Consultation Paper 14/2017

Telecom Regulatory Authority of India

Consultation Paper

on

In Flight Connectivity (IFC)

29th September 2017

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Jawahar Lal Nehru Marg,
New Delhi- 110002

Written Comments on the draft Consultation Paper are invited from the stakeholders by 27th October 2017 and counter-comments by 3rd November 2017. Comments and counter-comments will be posted on TRAI's website www.trai.gov.in. The comments and counter-comments may be sent, preferably in electronic form, to Shri Syed Tausif Abbas, Advisor (Networks, Spectrum and Licensing), TRAI on the email ID advmn@trai.gov.in. For any clarification/ information, he may be contacted at Telephone No. +91-11-23210481.

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CHAPTER- I: INTRODUCTION

1.1 Satellites are shaping a new age of in-flight connectivity (IFC). New satellite technologies are making it possible to provide ubiquitous coverage across the globe. It is possible for the passengers to have telecom services in the Aircraft travelling at 800 Km per hour and 10,000 meters in the sky due to satellite-enabled connectivity. As technologies to provide such access have developed, so too have consumers' expectations. They desire seamless connectivity regardless of their location - whether on land, in the air or on the sea. New advances in technology mean more flyers have access to telecom services than ever before.

1.2 It has been noticed that there has been increasing interest and demand for broadband connectivity (both voice and data) to passengers on board a flight. As per one estimate, the number of connected commercial aircraft is expected to grow from 5,300 in 2015 to 23,100 in 2025, accounting for 62% of the global fleet[1]. Another study predicts that the number of aircraft offering wireless connectivity will rise to 14,000 by 2022 (a 50 percent connectivity penetration in commercial aircrafts)[2]. This study also projects that approximately 5,000 of these aircrafts will offer both Wi-Fi and cellular options. In-flight connectivity has come a long way since its inception a decade ago. Since 2007, in-flight communication services have been introduced by airlines in Africa, Asia, Australia, Europe, the Middle East and South America.

[1] http://www.euroconsult-ec.com/research/prospects-for-IFEC-2016-brochure.pdf

[2] News Release, IHS, In-Flight Wireless Installations Take Off; Change in FAA Rules Gives Airlines Opportunity to Promote Services (Nov. 1, 2013), http://press.ihs.com/press-release/design-supply-chain-media/flight-wirelessinstallations-take-change-faa-rules-gives-ai.

Wi-Fi Service Onboard

1.3 Although in-flight Wi-Fi hasn't been available for very long, passenger surveys show growing demand for this service among travelers. International Air Transport Association's (IATA) 2014 global passenger survey reveals that 80% of the passengers would use Wi-Fi if offered on board a flight. More than half of the world's airline passengers say the availability and quality of in-flight Wi-Fi is increasingly a factor in their airline choice when booking a flight[3]. Routehappy's 2017 Wi-Fi Report[4] has found that more than 70 airlines now offer in-flight Wi-Fi in most of the regions of the globe, which is quite extraordinary considering less than a decade ago it wasn't even possible. Airline passengers worldwide now have a 39% chance of stepping aboard a Wi-Fi-equipped flight.

1.4 There has been a shift away from basic Wi-Fi systems to faster systems. The launch of High Throughput Satellites (HTS) in both Ku-band and Ka-band is expected to be a game-changer for the in-flight connectivity market. HTS systems will not only tremendously increase data speeds to the plane compared to regular satellite systems, but will also significantly lower costs, thereby further driving the adoption of IFC services. In-flight Wi-Fi continues to grow in both airline adoption and capability.

In-Flight Mobile Services

1.5 Regular fliers will be familiar with the usual request to "switch off all mobile phones when on board the aircraft". Till few year back, aircraft was among the few places where mobile phones cannot function. However, with the advancement in the technology, it is now possible to permit the use of mobile phones on board. Special equipment, called

[3] Gogo 2016 Global Airline Passenger Study
[4] https://www.routehappy.com/insights/wi-fi/2017

"Mobile Communication services on board Aircraft (MCA) system" that can be installed directly on an airplane is now available to prevent any interference, and has already been deployed successfully in many countries around the world without any adverse incidence. There are currently over 30 airlines already allowing mobile phone use on aircraft including: AirAsia, Air France, British Airways, Egypt Air, Emirates, Air New Zealand, Malaysia Airlines, Ryanair, Qatar Airways and Virgin Atlantic. Internationally, more than forty jurisdictions, including the European Union (EU), Asia, and Australia, have authorized the use of mobile communications services on aircraft[5]. These services have successfully been operated without causing harmful interference to terrestrial commercial wireless networks, as explained later in this document.

Reference Received from DoT

1.6 Given the rapidly expanding demand for In-Flight Communication, there is a proposal to introduce In-Flight connectivity (IFC) for voice, data and video services over Indian airspace for domestic, international and overflying flight in Indian airspace. Department of Telecommunications (DoT), through its reference dated 10th August 2017 **(Annexure 1.1)** has requested TRAI to furnish its recommendations on licensing terms and conditions for provision of In-Flight connectivity (IFC) for voice, data and Video services and associated issues such as entry fee, licence fee, spectrum related issues including usage charges & method of allocation and other conditions as per clause 1(1)(a) of TRAI Act 1997 as amended.

