



**Vodafone's response to TRAI's Consultation Paper No.14/2017 dated 29th September 2017 on
Inflight Connectivity (IFC)**

Executive Summary

1. IFC/MCA services should be made available only during cruise phase of flight over Indian airspace as a pan Indian operation and not on ground to ensure that a) there is no infringement with the services being provided by licensed UASLs/UL (access)/CMSP/ISP operators in the airports and b) there is no interference with ground based networks.
2. IFC/MCA should be permitted to licensed UASLs/UL (access)/CMSP under scope of existing license; other entities should take an IFC authorization under Unified License.
3. IFC/MCA services should be limited to GSM services in the 1800 MHz band, UMTS in the 2100 MHz band and LTE in the 1800 MHz band, in line with EU regulations, as these bands have been technically evaluated and standards prescribed. Other bands may be included as and when they are globally added.
4. IFC/MCA service provider should be mandated to enter into agreements with all UASLs/UL (access)/CMSPs on non-discriminatory basis to ensure that the IFC/MCA services are ubiquitously accessible to mobile subscribers of all UASLs/UL (access)/CMSPs. There should be no exclusivity for provision of IFC/MCA services, whereby subscribers of only certain mobile operators are able to avail IFC/MCA services.
5. Basis IFC/MCA service provider's agreements with UASLs/UL(access)/CMSPs, mobile subscribers availing IFC/MCA service should be charged by their respective mobile operator, for ease of use of IFC/MCA services by consumers.
6. The use of IFC/MCA services by mobile subscribers of various UASLs/UL(access)/CMSPs during cruise phase of flight over Indian airspace should be considered as pan Indian operations since there cannot be a circle-wise service area concept for use of IFC/MCA services.

Issue-wise Response

Q.1 Which of the following IFC services be permitted in India? a. Internet services b. Mobile Communication services (MCA service) c. Both, Internet and MCA

A.1 As mentioned by the Authority in Para 2.13 of its consultation paper, the Wi-fi based on-board access technology combined with AMSS (aeronautical mobile satellite services) will only permit Internet services while MCA (mobile communication services on board aircraft) will permit voice, text, video and internet services by utilising the mobile cellular systems of the home terrestrial PLMN (mobile) networks and have wider reach and use. Also, MCA services are widely adopted in many countries as noted by the Authority in para 2.18 of its consultation paper and many foreign airlines operating in India are already enabling MCA services outside the Indian airspace in their international outbound/inbound flights through international



roaming arrangements between such MCA licensees with Indian mobile service providers, resulting in international roaming revenues to the Indian Government.

We note that the DoT reference to TRAI of 10th August 2017 has sought TRAI's recommendations for provision of In-flight connectivity for voice, internet and video services. Since MCA covers all services i.e. voice, text, internet and video services, we recommend that these should be permitted in India whereby the MCA licensee can get MCA equipment installed in the aircrafts with relevant authorizations from WPC and Indian Civil Aviation authorities, post which it can enter into arrangements with other mobile operators for provision of In-flight connectivity-MCA services. The advantage of MCA services is that users can use their existing mobile devices/dongles for the purpose of availing in-flight connectivity services and the user experience in terms of billing, ease of use is simple and familiar to users. It is also cost-effective, simple and manageable for the airlines and MCA licensees while enabling the in-flight connectivity services to users from the comfort of their seats.

We note that the DoT reference to TRAI of 10th August 2017 mentions two annexures, viz. note that was submitted to the Committee of Secretaries (COS) for allowing In-Flight Connectivity on 9th January 2017 and the note was attached as Annex-A to the reference from DoT to TRAI. The letter further states that a meeting of Committee of Secretaries (COS) was held on 30th January 2017 and the minutes of this COS meeting was attached as Annex-B to the reference from DoT to TRAI. These were not shared by the Authority while issuing its Consultation Paper. Our request for the same for turned down by the Authority on the grounds that the same were classified as secret and that the background and relevant details have been included by the Authority in the Consultation. We are proceeding with our response to the Consultation on this basis.

Q.2 Should the global standards of AES/ESIM, shown in Table 2.1, be mandated for the provision of AMSS in Indian airspace?

