licence first issued]**
Licence start date	**[date system generated licence]**

2   Ofcom, in exercise of the power conferred by Schedule 1, paragraph 6 of the Wireless Telegraphy Act 2006 ("the Act"), hereby varies the Aircraft Radio Licence ("the Licence") as identified above, in accordance with Schedule 1 of the Act.

3   Terms and expressions defined in the Licence shall have the same meaning herein except where the context requires otherwise.

4   The Licence shall be varied as and from the Date of Issue of this Notice of Variation, such that the Licence shall be read and construed as if the following table is added after the last row in the table in clause 2 "Licence Terms and Conditions" of the Licensee:

	Frequency Range (MHz)	
	FROM	**TO**
Aircraft-Base Transceiver Station **(Public Cellular Base Station)** *(aircraft-BTS)*	**1710** **1805**	**1785** **1880**
Network Control Unit (NCU)	**460** **921** **1805** **2110**	**470** **960** **1880** **2170**

5   The additional terms set by paragraph 6 to 10 below shall apply in respect of the establishment, installation and use of the radio equipment described in the table in clause 4 above and shall be read as an integral part of the Licence for this purpose.

6   The following terms and conditions shall apply:

   a) the aircraft-BTS and NCU may only be used to provide "Mobile Communications onboard Aircraft" (MCA) services by wireless telegraphy between the MCA system and GSM mobile terminals.

   b) The aircraft-BTS and NCU shall be operated on a 'non-interference non-protected' basis; with the provision that the NCU may only be used for the facilitation of the purpose as set out in Clause 6 a.

   c) The aircraft-BTS and NCU shall only be operated when it forms part of a relevant network as defined in Part 1 of Schedule 3 to the Wireless Telegraphy (Exemption) Regulations 2003 as amended;

   d) the aircraft-BTS and NCU may only be operated when there is a minimum separation distance of 3000m between the aircraft-BTS and NCU and the ground;

   e) appropriate measures must be taken to ensure that GSM mobile terminals on board are switched off when the radio equipment is not in operation and that user stations not controlled by the radio equipment remain switched off during all phases of the flight;

   f) Records of when the radio equipment is switched on and off must be kept for a minimum period of six months by the licensee and submitted to Ofcom at such intervals as Ofcom shall notify to the Licensee.

7.   The aircraft-BTS and NCU shall comply with the UK Interface Requirement IR XXXX.

8.   The aircraft-BTS and NCU shall comply with the requirements of ETSI EN 302 480 – Electromagnetic compatibility and Radio spectrum Matters (ERM); Harmonised EN for the GSM onboard aircraft system covering essential requirements of Article 3.2 of the R&TTE Directive or other equivalent specification;

9.   The aircraft-BTs and NCU shall comply with the technical and operational requirements for airborne GSM systems specified in the Annex of the Electronic Communications Committee Decision "ECC Decision of 1 December 2006– on the harmonised use of airborne GSM systems in the frequency bands 1710 – 1785 and 1805 – 1880 MHz" (ECC/DEC/(06)07).

10.   Use of the aircraft-BTS and NCU:

   (a)   The Licensee must ensure that the radio equipment is constructed and used only in accordance with the provisions specified in this Notice of Variation. Any proposal to amend any detail specified in this Notice of Variation or Licence must be agreed with Ofcom in advance and implemented only after the Licence has been varied or reissued accordingly.

(b)   The Licensee must ensure that the radio equipment is operated in compliance with the terms of the Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.

11.   Interpretation for the purposes of this NoV:

(a)   "Mobile Communications onboard Aircraft (MCA)" services means electronic communication services according to Art. 2 (c) of Directive 2002/21/EC provided by an undertaking to enable airline passengers to communicate via public communication networks during flight using a GSM system without establishing direct connections with terrestrial mobile networks;

(a)   "the 1800 MHz band" means the 1710-1785 MHz for uplink (terminal transmit, base station receive) and 1805-1880 MHz for downlink (base station transmit, terminal receive);

(b)   "GSM system" means an electronic communications network, which complies with the GSM Standards, as published by ETSI, in particular EN 301 502 and EN 301 511;

(c)   "non-interference and non-protected basis" means that no harmful interference may be caused to any radiocommunication service and that no claim may be made for protection of these devices against harmful interference originating from radiocommunication services;