[5] Federal Communications Commission (FCC), FCC 13-157, Notice Of Proposed Rulemaking, Released: December 13, 2013

CHAPTER- II: AERONAUTICAL MOBILE SATELLITE SERVICE (AMSS)

I. NETWORK ARCHITECTURE OF AMSS

2.1 To provide IFC services, a mobile earth station is installed in the Aircraft to establish backhaul link with the ground. According to Article 1.35 of the International Telecommunication Union´s (ITU) Radio Regulations 2016, a mobile satellite service in which mobile earth stations are located on board aircraft is defined as aeronautical mobile-satellite service (AMSS). When combined with on-board access technology (Wi-Fi or mobile networks), AMSSs allow passengers to have telecom connectivity. AMSS networks are composed of three segments (Figure 1):

- a **"Space Segment (SS)**", which consists the satellite system that provides wide coverage;
- an **"Aircraft Earth Station (AES) segment**", which comprises of the equipment hosted on the aircraft like antenna, VSAT equipment, Wi-Fi APs etc;
- **"Ground Earth Segment (GES)"** consisting of the Hub/ Earth station for the network at ground which controls the remote mobile earth stations and also hosts the network operation center (NOC). NOC controls the aggregate emissions of the AMSS network in order to prevent interference to other systems.

Aircraft Earth Stations (AES)

2.2 The Radio Regulation 2016 in its Article 1.84 defines AES as; "A mobile earth station in the aeronautical mobile-satellite service located on board an aircraft." AES are installed on board aircraft. These are intended to provide non-safety related broad-band data communication services (e.g. internet and other type of data services) to users on board

