



Information & Communication Technologies Authority

Consultation Ref: ICTA/01/09

CONSULTATION PAPER ON MOBILE COMMUNICATION SERVICES ON AIRCRAFT (MCA SERVICES)

1 July 2009

Explanatory memorandum

Considering that:

- 1) the ICT Authority has as one of its functions, under section 18(p) of the Information and Communication Technologies Act 2001, to “*allocate frequencies and manage, review, and, where appropriate, reorganise the frequency spectrum*”;
- 2) the ICT Authority has as one of its objects, under section 16(g) of the Information and Communication Technologies Act 2001, to “*further the advancement of technology, research and development relating to information and communication technologies through modern and effective infrastructure taking into account the convergence of information technology, media, telecommunications, and consumer electronics*”;
- 3) the ICT Authority has received representations from two companies requesting it to give consideration to the use GSM phones onboard both Mauritian aircrafts and foreign aircrafts engaged in innocent passage in the airspace of Mauritius. Both representations express the views that there is an increasing interest from users for such services.

The Information and Communication Technologies Authority resolves to:

- 1) make available for public consultation the Consultation Document Ref ICTA/01/2009;
- 2) invite views, contributions, and comments on the Consultation Document.

Mr. T. Dwarka
Chairman

Dr. M. K. Oolun
Executive Director

GUIDELINES ON RESPONDING TO THIS CONSULTATION

G.1 All comments are welcomed; however it would make the task of analyzing responses easier if comments were referenced to the relevant question numbers from this document. The questions are listed together at ANNEX A.

G.2 You are invited to send your written views and comments on the issues raised in this document to the **Executive Director, ICT Authority, 12th Floor The Celicourt, Celicourt Antelme Street, Port Louis**, or by email to icta@intnet.mu, at latest by 16h00 on 1 August 2009.

G.3 Should you be including confidential information as part of your responses, you are requested to clearly identify the said confidential materials and to place same in a separate annex to your response.

1.0 Background

- 1.1 Currently the use of mobile phones on board aircrafts is not permitted because of the potential interference they represent to essential on board systems. However research by operators and airlines suggests that there is consumer demand for such services, and there is now commercial interest in addressing the technical issues so as to enable a robust and reliable public mobile service on aircraft. ¹
- 1.2 The Terrestrial Flight Terrestrial System (TFTS), used in the nineties allowed passengers on board aircrafts to make phone calls using the handset attached to the seats. TFTS provided connection to public telecommunications networks though a radio link between the aircraft and ground stations. The passengers paid for their communication with their credit cards.
- 1.3 Because of the increasing interest for mobile communication many organizations have been looking at the possibility of having a GSM system on board the aircraft, allowing passengers to use their own mobile phones during certain states of flight. Technical as well as licensing issues need to be addressed so as to enable to provision of such services on board aircrafts.

2.0 System Description

- 2.1 The GSM on board system consists of a pico base station to which the mobile terminals connect through the standard GSM interface, with passengers' handsets roaming onto the onboard network when flying above 3,000 metres. The onboard cell is connected to terrestrial networks via a satellite link as shown in figure 1.