A.2 Yes, global standards should be adopted. We note that as per NFAP 2011, explanatory notes 5.504B and 5.504C already mention ITU R-R M.1643 (WRC-03). However, subsequent developments viz. ITU-R S.2357 or Resolution 156 (WRC-15) needs to be considered, which means that during NFAP review, these standards would need to be reviewed and accordingly decided for inclusion in NFAP.

Q.3 If MCA services are permitted in Indian airspace, what measures should be adopted to prevent an airborne mobile phone from interfering with terrestrial cellular mobile network? Should it be made technology and frequency neutral or restricted to GSM services in the 1800 MHz frequency band, UMTS in the 2100 MHz band and LTE in the 1800 MHz band in line with EU regulations?

7. A.3 Firstly, MCA services should be restricted to the three specific bands identified and mentioned above as the technical evaluations have been done and technical and operational conditions have been clearly laid out by the Regulators and Technical standards bodies/organizations. Other bands may be included as and when they are globally added. It is imperative that the frequency band used for MCA service in equipment installed in the aircraft should work with/be compatible with the mobile devices' and ground based mobile networks' frequencies and should not cause interference issues both with the aircraft radio equipment and with the ground based networks. Globally, MCA services were initially permitted only in 1800 MHz band where most regulators allowed the use of the GSM 1800 frequency band for MCA service on non-protection, non-interference and non-exclusive basis,



subject to certain conditions of compliance to ensure non-interference and operations only during cruise phase of flights (and not on ground). This too was permitted basis report from CEPT which defined the conditions under which MCA can be operated in 1800 MHz band without causing harmful interference to ground based mobile networks.

We note that in the EU, the use of mobile devices on aircraft for inflight connectivity was permitted in 2008, which allowed use of only GSM 1800 (2G) technology in the 1710-1785 and 1805-1880 MHz band on non-protection, non-interference and non-exclusive basis, subject to compliance to specific technical and operational conditions. Later on, in light of advancements in technology and increasing demand for mobile data services, the EU amended its 2008 MCA Decision in 2013 and extended the harmonisation of MCA services to cover 3G services in 1920-1980MHz p/w 2110-2170MHz (the "2100 MHz" frequency band) and 4G in 1710-1785MHz p/w 1805-1880 MHz (the "1800 MHz" frequency band), subject to compliance with various terms, provisions and limitations on technical and operational aspects. This decision of EU was basis CEPT report of 8th March 2013 which, after assessment of the technical compatibility between the operation of airborne UMTS and LTE/WiMAX technologies in frequency bands such as 2 GHz and 2.6 GHz, finally submitted that it would be possible to introduce, subject to relevant technical conditions, UMTS and LTE based MCA services in the 2.1 GHz and 1800 MHz bands respectively. Hence, we recommend that MCA services should be restricted to 1800 MHz frequency band, UMTS in the 2100 MHz band and LTE in the 1800 MHz band in line with EU regulations, for which the technical evaluations have been done and technical and operational conditions have been clearly laid out by the Regulators and Technical standards bodies/organizations.

Secondly, in terms of the measures to be adopted for prevention of airborne mobile phone/MCA system from interfering with terrestrial cellular mobile network and any other terrestrial wireless networks, the rules and conditions specified by Regulators and Technical standards bodies globally should be referred to, for designing the appropriate rules and conditions for provision of MCA services in India. We reproduce some of these rules in [Annexure 1](#).

Q.4 Do you foresee any challenges, if the internet services be made available 'gate to gate' i.e. from the boarding gate of the departure airport until the disembarking gate at the arrival airport?

A.4 At the airports, cellular mobile internet services and Wifi services are already being provided by licensed UL/UASL/CMSP mobile service providers and ISPs respectively. Hence, there can be no case of 'gate to gate' services being provided by MCA license holder who will only be permitted to provide MCA service during cruise phase of flight, since the provision of gate-to-gate service will infringe on the rights of the PLMN/mobile network providers. We are not aware of any permissions accorded by any Regulator for gate-to-gate internet services.