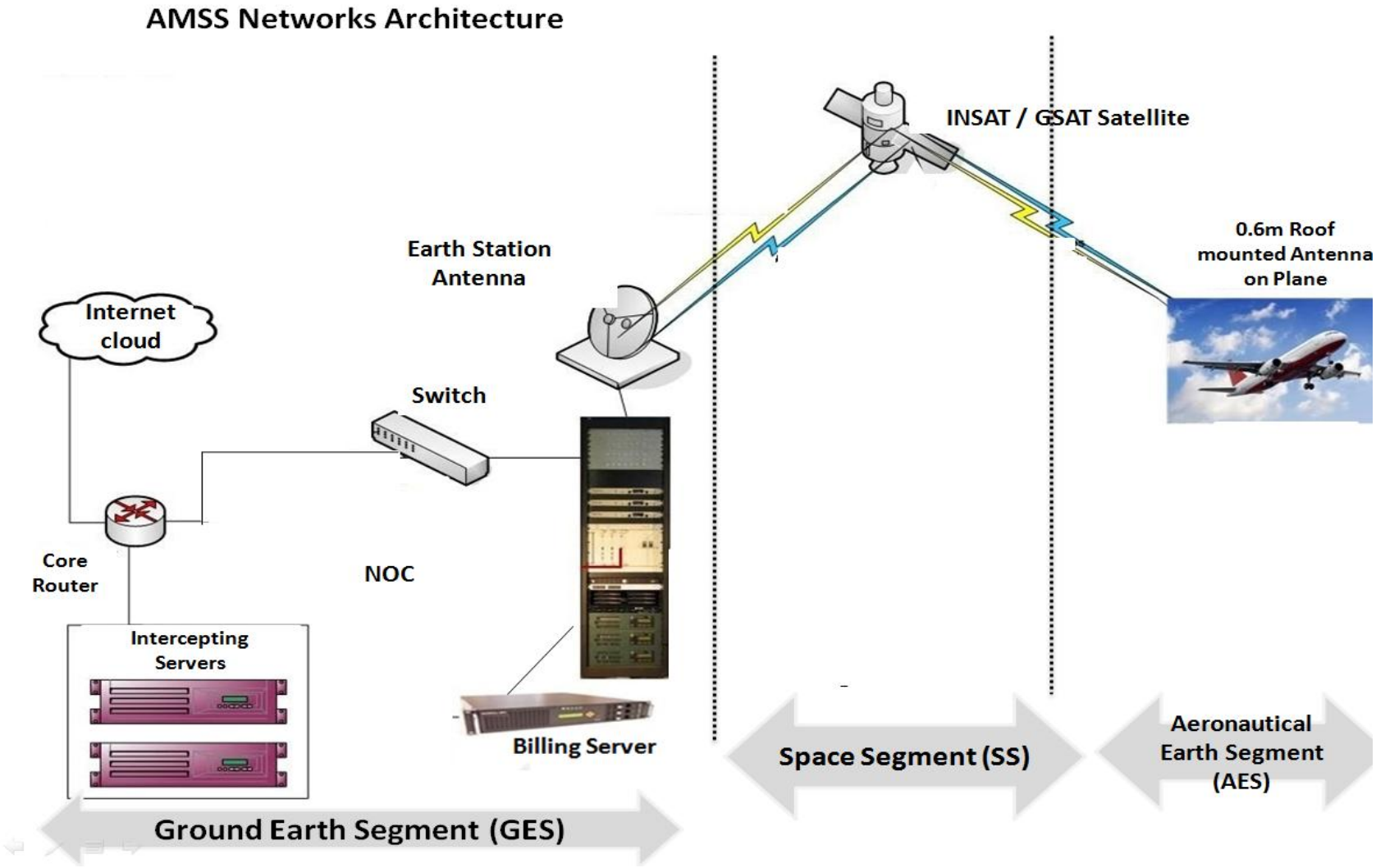

AMSS Networks Architecture
INSAT / GSAT Satellite
0.6m Roof mounted Antenna on Plane
Earth Station Antenna
Internet cloud
Switch
Core Router
NOC
Intercepting Servers
Billing Server
Space Segment (SS)
Aeronautical Earth Segment (AES)
Ground Earth Segment (GES)

Fig: 2.1

aircraft using their own data equipment (e.g. laptop computer or PDA) or one provided by the airline.

Frequency of operation:

2.3 The frequency of operation of AES is generally in the Ku bands[6]. They operate in the 14-14.5 GHz frequency band allocated to the mobile satellite service (MSS) on a secondary basis[7] (WRC-03), and in the fixed satellite service (FSS)[8] allocations at 10/11/12 GHz, where they operate on a non-protection basis.

2.4 World Radio-communications Conference in 2015 (WRC-15) brought a new term - 'Earth Station in Motion (ESIM)' - for Mobile earth station. It also gave them flexibility to use existing Fixed Satellite Service satellite allocations using the 19.7-20.2 GHz (space-to-Earth) and 29.5-30.0 GHz (Earth-to-space) Ka-band radiofrequency spectrum. ESIMs are designed to be used on aircraft, ships and land vehicles. They are small size terminals, with high-precision tracking capabilities, associated with state-of-the-art Ka-band satellites providing high-power multiple spot beam coverage, allowing transmission rates in the order of 10-50 Mbits/s. For the purpose of IFC, ESIM functionally serves the same purpose in Ka band as AES does in Ku band. Therefore, following are the frequency ranges that can be used for IFC in Ku and Ka bands in the space segment:

Frequency Ranges in Ku – Band

- 14.00 - 14.50 GHz (Earth-to-space);
- 10.70 - 11.70 GHz (space-to-Earth);

[6] ETSI EN 302 186 V1.1.1 (2004-01)

[7] Secondary Basis" means the order of a Radio-communication Service where it shall not cause harmful interference to stations of Primary Services and cannot claim protection from harmful interference from stations of Primary Services. This service appears as lower case in the National Spectrum Plan.

[8] Fixed Satellite Service (FSS)" means a radio-communication service between earth stations at given positions.

- 12.50 - 12.75 GHz (space-to-Earth).

Frequency Ranges in Ka – Band

- 19.7-20.2 GHz (space-to-Earth);
- 29.5-30.0 GHz (Earth-to-space).

Global standards and regulations

2.5 The table below provides a brief overview of the standards from ITU, ETSI and ECC pertaining to AES/ESIM.

Table 2.1

Global standards of AES/ESIM

Sl. No.	Organization	Standards
1.	ITU	• ITU-R M.1643 (06/2003) (For Ku band) • ITU-R S.2357 (06/2015) (For Ka band) • Resolution 156 (WRC-15) (For Ka band)
2.	ETSI	• EN 302 186 (For Ku band) • EN 303 978 (For Ka band)
3.	ECC	• ECC Decision (05)11 (For Ku band) • ECC Decision (13)01 (For Ka band)

Recommendation ITU-R M.1643 (06/2003)

2.6 Aircraft earth station (AES) operates on national and international airlines around the world; and that circulation of AES is usually a subject of a number of national and international rules and regulations including satisfactory conformance to a mutually agreed technical standard and operational requirements. Therefore, identification of technical and operational requirements for AES was felt necessary. Accordingly, Recommendation M.1643 was issued by ITU-R in 2003 which provides the technical and operational requirements for aircraft earth stations (AES) of aeronautical mobile-satellite service (AMSS). The AES operations comply with the provisions of Recommendation ITU-R

M.1643 for the protection of the fixed service (FS), FSS and radio astronomy service (RAS).

Resolution 156 (WRC-15)

2.7 As demand for broadband connectivity evolves, satellite service providers started targeting higher frequency bands. Recognizing that there is a need for global broadband mobile-satellite communications, WRC-15 allowed ESIMs to communicate with geostationary (GSO) FSS space stations using the 19.7-20.2 GHz (space-to-Earth) and 29.5-30.0 GHz (Earth-to-space) Ka-band radiofrequency spectrum. The operation of ESIMs communicating with the fixed-satellite service (FSS) is subject to **Resolution 156 (WRC-15)** which specifies technical and operational conditions for the use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz. WRC-15 also decided that the next Conference – WRC-19 – should consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5- 29.5 GHz (Earth-to-space) by ESIMs communicating with GSO FSS space stations, taking into account the results of studies carried out by the ITU Radio-communication Sector.