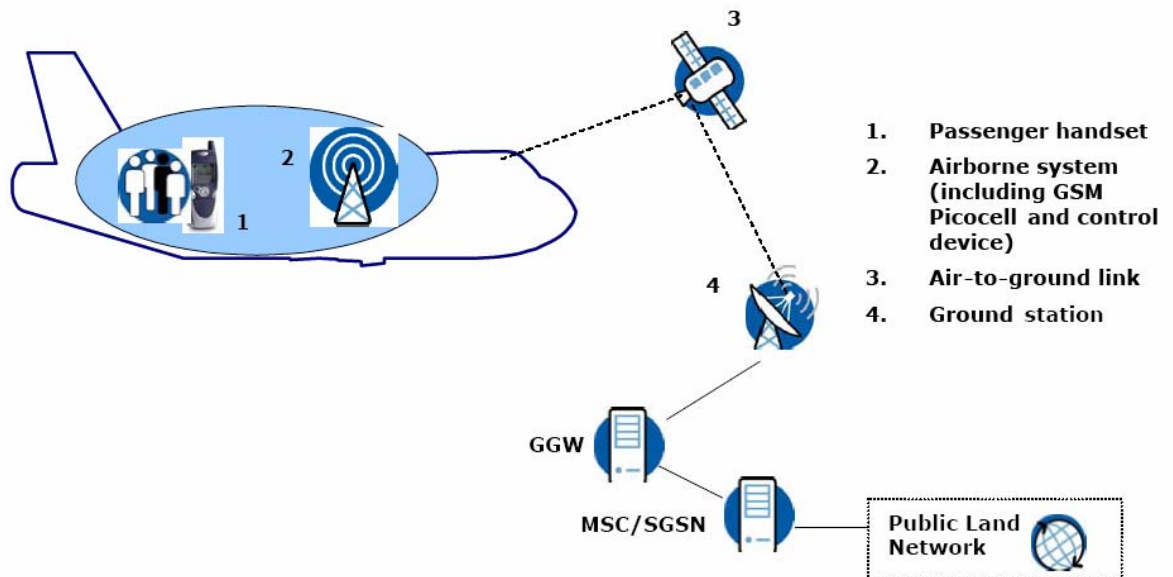


Figure 1 - Overview of the MCA System and associated components²

¹ Mobile Services on Aircraft Discussion paper on the introduction of mobile services on aircraft, Ofcom, 10 April 2006

² CEPT Report 016, 12 June 2007

2.2 The MCA System operates in the 1710 – 1785 MHz and 1805 – 1880 MHz (GSM 1800) frequency bands. GSM 1800 has been chosen mainly for technical reasons. The minimum transmit power for terminals being lower than those in the GSM 900 and the fact that path loss is higher at higher frequencies, makes it easier to avoid interference to ground-based systems. Also, most GSM terminals support the 1800 MHz band.

3.0 System Architecture

3.1 The MCA System consists of two segments, the airborne segment and the ground as shown in figure 2.

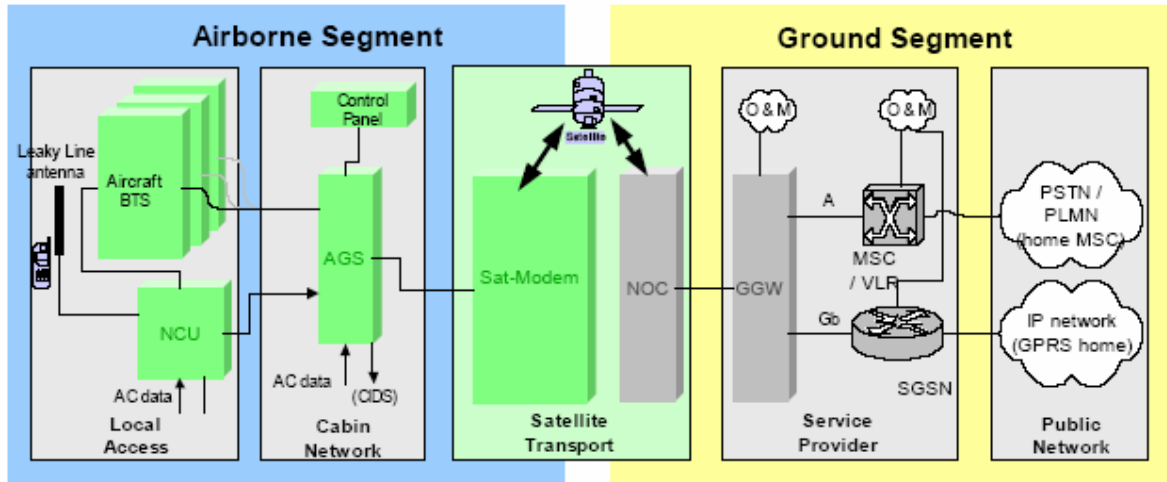


Figure 2 – Architecture of GSM on board System²

3.2 The airborne segment consists of the local access domain and the cabin network domain³:

- The local access domain contains the Base Transceiver Station (BTS), providing GSM access, and the Network Control Unit (NCU). The purpose of the NCU in conjunction with the GSM pico-cell is to prevent terminals from accessing terrestrial networks, and to control the radio frequency emissions of these terminals in the bands protected by the system;
- The cabin network contains an Aircraft GSM Server (AGS) that integrates the main modules onboard, i.e. the BTS, the NCU and the Satellite Modem.