Q.5 Whether the Unified Licensee having authorization for Access Service/Internet Service (Cat-A) be permitted to provide IFC services in Indian airspace in airlines registered in India?

A.5. As we have recommended in our response to Q.1 that MCA services should be permitted in Indian airspace, Unified licensee having authorization for Access Service having mobile spectrum or UASL/CMSP having mobile spectrum should be permitted to provide IFC services in airlines registered in India. These licensees will be able to establish arrangements with other telecom service providers for exchange of traffic.



However, it is possible that MCA systems are installed by aircraft owners/airlines carriers, in which case, the MCA licensee could either be the aircraft owner/airlines carriers or the MCA system owner. In such case, it will be necessary that the MCA licensee enter into arrangements with mobile service providers for the provision of MCA services.

Q.6 Whether a separate category of IFC Service Provider be created to permit IFC services in Indian airspace in airlines registered in India?

A.6 As we have recommended in our response to Q.5 that Unified licensee having authorization for Access Service having access spectrum or UASL/CMSP having access spectrum should be permitted to provide IFC services in airlines registered in India under scope of existing license/authorization that permits all types of access service. For any another entity interested in providing MCA, then a separate category of IFC Service provider will need to be created under Unified License which prescribes the eligibility and terms and conditions for provision of IFC services in Indian airspace in airlines registered in India.

Q.7 Whether an IFC service provider be permitted to provide IFC services, after entering into an agreement with Unified Licensee having appropriate authorization, in Indian airspace in airlines registered in India?

A.7 Yes, the IFC service provider will need to enter into an arrangement/agreement with Unified licensee/UASL/CMSP having access service permission, for the provision of MCA services in Indian airspace in airlines registered in India. It will be like roaming arrangement since the mobile subscriber will be of UASL/UL/CMSP.

Q.8 If response to Q.7 is YES, is there any need for separate permission to be taken by IFC service providers from DoT to offer IFC service in Indian airspace in Indian registered airlines? Should they be required to register with DoT? In such a scenario, what should be the broad requirements for the fulfillment of registration process?

A.8 Yes, a separate permission is required by way of an authorization under Unified License. MCA Existing licensee having authorization for Access Service having access spectrum or UASL/CMSP having access spectrum should be allowed to offer MCA under scope of existing license/authorization, whilst in case of other entities, they should be required to take a specific authorization for IFC under Unified License. MCA licensee should be required to be under the aegis of TEC and WPC for meeting the technical requirements as mentioned in response to Q 3 (incl. Annexure 1) and for resolving any interference issues with ground based cellular mobile networks.

It is reiterated that if a CMSP/UASL/UL mobile service access provider wants to provide the MCA service, the same should be permissible under existing license/authorization.

Broad requirements for taking an IFC authorization under Unified License can be :

- a. Company has to be registered in India.
- b. Company to apply and obtain permission for installation, operation and use of the MCA systems in aircraft.
- c. Company to enter into arrangements with Unified licensee/UASL/CMSP having mobile access service permission, for the provision of MCA services in Indian airspace in airlines registered in India.



- d. Company to liaise with aircraft owner/airlines carrier for obtaining permission from Civil Aviation authority to ensure compliance to civil aviation requirements for the provision of MCA services.
- e. For the connectivity from aircraft to ground, Company must arrangement/setup with India-based ground stations.
- f. Company must submit technology and operations MCA service proposal to ensure that the proposal is in line with telecom licensing, spectrum and regulatory framework

Q.9 If an IFC service provider be permitted to provide IFC services in agreement with Unified Licensee having appropriate authorization in airlines registered in India, which authorization holder can be permitted to tie up with an IFC service provider to offer IFC service in Indian airspace?

A.9. IFC service provider should be permitted and mandated to enter into non-discriminatory arrangements with all Unified Licensee/UASL/CMSP having mobile access service permission, for the provision of ubiquitous MCA services in Indian airspace in airlines registered in India.

Q.10 What other restrictions/regulations should be in place for the provision of IFC in the airlines registered in India.

A.10 Interference related restrictions/regulations, type approval of equipments deployed in the aircrafts, undertaking to operate only above 3000 metres from ground level, interception requirements, etc.