Recommendation ITU-R S.2357 (06/2015)

2.8 This Report provides technical and operational guidelines to administrations wishing to use Earth Stations on Mobile Platforms (ESOMPs) communicating with GSO space stations in the FSS frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz.

EN 302 186[9]

2.9 EN 302 186 specifies certain minimum technical performance requirements of Aircraft Earth Station (AES) equipment with both transmit and receive capabilities for provision of aeronautical mobile

[9] http://www.etsi.org/deliver/etsi_en/302100_302199/302186/02.01.01_60/en_302186v020101p.pdf

satellite service, in the 14.00 GHz to 14.50 GHz (AES transmit), 10.70 GHz to 11.70 GHz (AES receive) and 12.50 GHz to 12.75 GHz (AES receive).

EN 303 978[10]

2.10 EN 303 978 applies to Earth Stations on Mobile Platforms (ESOMP)[11]. The ESOMP transmits within the frequency range from 27.50 GHz to 30.00 GHz, which is a band allocated to the Fixed Satellite Services (FSS) (Earth-to-space) among other services. However, operation of the ESOMP is intended to be restricted to the frequency range 29.50 GHz to 30.00 GHz in and near those countries that have allocated Fixed Service (FS) to the other frequency ranges. The ESOMP receives in one or more frequencies within the range from 17.30 GHz to 20.20 GHz (FSS).

ECC Decision (05)11 dated 24 June 2005

2.11 ECC Decision (05)11 dated 24 June 2005 designated the frequency band 14.0-14.5 GHz (Earth-to-space), 10.7-11.7 GHz and 12.5-12.75 GHz (space-to-Earth) for the use by AES and enable operation within CEPT countries of AES that have been authorised by their country of registration subject to certain conditions to be met by AES such as (i) AES is authorised by the relevant administration of the country in which the aircraft is registered; (ii) AES is in compliance with the relevant European Telecommunication Standards (EN 302 186[12]) (iii) It is compliant with Recommendation ITU-R M.1643 etc. This decision facilitated the harmonised operation of AES in the frequency bands

[10] http://standards.globalspec.com/std/1567789/etsi-en-303-978

[11] ESIMs were previously known as Earth Stations on Moving Platforms or ESOMPs.

[12] EN 302 186 specifies certain minimum technical performance requirements of Aircraft Earth Station (AES) equipment with both transmit and receive capabilities for provision of aeronautical mobile satellite service, in the frequency bands AES Transmit : 14,00 GHz to 14,50 GHz; AES receive : 10,70 GHz to 11,70 GHz or 12,50 GHz to 12,75 GHz.

14.0- 14.5 GHz (Earth-to-space), 10.7-11.7 GHz (space-to-Earth) and 12.5-12.75 GHz (space-to-Earth).

ECC Decision (13)01 dated 8th March 2013

2.12 In Europe, Studies have been carried out to identify technical and regulatory conditions required for the operation of ESOMPs in the 17.3-30.0 GHz range. Results of those studies are outlined in the ECC Report 184, and became the technical basis for the development of ECC Decision (13)01. The Decision specifies the conditions to allow the free circulation and use of ESOMPs operating within GSO satellite networks. It covers the maritime and aircraft earth stations on the territories of CEPT countries implementing that Decision).

II. MOBILE COMMUNICATION SERVICES ON BOARD AIRCRAFT (MCA)

2.13 As discussed above, the on-board access technology, when combined with AMSS, allows passengers to have telecom connectivity. The on-board access technology can be Wi-Fi to access Internet, e-mail, internal corporate networks on board aircraft. The access technology can be mobile network which will allow voice and text communications also. Earlier, mobile phone use on aircraft was prohibited because of concerns about potential interference to safety-critical aircraft systems and terrestrial wireless networks. 'Mobile Communication services on board Aircraft' (MCA) systems are used to minimize the potential for airborne wireless devices interfering with terrestrial networks.

System Description[13]

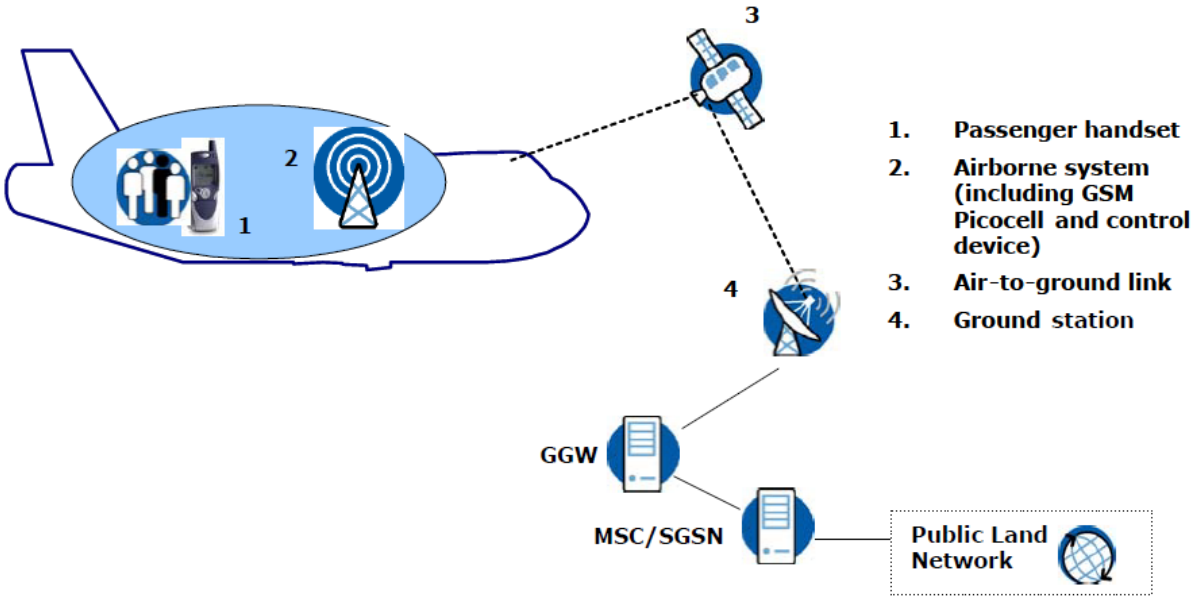
2.14 The most common MCA System in use internationally today consists of an airborne picocell – a very small low power mobile base station; and a network control unit (NCU) that stops onboard phones connecting with