(d)   "e.i.r.p." means equivalent isotropic radiated power;

(e)   "Network Control Unit (NCU)" means an equipment to be located in the aircraft that ensures that signals transmitted by ground-based mobile systems are not receivable within the cabin by raising the noise floor inside the cabin in mobile receive bands;

(f)   "Aircraft Base Transceiver Station (aircraft-BTS)" means a mobile picocell located on the aircraft supporting GSM and GPRS services in the 1800 MHz band;

(g)   "Public Cellular Base Station" means a base station intended to provide a public cellular electronic communications service using the Global System for Mobile Communications technology;

(h)   "GSM mobile terminal" means any portable mobile station designed for mobile use which meet the appropriate technical performance requirements as set out in the Wireless Telegraphy (Exemption) Regulations 2003 as amended and either complies with the appropriate Interface Regulation, or for equipment placed on the market before 8 April 2000, is type approved in accordance with a recognised technical standard relating to the service licensed;

(i)   UK Interface Requirement IR XXXX for the aircraft-BTS and NCU is a United Kingdom Radio Interface Requirement published by Ofcom in accordance with Article 4.1 of Directive 1995/5/EC of the European Parliament and of the Council on radio equipment and electronic communications service terminal equipment (RTTE) and the mutual recognition of their conformity;

(j)   all technical terms, unless the contrary intention appears, shall have the meaning assigned to them in the Radio Regulations.

(k)   Radio Regulations means the 2004 edition of the Radio Regulations made under Article 13 of the Constitution of the International Telecommunication Union;

12   This notice of variation shall take immediate effect.

Issued by the CAA on behalf of Ofcom

Ofcom Licensing Centre
Riverside House
2a Southwark Bridge Road
London, SE1 9HA

UK Tel. +44 (0)20 7981 3131
Fax. +44 (0)20 7981 3333

Civil Aviation Authority
CAA House K6 G6
45-59 Kingsway
London WC2B 6TE

Date of issue:

Notes:

1.   This Notice of variation does not affect the requirement, where necessary, to obtain licences or authorisations under other legislation or from other countries prior to the installation or operation of a Public Cellular Base Station, in particular outside UK territory. The Licensee is encouraged to seek its own independent professional advice in this respect.

2.   Further guidance and information can be obtained from:

Aeronautical and Maritime Team,
Ofcom Licensing Centre,
Ofcom,
Riverside House
2a Southwark Bridge Road,
London SE1 9HA
Tel: +44 (0) 20 7981 3131
Fax: +44 (0) 20 7783 4235

and, in respect of any aircraft certification requirements:

CAA
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex RH6 0YR
+44 (0) 1293 573293
+44 (0) 1293 573187
Department.Certification@srg.caa.co.uk

Annex 6

Glossary

2G	2G (or 2-G) is short for second-generation wireless telephone technology. The main differentiator to previous mobile telephone systems, retrospectively dubbed 1G, is that the radio signals that 1G networks use are analogue, while 2G networks are digital.
2.5G	2.5G is a stepping stone between 2G and 3G cellular wireless technologies. The term "second and a half generation" is used to describe 2G-systems that have implemented a packet switched domain in addition to the circuit switched domain. It does not necessarily provide faster services because bundling of timeslots is used for circuit switched data services (HSCSD) as well.
3G	3G is the third generation of mobile phone standards and technology, after 2G. It is based on the International Telecommunication Union (ITU) family of standards under the International Mobile Electronic communications service programme, "IMT-2000". 3G technologies enable network operators to offer users a wider range of more advanced services while achieving greater network capacity through improved spectral efficiency. Services include wide-area wireless voice telephony and broadband wireless data, all in a mobile environment.
3GPP	The 3rd Generation Partnership Project (3GPP) is a collaboration agreement that was established in December 1998. The collaboration agreement brings together a number of electronic communications service standards bodies which are known as Organizational Partners. The establishment of 3GPP was formalized in December 1998 by the signing of the "The 3rd Generation Partnership Project Agreement". The original scope of 3GPP was to produce globally applicable Technical Specifications and Technical Reports for a 3rd Generation Mobile System based on evolved GSM core networks and the radio access technologies that they support (i.e., Universal Terrestrial Radio Access (UTRA) both Frequency Division Duplex (FDD) and Time Division Duplex (TDD) modes). The scope was subsequently amended to include the maintenance and development of the Global System for Mobile communication (GSM) Technical Specifications and Technical Reports including evolved radio access technologies (e.g. General Packet Radio Service (GPRS) and Enhanced Data rates for GSM Evolution (EDGE)).
A	An "A" (Access) link is a SL (Signalling Link) that connects a signalling end point, i.e. a SP (Signalling Point), to an STP (Signalling Transfer Point). Only messages that are originating from or destined to the signalling end point are transmitted on this link.
AGS	The Aircraft GSM Server The AGS represents the central control entity of the MCA system. It provides the interfaces to the aircraft internal systems for retrieving relevant flight information (e.g. actual position, altitude and flight phase) as well as for controlling means for indicating admission of mobile phone use to passengers. It manages the satellite link communication, controls the aircraft-BTS, monitors the NCU output power level and manages the Operations and Maintenance (O&M) functions.