Q.11 What restrictions/regulations should be in place for the provision of IFC in the foreign airlines? Should the regulatory requirements be any different for an IFC service provider to offer IFC services in Indian airspace in airlines registered outside India vis-à-vis those if IFC services are provided in Indian registered airlines?

A.11 Based on the principle of reciprocity emanating from the Convention on International Civil Aviation, the request of foreign airlines can be considered. In such case the arrangements for lawful interception and monitoring will need to be seen – it will be desirable to have such arrangements managed from India to meet the security requirements.

Q.12 Do you agree that the permission for the provision of IFC services can be given by making rules under Section 4 of Indian Telegraph Act, 1885?

A.12 The provision for rules for establishment, maintenance, and working of telegraph equipment in aircrafts is also mentioned in Section 4 of the Indian Telegraph Act, 1885.

Under such Rules, permission for provision of IFC should be by way of a separate authorization under Unified License. The present licensing framework for establishment, maintenance, and working of telegraph is governed by the Indian Telegraph Act with licenses given under Section 4 of the same. This licensing regime may also be extended to provision of MCA.

Q.13 Which of the options discussed in Para 3.19 to 3.22 should be mandated to ensure control over the usage on IFC when the aircraft is in Indian airspace?



A.13 For IFC operations in domestic /foreign flights (Indian registered aircrafts), either Indian Satellite System or foreign satellite leased through DOS with ground earth station located within India can be permitted.

For IFC operations in foreign flights (foreign registered aircrafts), it is difficult to comment since it may depend upon appropriate LEA arrangements, if any, between countries hosting the ground earth station and countries permitting IFC services using such ground earth stations.

Q.14 Should the IFC operations in the domestic flights be permitted only through INSAT system (including foreign satellite system leased through DOS)?

A.14 No comments

Q.15 Should the IFC operations in international flights (both Indian registered as well as foreign airlines) flying over multiple jurisdictions be permitted to use either INSAT System or foreign satellite system in Indian airspace?

A.15 Refer response to Q.13 above

Q.16 Please suggest how the IFC service providers be charged in the following cases? (a) Foreign registered airlines. (b) Indian registered airlines.

A.16 The licence fee charges should be uniform for both categories.

Q.17 Should satellite frequency spectrum bands be specified for the provisioning of the IFC services or spectrum neutral approach be adopted?

A.17 Internationally harmonized spectrum bands should be adopted.

Q.18 If stakeholders are of the view that IFC services be permitted only in specified satellite frequency bands, which frequency spectrum bands should be specified for this purpose?

A.18 No comments

**New Delhi 3
November 2017**



Annexure 1 – Rules and Conditions imposed w.r.t MCA services

1. Oman :

Technical Specifications of Mobile Communications Onboard Aircraft (MCA)

MCA shall fulfil the requirements of Decision Amended ECC/DEC(06)07 of the Electronic Communications Committee (ECC) amended on 13th March 2009, particularly the following:

- The absolute minimum height above ground for any transmission from the system in operation shall be 3,000 metres;
- Total EIRP defined outside the aircraft resulting from the base station (BTS) within the aircraft shall not exceed -13 dBm/channel at 3,000 m;
- EIRP defined outside the aircraft, resulting from the GSM mobile terminal transmitting at 0 dBm shall not exceed 1.8 dBm/channel at 3,000 m;
- 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;
- Corresponding MCA licenses issued by foreign authorities for aircraft registered outside of the Sultanate of Oman will be recognised in the Sultanate.
- The companies licensed shall comply with the following:
 - a. The equipment installed in aeroplanes must not cause harmful interferences to the terrestrial services, particularly the Public Mobile Telecommunications Services.
 - b. To meet requirements of national security by enabling the competent authorities to obtain all the information and data upon requesting traffic of calls and communications that take place within the Omani airspace when crossed by aeroplanes.
 - c. Not to use the equipment installed in aeroplanes except above the altitude of 3000 meters above the earth's surface, and to switch them off upon landing.