3.3 The ground segment consists of a service provider domain and the public network domain³:

- The service provider domain hosts communication controller functions that act together with the AGS functions in the aircraft. For this purpose, a Ground Gateway (GGW) and GSM visited network components (VMSC2 and SGSN3) are required. Their main features are to perform the routing towards the aircraft and to interconnect the aircraft traffic with terrestrial backbone networks of the Public Network Domain;

³ ETSI White paper No. 4 – GSM Operation onboard aircraft.

- The public network domain provides the interconnection of the call, data or signalling communication to the relevant public network end points.

3.4 The key system components of the system are described in more detail below³.

- **Cabin Antenna** – The antenna is shared between the onboard BTS and the NCU. The typical implementation is a leaky feeder running along the cabin ceiling. Depending on the cabin and on the desired areas of coverage, multiple feeders or point source antennas could also be envisaged.

- **AGS** – Aircraft GSM Server – The AGS forwards the data streams between the onboard BTS and the ground. The AGS manages the satellite link communication, controls the BTS, monitors the NCU output power level and manages the Operations and Maintenance functions. The crew will be able to access the system through the control panel. The aircraft data contains aircraft information such as altitude, aircraft position and flight phase.

- **Satellite link** – The onboard satellite components consist of the satellite modem and the external aircraft satellite antenna. The satellite antenna receives and transmits the signals from/to the satellite system. The link will be provided by a satellite operator such as Inmarsat.

- **Network Control Unit (NCU)** - 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 following bands:

- GSM- and WCDMA/UMTS-900 downlink (921 – 960 MHz)
- GSM- and WCDMA/UMTS-1800 downlink (1805 – 1880 MHz)
- UMTS UTRA-FDD 2GHz downlink (2110 – 2170 MHz)
- CDMA-450/FLASH-OFDM downlink (460 – 470 MHz)

The unit does not transmit below 3000m. The power level of its emissions will depend on the frequency band and on the altitude (increased altitude means decreased signal strength received in the aircraft from terrestrial networks).

- **Onboard BTS** – GSM connectivity is provided by a standard GSM pico-BTS. The BTS will support GSM and GPRS services in the DCS1800 band (1710-1785 MHz and 1805-1880 MHz).

- **Mobile station** – The passengers' terminals will be standard GSM and must support the GSM1800 band. The BTS will command the terminals to only transmit at their minimum possible level, after initial registration.

4.0 Key Issues to be considered

Several issues, both technical and regulatory must be considered in determining whether mobile communication services on aircraft (MCA Services) may be allowed in the airspace of Mauritius.

4.1 Radio Spectrum Allocation and Interference with ground-based mobile networks

- 4.1.1 As noted previously, the MCA System operates in the 1710 – 1785 MHz and 1805 – 1880 MHz (GSM 1800) frequency band mainly for the technical reasons.
- 4.1.2 Results of a compatibility study of MCA Systems on to networks on the ground, presented in the CEPT Report 016 of 12 June 2007, showed that it is possible for mobiles to successfully communicate with mobile networks on ground. The compatibility study demonstrated that in order to ensure that MCA Systems do not cause any interference on to ground based mobile networks, certain conditions as listed below must be complied with:-
- The aircraft should be at a height of at least 3000m;
 - The transmit power of Aircraft Mobile Station (ac-MS) must be controlled by the MCA system to the minimum value (0 dBm nominal);
 - ac-MS/UE not connected to the MCA network must be prevented from attempting to connect to ground based mobile networks (in both the GSM 1800 band and other relevant frequency bands), as this would disrupt the operation of these networks and cause interference to them;
 - The aircraft fuselage will attenuate the total power entering or leaking from the cabin, but it might under some circumstances also act as a directive gain. If the cabin fuselage does not provide sufficient attenuation, an active device such as an NCU can be used to mask the signals from ground based mobile networks that enter the cabin. The power of the masking signal from the NCU must be sufficient to reliably perform this function, but must not be high enough to cause harmful interference to ground based mobile networks in any of the frequency bands in which the NCU operates.
- 4.1.3 The study also showed that in order to avoid harmful to ground-based networks e.i.r.p limits outside the aircraft should be as defined in Table 2 irrespective of aircraft attenuation due to factors such as the aircraft type/variant, the characteristics of the aircraft RF isolation, the propagation characteristics within the cabin, the installation of the MCA system.