BSC   Base Station Controller. The BSC is the functional entity within the GSM architecture that is responsible for Radio Resource allocation to a mobile station, frequency administration and handover between Base Transceiver Station controlled by the BSC. The BSC function may be physically located with the BTS.

BTS   In cellular system the Base Transceiver Station terminates the radio interface. Each BTS may consist of a number of TRX (Transceivers), typically between 1 and 16. In the GSM system the BTS is also responsible for ciphering of the air interface.

CAA   Civil Aviation Authority. The CAA is the UK's independent aviation regulator, with all civil aviation regulatory functions (economic regulation, airspace policy, safety regulation and consumer protection) integrated within a single specialist body. http://www.caa.co.uk/

CDMA2000   CDMA2000 is a hybrid 2.5/3G mobile digital radio protocol of mobile electronic communications service standards that use code division multiple access (CDMA), a multiple access scheme for digital radio, to send voice, data, and signalling data (such as a dialed telephone number) between mobile phones and cell sites. CDMA channels are defined with codes and permit many simultaneous transmitters on the same frequency channel.

CEPT   The European Conference of Postal and Telecommunications Administrations - CEPT - was established in 1959. CEPT is the European regional organisation dealing with postal and telecommunication service issues. Original members were the incumbent monopoly-holding postal and telecommunication service administrations. CEPT's activities included co-operation on commercial, operational, regulatory and technical standardisation issues. Currently has 45 members. www.cept.org

CIDS   Connection Identifiers. A connection identifier is a unique string (a 10-bit field that defines the destination address of a data packet) representing the name of the connection. This name could then be used as a placeholder to indicate the connection itself. CID is a channel number which is attached to frame relay data frames to tell the network how to route the data. The address is local on a link-by-link basis.

COCOM   The European Communications Committee. The Communications Committee was established by the Europen Framework Directive (Article 22 and Recital 34). It has replaced the ONP Committee and the Licensing Committee which were instituted under the 1998 regulatory package for electronic communications service. The Cocom assists the Commission in carrying out its executive powers under the new regulatory framework. The Cocom exercises its function through advisory and regulatory procedures in accordance with the Council Comitology Decision. The Cocom furthermore provides a platform for an exchange of information on market developments and regulatory activities. http://ec.europa.eu/information_society/policy/ecomm/committees_working_groups/index_en.htm#cocom

dB   The decibel (dB) is a logarithmic unit of measurement that expresses the magnitude of a physical quantity (usually power) relative to a specified or implied reference level.

dBm   dBm is an abbreviation for the power ratio in decibel (dB) of the measured power referenced to one milliwatt (mW). It is used in radio, microwave and fiber optic networks as a convenient measure of absolute power because of its capability to express both very large and very small values in a short form.