2. Bahrain :

- Earth station and MCA transmitters shall not be operated at an altitude less than 3000 metres above the territory of the Kingdom of Bahrain (including the territorial sea). For MCA equipment the 3000m height limit is sufficient to protect interference to terrestrial GSM-1800 networks. **It is the normal practice to switch off all electronic apparatus during take-off and landing.**
- The GSM Base station should meet the technical requirements as specified by TRA.
- For Earth station equipment established on-board an aircraft utilising uplinks in the frequency band 14.00 – 14.5 GHz the power flux density on the territory of the Kingdom of Bahrain shall not exceed the limits given in Annex 1, Part B of Recommendation ITU-R M.1643, "*Technical and operational requirements for aircraft earth stations of aeronautical mobile-satellite service including those using fixed-satellite service network transponders in the band 14-14.5 GHz (Earth-to-space)*". Similar limits will be developed for Earth station transmitters up-linking in the 6 GHz and 30 GHz bands. Until such limits have been agreed and implemented, emissions from on-board Earth stations shall not cause harmful interference to land based fixed point-to-point services in the Kingdom of Bahrain.
- Non Bahraini registered ships and aircraft requiring the use of an on-board Earth station and MCA systems whilst passing the territorial sea or airspace shall seek the agreement of DWLF&M



(Directorate of Wireless Licensing Frequencies and Monitoring, Kingdom of Bahrain) and shall comply with the above requirements.

3. Singapore

- The (SBO) Licensee shall ensure that the operation of MCA in Singapore airspace complies with the technical and operational requirements as prescribed in the Annex to the ECC Decision ECC/DEC(06)07 (Electronic Communications Committee (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).
- Unless specifically allowed otherwise by the Authority, the (SBO) Licensee shall only operate the MCA at a minimum height of 3000 metres above ground in Singapore airspace. The (SBO) Licensee shall obtain separate approval from the Authority before carrying out any installation and testing of MCA on the ground in Singapore. The (SBO) Licensee shall obtain all necessary approvals from the relevant authorities in Singapore for the operation of MCA within Singapore airspace.

4. Saudi Arabia

Obligations of MCA operator:

1. Shall use the frequencies allocated for this service by the Communications and Information Technology Commission, namely:
 - a. Uplink Center Freq. 1710-1785 MHz
 - b. Downlink Center Freq. 1805-1880 MHz
 - c. as an unprotected secondary usage, provided, however, that it shall not interfere with or affect basic services operating in this spectrum.
2. This service shall neither be provided at less than 10,000 (ten thousand) feet in height nor while aircrafts are parking within Saudi Arabian airports.
3. Equipment used in this service shall be set at low transmission power, so as not to affect the ground mobile networks/ equipment.
4. CITC have the right, at any time, to suspend this service; if it is proven that the use of these frequencies interferes with the basic equipment and systems operating at the same frequency band.
5. The licensee shall not claim any protection against interference that his services may be exposed to because of other radio services or similar systems. At the same time, the licensee's equipment and systems shall not cause interference with the other uses or similar equipment.
6. The user of this technology shall cease using frequencies of this band when and where required by CITC without any CITC responsibility thereof.

5. Isle of Man, Channel islands etc.

The deployment and use of both the BTS and NCU on an aircraft is subject to wireless telegraphy regulation [i.e. The Wireless Telegraphy (Mobile Communication Services on Aircraft) (Exemption) Regulations 2017] and the issuance of a variation to the aircraft radio licence.

The regulation specifies the technical standards that must be met by a MCA system, including:



- the need to comply with European Telecommunications Standards Institute (ETSI) standards listed in the Regulation;
- spectrum limitations;
- minimum operating heights;
- power limits for the apparatus;
- maximum external radiated power limits;
- fuselage shielding or NCU requirements.

The use of a MCA system shall be authorised via an Ofcom Notice of Variation (NoV) to the existing aircraft radio licence administered by the UK Civil Aviation Authority. Requests for a NoV made either as part of an initial license application or at a late date when it is intended to install a MCA system should be made to Aeronautical Radio Licensing, Safety and Airspace Regulation of the UK CAA (Civil Aviation Authority).