[13] ETSI White paper No. 4 on GSM Operations Onboard aircraft dated January 2007

land-based networks. The third element of the MCA set-up is a satellite link connecting the aircraft to public phone networks on the ground. The cabin network also contains an Aircraft GSM Server (AGS) that integrates the main modules onboard, i.e. the BTS, the NCU and the Satellite Modem. The figure 2.2 shows the functional overview of the system.

2.15 A picocell is analogous to an in-building distributed antenna system (like those used in large buildings, malls, etc.) for use in the aircraft. The individual mobiles connect to onboard pico base station over any standard radio interface, say GSM[14]. It controls the power levels of all transmitting mobile broadband devices operating onboard aircraft, keeping them at or near their minimum output power.

Fig 2.2: Functional Overview of MCA



[14] Global System for Mobile Communications

Prevention of Interference to Terrestrial Mobile Network

2.16 Mobile devices typically connect to a wireless network through the nearest cell site that can serve the device. As the distance between the devices and cell sites increases, signals are attenuated by terrain and obstacles such as buildings, and blocked by the curvature of the earth. However, an uncontrolled wireless device on an airborne aircraft could potentially cause co-channel interference at multiple cell sites. This is because, even though the airborne wireless signal becomes weaker with increasing height above the ground, unlike the terrestrial case, it is not attenuated by terrain and obstacles, and it is not affected by the curvature of the earth. Thus, the signal from an airborne handset with an unobstructed line of sight may remain sufficiently strong as the device attempts to access multiple terrestrial sites, causing harmful interference or other undesirable effects to terrestrial systems. Therefore, unmanaged airborne mobile devices will attempt to connect and in some cases will succeed in temporarily connecting to a terrestrial system, causing harmful interference and disruption to the system it is connected to and to surrounding systems.

2.17 The NCU unit of MCA prevents mobile devices from connecting to the terrestrial network while on the aircraft. The NCU raises the noise floor within the aircraft cabin to prevent onboard mobile devices from communicating with the terrestrial network. To ensure minimal risk to terrestrial networks, the use of MCA systems is restricted to aircraft cruising at an altitude of 3000 meters or above.

International Adoption of mobile phone services on aircraft

2.18 A number of foreign communications administrations have issued regulations that have successfully allowed the non-interfering use of mobile communications services on airborne aircraft utilizing some

airborne access system. Among these nations are European Nations, Azerbaijan, Egypt, Jordan, Malaysia, Qatar, Russia, Saudi Arabia, Singapore, Thailand, and the United Arab Emirates. Details of EU are discussed below while details in respect of some of the countries are given in Annexure 2.1.

MCA services in the European Community

2.19 In April 2008, the European Commission (EC) introduced rules to facilitate the introduction of mobile phone services on aircraft across the European Union (EU). The following two measures were adopted by the Commission:

- European Commission Decision 2008/294/EC of 7th April 2008 on harmonised conditions of spectrum use for the operation of MCA services in the European Community. This Decision is referred to as the "MCA Decision".

- European Commission Recommendation 2008/295/EC of 7th April 2008 on authorisation of MCA services in the European Community". These recommendations are referred to as the "MCA Recommendation".

2.20 **MCA Decision, April 2008:** 'MCA Decision' set out the harmonised technical parameters for onboard equipment for in-flight mobile phone use throughout the European Union (EU). These technical specifications ensure that equipment does not generate interference and forms the basis for the certification of airworthiness of equipment for different airplane types by European Aviation Safety Agency (EASA). Through this Decision, EC mandated that EU member countries allocate the 1800 MHz band, which utilizes GSM technology, above 3,000 meters for MCA systems on a non-protected, non-interference basis according to specified technical conditions.

2.21 The EC issued its Decision following the EU's CEPT MCA Report 16. CEPT Report 16 defined the conditions under which MCA can be operated in the 1800 MHz band, with a minimum height of at least 3000 meters above ground level, without causing harmful interference to ground-based mobile networks. MCA Decision of 7th April 2008 is legally binding; ensuring the same type of equipment is used on all aircrafts.