EASA   The European Aviation Safety Agency is an agency of the European Union which has been given specific regulatory and executive tasks in the field of aviation safety. The Agency constitutes a key part of the European Union's strategy to establish and maintain a high uniform level of civil aviation safety in Europe. http://www.easa.eu.int/home/

EC   The European Commission. The European Commission embodies and upholds the general interest of the European Union and is the driving force in the Union's institutional system. Its four main roles are to propose legislation to Parliament and the Council, to administer and implement Community policies, to enforce Community law (jointly with the Court of Justice) and to negotiate international agreements, mainly those relating to trade and cooperation.http://europa.eu.int/comm/index_en.htm

ECC   Electronic Communications Committee. Created by the CEPT to Consider and develops policies on electronic communications activities in CEPT member countries, taking account of European and international legislation and regulations. www.ero.dk.

ECN   Electronic Communications Network as defined by Article 2 of EU Directive 2002/21/EC[24] means transmission systems and, where applicable, witching 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 (1) OJ L 184, 17.7.1999, p. 23. (2) OJ L 336, 30.12.2000, p. 4. L 108/38 EN Official Journal of the European Communities 24.4.2002 signals, networks used for radio and television broadcasting, and cable television networks, irrespective of the type of information conveyed;

ECS   Electronic Communication Service as defined by Article 2 of EU Directive 2002/21/EC 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 exclude services providing, or exercising editorial control over, content transmitted using electronic communications networks and services.

E.I.R.P   Equivalent isotropically radiated power (EIRP) or, alternatively, Effective isotropic radiated power is the amount of power that would have to be emitted by an isotropic antenna (that evenly distributes power in all directions and is a theoretical construct) to produce the peak power density observed in the direction of maximum antenna gain. EIRP can take into account the losses in transmission line and connectors and includes the gain of the antenna. The EIRP is often stated in terms of decibels over a reference power level, that would be the power emitted by an isotropic radiator with an equivalent signal

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[24] http://eur-lex.europa.eu/LexUriServ/site/en/oj/2002/l_108/l_10820020424en00330050.pdf

strength. The EIRP allows making comparisons between different emitters regardless of type, size or form. From the EIRP, and with knowledge of a real antenna's gain, it is possible to calculate real power and field strength values.

ETSI
European Electronic Telecommunications Standards Institute was established by CEPT in 1985 when the CEPT telecommunication standardisation activities were transferred from CEPT to ETSI. ETSI is an independent, non-profit organization, whose mission is to produce electronic communications service standards. This activity is supplemented by interoperability testing services and other specialisms. ETSI's prime objective is to support global harmonization by providing a forum in which all the key players can contribute actively. ETSI is officially recognized by the European Commission.http://www.etsi.org/

EU
The European Union (EU) is a sui generis supranational union, made up of twenty-seven member states. It was established as the European Economic Community in 1957 by the Treaty of Rome and has undergone many changes since, most notably in 1992 by the Maastricht Treaty. Since 1957 new accessions have raised the number of member states, and powers have expanded.

FLASH-OFDM
Flash-OFDM (Fast Low-latency Access with Seamless Handoff Orthogonal Frequency Division Multiplexing) is a system that is based on OFDM and specifies also higher protocol layers. Flash-OFDM has generated interest as a packet-switched cellular bearer, on which area it would compete with GSM and 3G networks.

Gb
A Gb interface is a GPRS interface which is located between the SGSN (Serving GPRS Support Node) and the PCU (Packet Control Unit).

GGW
Ground Gateway. The main feature of a GGW is to perform the routing of traffic towards the aircraft and to interconnect the aircraft traffic with terrestrial backbone networks of the Public Network Domain

GHz
Gigahertz, abbreviated GHz, is a unit of alternating current or electromagnetic wave frequency equal to one thousand million hetrz (1,000,000,000 Hz) or one thousand megahertz (1000 MHz).

GPRS
GPRS (General Packet Radio Service) is a mobile connectivity solution based on Internet Protocols that supports a wide range of enterprise and consumer applications. With throughput rates of up to 40 kbit/s, it has a similar access speed to a dial-up modems, but with the convenience of being able to connect from anywhere.
http://www.gsmworld.com/technology/gprs/index.shtml

GSM
Global System for Mobile communications (GSM) is a second generation digital cellular telecommunication system which was first planned in the early 1980s, and is now the technology that underpins most of the world's mobile phone networks. GSM has become the world's fastest growing communications technology and the leading global mobile standard. http://www.gsmworld.com/technology/gsm.shtml

GSM1800   The spectrum range for the GSM1800 operation is between 1710MHz and 1785MHz for uplink operation and 1805MHz and 1880MHz for downlink operation.