The use of apparatus on board aircraft registered in the UK, Isle of Man or any of the Channel Islands or aircraft flying over the relevant territorial waters will be exempt from licence if it meets the terms, provisions and limitations set out below:

- It must comply with the relevant GSM standard.
 - The apparatus must only operate in the 1800MHz or the 2100MHz band.
 - The apparatus must only be used, for mobile communication services on aircraft, when the aircraft is 3000 metres or more above the ground and when the following operational requirements are met:
 - i. the aircraft BTS while in operation limits the transmission power of all GSM apparatus to a nominal value of 0 dBm/200kHz at all stages of communication, including initial access;
 - ii. the aircraft BTS, while in operation, limits the transmission power of all LTE apparatus in the 1800MHz band to a nominal value of 5 dBm/5MHz at all stages of communications;
 - iii. the aircraft BTS, while in operation limits the transmission power of all UMTS apparatus in the 2100MHz band to a nominal value of -6 dBm/3.84MHz at all stages of communication and the maximum number of users does not exceed 20;
- Where the e.i.r.p outside the aircraft emanating from the apparatus transmitting in the frequency bands specified in the headings of Columns 2 to 4 of Table 1 of the Schedule, does not, at each of the heights above ground specified in Column 1 of that Table exceed the value specified in each of Columns 2, 3 or 4 of that Table.
- The apparatus must not cause or contribute to undue interference to any wireless telegraphy.
- The apparatus must connect directly to a relevant network in which –
 - a. the network control unit prevents the apparatus, when operating on one of the frequency bands listed in Column 1 of Table 2 of the Schedule, from registering on that band with the types of system on the ground which are listed adjacent to that band in Column 2 of that table;
 - b. the network control unit and the aircraft BTS operate such that their total e.i.r.p outside the aircraft does not, at each height above the ground specified in Column 1 of Table 4 of the Schedule and at each of the frequency bands specified in the heading of Columns 2 – 6 of that Table, exceed the value specified in Columns 2 to 6 of that Table;
 - c. the aircraft BTS complies with the GSM standards EN 301 502 and EN 302 480, the UMTS standard EN 301 908-1, EN 301 908-3 and EN 301 908-11, or the LTE standard EN 301 908-



14 and EN 301 908-15, published by ETSI (or equivalent specifications); and the network control unit complies with the standard EN 302 480 published by ETSI (or equivalent specification).

6. EU:

Technical parameters that the MCA systems must meet in order to be exempt from the need to hold a wireless telegraphy licence :

- Equipment will be exempt if its installation or use is not likely to:
 - involve undue interference with wireless telegraphy;
 - have an adverse effect on technical quality of service;
 - lead to inefficient use of the part of the electromagnetic spectrum available to wireless telegraphy;
 - endanger safety of life;
 - prejudice the promotion of social, regional or territorial cohesion; or
 - prejudice the promotion of cultural and linguistic diversity and media pluralism.

Frequency bands and systems allowed for MCA Services

Table 1

Type	Frequency	System
GSM 1800	1710-1 785 MHz (uplink) 1 805-1 880 MHz (downlink)	GSM complying with the GSM Standards as published by ETSI, in particular EN 301 502, EN 301 511 and EN 302 480, or equivalent specifications.
UMTS 2100 (FDD)	1920-1 980 MHz (uplink) 2110-2 170 MHz (downlink)	UMTS complying with the UMTS Standards as published by ETSI, in particular EN 301 908-1, EN 301 908-2, EN 301 908-3 and EN 301 908-11, or equivalent specifications.
LTE 1 800 (FDD)	1710-1 785 MHz (uplink) 1805-1 880 MHz (downlink)	LTE complying with LTE Standards, as published by ETSI, in particular EN 301 908-1, EN 301 908-13, EN 301 908-14, and EN 301 908-15, or equivalent specifications.

Prevention of connection of mobile terminals to ground networks

Mobile terminals receiving within the frequency bands listed in Table below must be prevented from attempting to register with UMTS mobile networks on the ground:

- by the inclusion, in the MCA system, of a Network Control Unit (NCU), which raises the noise floor inside the cabin in mobile receive bands, and/or
- by aircraft fuselage shielding to further attenuate the signal entering and leaving the fuselage.