2.22 The EC's Decision created the conditions for businesses which allow air passengers to call from on flights that often cross several borders. These harmonised technical conditions are essential:

- to ensure that the use of equipment on board – including the passengers' handsets – does not cause interference with the aircraft's equipment and systems.
- to ensure that mobile equipment does not interfere with terrestrial mobile communications networks but connects exclusively to the on-board base station linked to the ground via satellite;
- to offer common rules and standards so that on-board base stations are authorised to operate as a plane flies over different EU Member States.

2.23 **MCA recommendations, April 2008:** The MCA Recommendations called for a harmonised approach on licensing which would promote mutual recognition between national authorisations for mobile communications services on aircraft. The MCA Recommendation stated that (a) Member States shall authorise provision of MCA services in aircraft registered within their jurisdiction; (b) No additional authorisation is to be required for operation of MCA services in aircraft registered in other Member States with conditions set in the MCA Decision; and (c) MCA services in aircraft registered outside the Community should also be exempted from authorisation in the

Community, provided such services are in compliance with the conditions set in the MCA Decision and registered in accordance with the relevant ITU rules.

2.24 The MCA Recommendation addressed the coordination and mutual recognition of national authorisations granted for MCA services. Conditions for authorisations include compliance with the technical conditions referred to in the MCA Decision and the harmonised standard developed by ETSI[15].

2.25 Pursuant to the EU's MCA Decision and MCA Recommendations of 2008, the communications administrations of twenty-seven EU member states subsequently created licensing mechanisms for airborne mobile services in their individual jurisdictions.

Use of additional frequency ranges and technologies, such as UMTS and LTE, to be used in aircraft

2.26 In order to prepare for the use of the latest available technologies and frequencies for the provision of MCA services, the EC gave a mandate in October 2011 to the CEPT to assess technical compatibility between the operation of airborne UMTS systems and other feasible airborne technologies such as LTE or WiMax. Pursuant to that mandate, the CEPT provided its Report 48 on 8 March 2013. The CEPT Report 48 concluded that it would be possible to introduce, subject to the relevant technical conditions, UMTS and LTE technologies in the 2100 MHz and 1800 MHz bands respectively. CEPT defined the technical conditions for the use of UMTS in the 2100 MHz band and LTE technologies in the 1800 MHz band in the MCA, operating at height of at least 3000 meter

[15]The European Telecommunications Standards Institute (ETSI) developed a harmonised standard (ETSI EN 302 480) for equipment to deliver MCA and were notified in the Official Journal of the European Union in August 2008.

above ground. Consequently, on 14th November 2013, the EC issued a new decision modifying the existing EC Decision in order to allow for additional frequency ranges and technologies, such as UMTS and LTE, to be used in aircraft.[16]

[16] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013D0654

CHAPTER- III: FRAMEWORK FOR IFC IN INDIA

3.1 At present, the IFC services are not permitted over Indian airspace. In absence of permission for IFC, the services are switched off as soon as aircraft enters in the Indian airspace and announcement is made accordingly. Many Indian carriers have reportedly shown keen interest in IFC and advanced flight safety services. Many countries have already given rights to satellite service providers for IFC in aviation sector. Business travelers greatly value the use of IFC systems on board aircraft. The availability of a quality IFC system is becoming a determining factor when business travelers select an airline.

Scope of IFC services

3.2 As discussed earlier, the on-board access technology, when combined with AMSS, allows passengers to have IFC services. Depending upon the access technology, there are mainly two kinds of IFC services: (a) Internet services generally through Wi-Fi Onboard and (b) Mobile Communication services on board Aircraft (MCA). Internet services onboard are generally provided by all the IFC service providers. Lately, there is a demand for MCA services also.

Technical Requirements

3.3 AMSS operates on national and international airlines around the world. Therefore, it is essential that it is in conformance to global technical standard and operational requirements. The global standards of earth station installed on aircraft (AES/ESIM) have been discussed in Chapter-II and summarized in Table 2.1. Details about the technical standards adopted by European Union to ensure that MCA would not interfere with terrestrial networks have also been discussed in Chapter-II. It includes CEPT Report 16 dated 12th June 2007 which defined the

conditions under which GSM based MCA can be operated in the 1800 MHz band, with a minimum height of at least 3000 meters above ground level, without causing harmful interference to ground-based mobile networks. It also includes CEPT Report 48 dated 8th March 2013, which defined the technical conditions under which UMTS based MCA in the 2100 MHz band or LTE based MCA system in the 1800 MHz band can be operated at height of at least 3000 meter above ground.

3.4 The first ECC regulations adopted in 2006 allowed usage of GSM (2G) services in the 1800 MHz frequency band. MCA systems have been in use by some airlines in Europe since 2008. In 2013, the regulations were extended to allow usage of UMTS (3G) in the 2.1 GHz band, and LTE (4G) in the 1800 MHz band. Today, 2-3% of the 30,000 daily commercial flights in Europe are equipped with MCA[17].