Hz   The hertz (symbol: Hz) is the SI unit of frequency. Its base unit is cycle/s or s^{-1} (also called inverse seconds, reciprocal seconds). One hertz simply means *one per second* (typically that which is being counted is a complete *cycle*); 100 Hz means *one hundred per second*, and so on.

IP   Internet protocol. The Internet Protocol (IP) is a data-oriented protocol used for communicating data across a packet-switched internetwork. IP is a network layer protocol in the Internet protocol suite and is encapsulated in a data link layer protocol (e.g., Ethernet).

ISP   Internet Service Provider, a company that provides access to the Internet.

ITU   International Telecommunication Union. Headquartered in Geneva, Switzerland is an international organization within the United Nations System where governments and the private sector coordinate global telecom networks and services. http://www.itu.int/home/

Leaky Feeder   A leaky feeder is an aerial consisting of a coaxial cable run along drivages which emits and receives radio waves. The system has a limited range and because of the high frequency it uses the system is limited to line of sight applications.

MHz   Megahetrz abbreviated MHz, is a unit of alternating current or electromagnetic wave frequency equal to one million hetrz (1,000,000 Hz).

MNO   Mobile Network Operator. A mobile network operator (also known as wireless service provider, wireless carrier, mobile phone operator, or cellular operator) is a telephone company provides services for mobile phone subscribers.

MSC   A Mobile Switching Centre is a telecommunication switch or exchange within a cellular network architecture which is capable of interworking with location databases.

NCU   Network Control Unit. The purpose of the NCU is to stop terminals onboard from connecting to ground networks. To ensure this, it raises the RF noise floor inside the cabin to a level that effectively covers the signals from the ground base stations. The signal generated by the NCU is a band-limited white noise and, in the European configuration, it will blanket the GSM900, GSM1800, UMTS 2GHz and CDMA-450 / FLASH-OFDM bands.

NOC   A Network Operations Center or NOC is one or more locations from which control is exercised over a computer or electronic communications service network, or part thereof.

NoV   Notice of Variation. A notice to amend or vary a previously awarded licence.

O & M   Operations and maintenance. The O & M centre provides remote monitoring of the network performance and permits remote re-configuration and fault management activity as well as alarm and event monitoring.

OFDM Orthogonal Frequency-Division Multiplexing (OFDM) - essentially identical to Coded OFDM (COFDM) - is a digital multi-carrier modulation scheme, which uses a large number of closely-spaced orthogonal *sub-carriers*. Each sub-carrier is modulated with a conventional modulation scheme (such as quadrature amplitude modulation) at a low symbol rate, maintaining data rates similar to conventional *single-carrier* modulation schemes in the same bandwidth.

PCU The Packet Control Unit (PCU) is a late addition to the GSM standard. It performs some of the processing tasks of the BSC, but for packet data. The allocation of channels between voice and data is controlled by the base station, but once a channel is allocated to the PCU, the PCU takes full control over that channel. The PCU can be built into the base station, built into the BSC or even, in some proposed architectures, it can be at the SGSN site.

PSTN The public switched telephone network (PSTN) is the network of the world's public circuit-switched telephone networks, in much the same way that the Internet is the network of the world's public IP-based packet-switched networks. Originally a network of fixed-line analog telephone systems, the PSTN is now almost entirely digital, and now includes mobile as well as fixed telephones.

PLMN A public land mobile network (PLMN) is a network that is established and operated by an administration or by a recognized operating agency (ROA) for the specific purpose of providing land mobile electronic communications service services to the public. Access to PLMN services is achieved by means of an *air interface* involving radio communications between mobile phones or other wireless enabled user equipment and land based radio transmitters or radio base stations PLMNs interconnect with other PLMNs and PSTNs for telephone communications or with internet service providers for data and internet access.