Table 2

Frequency bands (MHz)	Systems on the ground
925-960 MHz	UMTS (and GSM, LTE)
2110-2170 MHz	UMTS (and LTE)

MCA operators may also decide to implement an NCU in the other frequency bands listed in Table 3 below.



Table 3

Frequency bands (MHz)	Systems on the ground
460-470 MHz	LTE ⁽¹⁾
791-821 MHz	LTE
1805-1880 MHz	LTE and GSM
2620-2690 MHz	LTE
2570-2620 MHz	LTE

⁽¹⁾ On a national level, administrations could use LTE technology for different applications such as BB-PPDR, BB-PMR or Mobile Networks.

Technical parameters

(a) Equivalent isotropic radiated power (e.i.r.p.), outside the aircraft, from the NCU/aircraft BTS/aircraft Node B

Table 4

The total e.i.r.p., outside the aircraft, from the NCU/aircraft BTS/aircraft Node B must not exceed:

Height above ground (m)	Maximum e.i.r.p. of the System outside the aircraft in dBm/channel		
	NCU	Aircraft BTS/Aircraft Node B	Aircraft BTS/Aircraft Node B and NCU
	Band: 900 MHz Channel B/W= 3,84 MHz	Band: 1800 MHz Channel B/W= 200 kHz	Band: 2100 MHz Channel B/W= 3,84 MHz
3000	- 6,2	- 13,0	1,0
4000	- 3,7	- 10,5	3,5
5000	- 1,7	- 8,5	5,4
6000	- 0,1	- 6,9	7,0
7000	1,2	- 5,6	8,3
8000	2,3	- 4,4	9,5

(b) Equivalent isotropic radiated power (e.i.r.p.), outside the aircraft, from the on-board terminal

Table 5

The e.i.r.p., outside the aircraft, from the mobile terminal must not exceed:

Height above ground (m)	Maximum e.i.r.p.,	Maximum e.i.r.p.,	Maximum e.i.r.p.,
	outside the aircraft, from the GSM mobile terminal in dBm/200 kHz GSM 1800 MHz	outside the aircraft, from the LTE mobile terminal in dBm/5 MHz LTE 1800 MHz	outside the aircraft, from the UMTS mobile terminal in dBm/3,84 MHz UMTS 2100 MHz
3000	- 3,3	1,7	3,1
4000	- 1,1	3,9	5,6
5000	0,5	5	7
6000	1,8	5	7
7000	2,9	5	7
8000	3,8	5	7



When MCA operators decide to implement an NCU in the frequency bands listed in Table 3, the maximum values indicated in Table below apply for the total e.i.r.p. outside the aircraft, from the NCU/aircraft BTS/aircraft Node B, in conjunction with the values mentioned in Table 4.

Table 6

Height above ground (m)	Maximum e.i.r.p. outside the aircraft, from the NCU/aircraft BTS/aircraft Node B			
	460-470 MHz dBm/1,25 MHz	791-821 MHz dBm/10 MHz	1805-1880 MHz dBm/200 kHz	2570-2690 MHz dBm/4,75 MHz
3000	- 17,0	- 0,87	- 13,0	1,9
4000	- 14,5	1,63	- 10,5	4,4
5000	- 12,6	3,57	- 8,5	6,3
6000	- 11,0	5,15	- 6,9	7,9
7000	- 9,6	6,49	- 5,6	9,3
8000	- 8,5	7,65	- 4,4	10,4

(c) Operational requirements

I. The minimum height above ground for any transmission from an MCA system in operation must be 3000 metres.

II. The aircraft BTS, while in operation, must limit the transmit power of all GSM mobile terminals transmitting in the 1800 MHz band to a nominal value of 0 dBm/200 kHz at all stages of communication, including initial access.

III. The aircraft Node B, while in operation, must limit the transmit power of all LTE mobile terminals transmitting in the 1800 MHz band to a nominal value of 5 dBm/5 MHz at all stages of communication.

IV. The aircraft Node B, while in operation, must limit the transmit power of all UMTS mobile terminals transmitting in the 2100 MHz band to a nominal value of -6 dBm/3,84 MHz at all stages of communication and the maximum number of users should not exceed 20.