Minimum operational height above ground (m)	Maximum permitted e.i.r.p. density produced by ac-MS, defined outside the aircraft (dBm/200 kHz)	Maximum permitted e.i.r.p. density produced by NCU/aircraft-BTS, defined outside the aircraft				
		Ac-BTS	NCU			
		1800 MHz	450 MHz	900 MHz*	1800 MHz*	2GHz
		(dBm/200 kHz)	(dBm/1250 kHz)	(dBm/200 kHz)	(dBm/200 kHz)	(dBm/3840 kHz)
3000	-3.3	-13.0	-17.0	-19.0	-13.0	1.0
4000	-1.1	-10.5	-14.5	-16.5	-10.5	3.5
5000	0.5	-8.5	-12.6	-14.5	-8.5	5.4
6000	1.8	-6.9	-11.0	-12.9	-6.9	7.0
7000	2.9	-5.6	-9.6	-11.6	-5.6	8.3
8000	3.8	-4.4	-8.5	-10.5	-4.4	9.5

Table 2: Maximum permitted e.i.r.p. density of MCA emitting entities, defined outside the aircraft⁴

4.1.4 The European Union Commission Decision of 07 April 2008 on harmonized conditions of spectrum use for the operation of mobile communication services on aircraft in the Community has already adopted the above limits as well as the use of GSM 1800 for MCA systems to be used in Europe and on boards European aircrafts.

A-1 Should MCA services be allowed on Mauritian Aircrafts? Please substantiate your reply;

A-2 Should foreign aircrafts engaged in innocent passage in the airspace of Mauritius be allowed to operate MCA systems? If so, under which conditions, if any?

4.2 Standardisation

4.2.1 The ETSI has developed and produced the harmonized European Standard EN 302 480 - Electromagnetic compatibility and Radio spectrum Matters (ERM); Harmonized EN for the GSM onboard aircraft system covering the essential requirements of Article 3.2 of the R&TTE Directive.

4.2.2 The standard document applies to a system comprising the following radio equipment types:

- 1) an Onboard GSM Base Transceiver System (OBTS) supporting the GSM 1800 functions with specific protocols for power constraints;
- 2) a Network Control Unit (NCU) preventing direct connection of the onboard mobile terminals with mobile networks on the ground by raising the noise floor in the cabin.⁵

⁴ CEPT Report 016, 12 June 2007

⁵ ETSI EN 302 480

A-3 Should the same technical / standardisation requirements and spectrum allocation as used in Europe be adopted since :-

- **Ground based GSM networks in Mauritius are compliant with European technical requirements and standards;**
- **The technical limits in Europe have been set after a thorough compatibility study with ground based GSM networks, similar to GSM networks in Mauritius. This will, to a large extent ensure that no interference will be caused to these networks.**

A-4 Should the Authority adopt the ETSI EN 302 480 standard for type-approving MCA system equipment to be installed on board Mauritian aircrafts?

4.3 Licensing Considerations

4.3.1 Any MCA system installed on board a Mauritian aircraft will need to be covered by a licence issued by the ICT Authority. It is proposed that the Aircraft Station licence as defined under the Information and Communication Technologies (Amendment of Schedule) Regulation 2003 be made to also cover the MCA system.