3.5 To avoid causing harmful interference to ground-based mobile networks, GSM based MCA are operated with a minimum height of at least 3000 meters above ground level, without. However, in light of the growth of 'gate to gate connectivity' worldwide, as a consequence of the removal of altitude restrictions on the use of personal electronic devices (smart phones, laptop etc), stakeholders' view can be solicited whether internet services be made available from the boarding gate of the departure airport until the disembarking gate at the arrival airport.

Issues for Consultation

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

[17] ECC Newsletter October 2016; http://apps.ero.dk/eccnews/oct-2016/the_changing_face_of_travel.html

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

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?

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?

Authorization for the provisioning of IFC service

3.6 In-flight connectivity services require sophisticated airborne satcom equipment, as well as the ground segment infrastructure needed for constant satellite coverage along a route under any conditions. There are more than one entities involved in the provisioning of IFC services, as discussed below:

IFC Service Providers

3.7 An international flight typically operates over multiple countries and fliers should be able to subscribe to IFC services at a single point for the entire trip. There are entities that make it possible and provide IFC services in aircraft in partnership with satellite systems for the entire flight duration. They may also be required to tie-up with Telecom Service Providers to offer telecom services inside the aircraft cabin. These entities are referred to as IFC Service Providers. There are many IFC service providers. For instance, SITAOnAir is a company that provides mobile telephony, SMS and internet access to airline passengers.

SITAOnAir offers the satellite connectivity required for its onboard services using Inmarsat's satellite network. Gogo Inc. is another provider of in-flight broadband Internet service and other connectivity services for commercial and business aircraft using SES and Intelsat satellite systems. Airlines/ private companies/organizations owning aircraft generally tie up with any of the IFC service providers for the installation, operation and/or provisioning of IFC services to their passengers.

Satellite backhaul links providers

3.8 IFC service providers would require a satellite backhaul link to transmit data from the aircraft to terrestrial networks. There is more than one option for the satellite backhaul link. It may be provided by Indian Satellite systems or through foreign satellites leased through Department of Space (DOS). In such cases, the traffic will pass-through the earth station installed in Indian territory. If is not mandated to use Indian Satellite systems or foreign satellites leased through DoS, the satellite backhaul links may also pass-through foreign satellites having earth stations outside Indian territory.

3.9 If the satellite bandwidth is to be provided by Indian Satellite systems or through foreign satellites leased through Department of Space (DoS), then IFC service providers will be required to tie-up with Indian Unified Licensee having appropriate authorization to access the satellite bandwidth. Satellite bandwidth can be provided by a Unified Licensee having National Long Distance (NLD) or VSAT-CUG authorization within its scope of authorization.

Service Licence

3.10 To provide terrestrial mobile services or internet services, the service provider is required to take a Unified Licence with Access Service or

Internet Service authorization. Therefore, an IFC service provider may be required to take a Unified Licence. Alternatively, it may be explored whether IFC be permitted to enter into agreement with a Unified Licensee (UL) having authorization for Access Services for the provision of Internet as well as MCA service. Similarly, IFC service provider may be permitted to rope in a Unified Licensee with authorization for Internet Service (Category-A), if it wants to provide only Internet Service. IFC service provider may possibly be permitted to provide IFC services in association with Access Service licensees such as Cellular Mobile Telephone Service (CMTS) licensees, Unified Access Service (UAS) licensees, Unified Licensee (Access Service) and also ISP (Cat-A) licensees.

3.11 Further, it can be seen from Clause 2.1 (i) of Chapter-XIV of UL) that a VSAT licensee after obtaining ISP license may provide Internet service directly:

"……the VSAT licensee after obtaining ISP license may use same Hub station and VSAT (remote station) to provide Internet service directly to the subscribers, and in this case VSAT (remote station) may be used as a distribution point to provide Internet service to multiple independent subscribers. (Clause 2.1 (i) of Chapter-XIV of UL)

Therefore, an IFC service provider may enter into agreement with a VSAT-CUG licensee who has also acquired ISP authorization to provide IFC services.

3.12 IFC services may also be provided by an IFC service provider in agreement with a Unified Licensee having Global Mobile Personal Communication by Satellite (GMPCS) Service authorization. Since Authorisation for Unified License (All Services) covers all services which can be provided by any authorization under UL, IFC service provider can

tie up with a licensee having Unified License (with authorization for all Services) to provide IFC services.

3.13 The issue that needs consultation is what sort of authorization/permission would be required by an IFC service provider from DoT for providing the IFC services in Indian registered airlines. One view could be that if IFC service providers provide IFC services in agreement with any Unified Licensee having appropriate authorization as discussed above, there may not be any need for any separate permission by IFC service providers to offer IFC service in Indian airspace. Another option could be that IFC service providers may be asked to register with the DoT.

3.14 IFC services are required, within Indian airspace, not only in Indian airlines but in foreign airlines also. In such a scenario, whether IFC service providers be subjected to separate permission from DoT to offer IFC services in Indian airspace is another issue for consultation.