R&TTE Radio and Electronic Telecommunications Terminal Equipment. RTTE / R&TTE Directive 1999/5/EC is the European regulation applicable to radio and telecoms terminal equipment. Manufacturers, suppliers and importers of such equipment must apply one of the conformity assessment procedures of the Directive before CE marking the equipment and placing it on the market of the European Economic Area (EEA). This Directive entered into force on 8 April 2000. After this date no new approvals under previous national or European laws could be issued. There was a transition period from 8th April 2000 to 7th April 2001 under which apparatus approved under previous national or European legislation could continue to be supplied. However, from 8th April 2001 all apparatus within the scope of this Directive must comply with its provisions before being placed on the EEA market. The scope of the R&TTE Directive relates to the equipment and components which fit within the definitions of radio equipment and telecoms terminal equipment given in the directive.

RSC The Radio Spectrum Committee (RSC) has been established under the Radio Spectrum Decision 676/2002/EC as part of the regulatory framework for electronic communications which entered into force on 24 April 2002. The RSC assists the Commission in the development and adoption of technical implementing measures aimed at ensuring harmonised conditions for the availability and efficient use of radio spectrum, as well as the availability of information related to the use of radio spectrum.

SAT-Modem   A satellite modem or satmodem is a modem (a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information) used to establish data transfers using a communications satellite as a relay. A satellite modem's main function is to transform an input bitstream to a radio signal and vice versa.

SGSN   A Serving GPRS Support Node (SGSN) is responsible for the delivery of data packets from and to the mobile stations within its geographical service area. Its tasks include packet routing and transfer, mobility management (attach/detach and location management), logical link management, and authentication and charging functions. The location register of the SGSN stores location information (e.g., current cell, current VLR) and user profiles (e.g., IMSI, address(es) used in the packet data network) of all GPRS users registered with this SGSN.

TCAM   The TCAM (Telecommunications Conformity Assessment and Market Surveillance Committee) is the standing Committee assisting the European Commission in the management of R&TTE Directive 99/5/EC. This Interest Group was set-up to facilitate the exchange of documents between Member States and the Commission.

TRX   A Transceiver. A device that is capable of both transmission and reception of a signal.

UMTS   Universal Mobile Telecommunications System (UMTS) is one of the third-generation (3G) cell phone technologies. Currently, the most common form uses W-CDMA as the underlying air interface, is standardized by the 3GPP, and is the European answer to the ITU IMT-2000 requirements for 3G cellular radio systems. To differentiate UMTS from competing network technologies, UMTS is sometimes marketed as 3GSM, emphasizing the combination of the 3G nature of the technology and the GSM standard which it was designed to succeed.

VLR   Visitor Location Register (VLR) is a database - part of the GSM mobile phone system - which stores information about all the mobiles that are currently under the jurisdiction of the MSC (Mobile Switching Centre) which it serves. Of all the information it stores about each MS (Mobile Station), the most important is the current LAI (Location Area Identity). LAI identifies under which BSC (Base Station Controller) the MS is currently present. This information is vital in the call setup process. Whenever an MSC detects a new MS in its network, in addition to creating a new record in the VLR, it also updates the HLR of the mobile subscriber, apprising it of the new location of that MS.

WCDMA   Wideband Code Division Multiple Access (WCDMA) is a type of 3G cellular network. WCDMA is the higher speed transmission protocol used in the Japanese FOMA system and in the UMTS system, a third generation follow-on to the 2G GSM networks deployed worldwide. More technically, WCDMA is a wideband spread-spectrum mobile air interface that utilizes the direct sequence Code Division Multiple Access signalling method (or CDMA) to achieve higher speeds and support more users compared to the implementation of time division multiplexing (TDMA) used by 2G GSM networks.

WGSE   Working Group Spectrum Engineering of the ECC. This group has the function of ensuring that the usable frequency spectrum can be used with optimum efficiency and effectiveness by the various competing radio services. The major activities of WGSE involve the development of sharing criteria between radiocommunication services, systems or applications using the same frequency bands and the development of compatibility criteria between radiocommunication services using different frequency bands. Many aspects of the work of ETSI are relevant to the efficient use of spectrum and WGSE therefore plays a key role in liaising with the relevant committees in ETSI and reviewing the relevant parameters of radio equipment specifications under development within ETSI. Project Team SE7 of WGSE has responsibility for compatibility and sharing issues related to mobile systems (except IMT2000) operating below 3 GHz. SE& are specifically tasked with studying the compatibility between airborn GSM systems and ground-based mobile networks. http://www.ero.dk/