4.3.2 It is further proposed that a service provider offering MCA services on board of Mauritian aircraft be either duly authorized or licensed by the Authority should the said licence be defined under the licensing regime

A-5 Should licensing of MCA systems on board Mauritian aircrafts be included in their aircraft station licence?

A-6 Should a Service provider be a licensed Mauritian company in order to offer MCA Services on board Mauritian aircrafts?

4.4 Mutual Recognition of authorisations issued to foreign aircrafts by their respective administrations

4.4.1 For MCA systems operated on board foreign aircrafts engaged in innocent passage in the airspace of Mauritius, authorisations / licences issued to these aircrafts by their administrations would be mutually recognized. Such systems would normally be switched off when the aircrafts are stationed on ground in Mauritius.

4.4.2 Also installation of MCA systems and operation of mobile wireless terminal equipment onboard an aircraft is subject to airworthiness certification by the relevant Civil Aviation Authorities.

A-7 Should the issue of airworthiness of MCA systems and mutual recognition of airworthiness certificates issued by foreign civil aviation agencies rest with the Civil Aviation Department, as it normally is for other safety considerations?

4.5 Roaming Charges

The proposed MCA envisage customers roaming onto the service offered on-board, similar to their registering with an operator when visiting a foreign country and calls will be billed to the user like any roaming call. This would require that ground-based mobile networks enter into roaming agreements with MCA service providers.

4.6 Numbering

- 4.6.1 Since the process of passengers connecting to MCA systems on board aircrafts would be similar to their registering with an operator when visiting a foreign country, the passengers and people calling them will see no change to their normal handset number.
- 4.6.2 The onboard operator therefore will need to be allocated with a Mobile Country Code (MCC) and a mobile network code (MNC) number to allow for registration and call direction to take place. One MCC and MNC would be needed for each service provider rather than for each aircraft.
- 4.6.3 Due to the international nature of the service it would be difficult to establish national codes and it has been proposed, by Ofcom in its Consultation Document on the introduction of mobile services on aircraft, that international codes administered by the ITU should be allocated to MCA Service providers.

A-8 Which MCC and MNC should be assigned to the MCA systems installed on Mauritian Aircrafts?

4.7 On- Ground Testing of MCA Systems on board Mauritian aircrafts

For MCA systems installed on board Mauritian aircrafts, special coordination procedures with Public Land Mobile Network and civil aviation department operators need to be defined in case the systems need to be tested while the aircraft is station on ground in Mauritius.

A-9 Should the testing of MCA Systems on board Mauritian aircrafts be allowed when the aircraft is stationed on ground in Mauritius? If so, under which conditions?

ANNEX A: CONSULTATION QUESTION LIST

- A-1 Should MCA services be allowed on Mauritian Aircrafts? Please substantiate your reply;
- A-2 Should foreign aircrafts engaged in innocent passage in the airspace of Mauritius be allowed to operate MCA systems? If so, under which conditions, if any?
- A-3 Should the same technical / standardisation requirements and spectrum allocation as used in Europe be adopted since :-
- Ground based GSM networks in Mauritius are compliant with European technical requirements and standards;
 - The technical limits in Europe have been set after a thorough compatibility study with ground based GSM networks, similar to GSM networks in Mauritius. This will, to a large extent ensure that no interference will be caused to these networks.
- A-4 Should the Authority adopt the ETSI EN 302 480 standard for type-approving MCA system equipment to be installed on board Mauritian aircrafts?
- A-5 Should licensing of MCA systems on board Mauritian aircrafts be included in their aircraft station licence?
- A-6 Should a Service provider be a licensed Mauritian company in order to offer MCA Services on board Mauritian aircrafts?
- A-7 Should the issue of airworthiness of MCA systems and mutual recognition of airworthiness certificates issued by foreign civil aviation agencies rest with the Civil Aviation Department, as it normally is for other safety considerations?
- A-8 Which MCC and MNC should be assigned to the MCA systems installed on Mauritian Aircrafts?
- A-9 Should the testing of MCA Systems on board Mauritian aircrafts be allowed when the aircraft is stationed on ground in Mauritius? If so, under which conditions?