3.15 The concept of reciprocity (i.e. "the granting of a right or benefit by a State to a foreign airline when it has no international obligation to do so, on the condition that the same treatment will be accorded to its airline by the home State of that airline") is used in the aviation sector. This concept stems from the Convention on International Civil Aviation (The Chicago Convention[18]). When offering IFC services, Indian airlines will overfly other countries airspace and will want to have the ability to provide continuity of service. The authorisation for IFC provision on foreign aircraft while overflying is already provided on a global basis, with very few exceptions. Foreign airlines, while in Indian airspace, may like to have the same rights to provide IFC services to their passengers.

[18] Under the Chicago Convention, aircraft registered to a member country may use radio transmitter equipment over another country's territory provided that the transmitter is licensed by the country that registered the aircraft and that said use is in compliance with the regulations of the country over which the aircraft is flying.

Provisions in the Indian Telegraph Act

3.16 Section 4 of Indian Telegraph Act 1885, inter alia, states that:

"4. **Exclusive privilege in respect of telegraphs, and power to grant licenses.** — (1) Within [India], the Central Government shall have exclusive privilege of establishing, maintaining and working telegraphs:

Provided that the Central Government may grant a license, on such conditions and in consideration of such payments as it thinks fit, to any person to establish, maintain or work a telegraph within any part of [India]:

[*Provided* further that the Central Government may, by rules made under this Act and published in the Official Gazette, permit, subject to such restrictions and conditions as it thinks fit, the establishment, maintenance and working—

(a) of wireless telegraphs on ships within Indian territorial waters [and on aircraft within or above [India], or Indian territorial waters], and

(b) of telegraphs other than wireless telegraphs within any part of [India]."

3.17 As can be seen from above Section 4(1)(a), one option could be to give permission for the provision of IFC services by making rules under Section 4 of Indian Telegraph Act, 1885.

Spectrum Rights for the operation of MCA services

3.18 If the IFC service provider uses GSM based picocell for providing MCA services in agreement with a Unified licensee having Access Service authorization, the network inside the aircraft may be treated as extension of the Unified licensee into the sky i.e. the MCA will be a part of the GSM system of a home terrestrial GSM network operator and the IFC service provider shall not be accorded any spectrum right for the operation of MCA in GSM 1800 MHz frequency band.

Issues for Consultation

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?

Q.6 Whether a separate category of IFC Service Provider be created to permit 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?

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?

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?

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

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?

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?

Security Consideration

3.19 It should be ensured that the security concerns are fully addressed before permitting IFC. It should be possible to monitor the traffic to and from user terminal in Indian airspace if so desired by designated security agencies. To ensure Lawful Interception, one possibility can be to mandate the use of Indian Satellite System while travelling over Indian airspace. However, the issue of the availability of domestic satellite capacity has to be addressed. Moreover, foreign airlines may not like to switch to Indian Satellite System.

3.20 Another possibility could be to permit the use of either Indian Satellite System or foreign satellite leased through DOS. Under this option also, while over Indian airspace, airborne IFC equipments should get connected to Ground Earth Stations located in India. Thus, it will help in exercising control over the usage on IFC when the aircraft is in Indian airspace.

3.21 As a third option solution, traffic to and from user terminals in Indian airspace may be sent to a node owned and operated by an Indian entity to address the requirement of lawful interception directly or in mirror mode.

3.22 The relevant issue here is which of the above option should be permitted for the IFC services in Indian airspace? In this aspect, IFC operation in a domestic flight (flight that flies within Indian airspace only) may need to

be distinguished from that of an International flight (flight that flies in Indian airspace and beyond). One option could be that the IFC operations in the domestic flights could be permitted only through Indian satellite systems, while international airlines flying over multiple jurisdictions may be asked to use either Indian Satellite System or foreign satellite leased through DOS while it is in Indian airspace. Another option could be not to put any such restriction on the international airlines.

Issue for Consultation

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?

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

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?

Fee and Charges

3.23 How much fee a service provider be charged for giving it the permission to offer IFC service? An international flight typically operates over multiple countries and fliers, subscribing to IFC services, pay for the services at once and can make use of its subscription any time during the flight. Apportioning it for use over Indian airspace does not seem to be a workable proposition. Moreover, the aircrafts fly over India typically for around 3-4 hours and it may be safe to assume that the traffic

generated won't be significant. If the IFC service provider enters into appropriate commercial agreements with Unified Licensee for the provision of IFC services, the revenue earned by the Unified Licensee will get added to its Adjusted Gross Revenue (AGR) which is subjected to the Licence Fee and SUC. IFC service can be treated as an extension of the satellite service. Therefore, one option could be that the IFC service provider may be imposed a flat annual Licence Fee of some token amount, say Rs. 1, for its in-cabin operations, to be amended at a later stage, if need be, in public interest and for conduct of telegraph services.

Q.16 Please suggest how the IFC service providers be charged in the following cases?

(a) Foreign registered airlines.

(b) Indian registered airlines.

Satellite Bands of Operation:

3.24 The connectivity within aircraft for voice may be provided by installing a pico cell within the aircraft through which either GSM or LTE services can be provided. However, data and video connectivity through internet can be provided by satellite terminals installed in the aircraft using Wi-Fi, without pico cell. The predominantly used satellite bands are L-band (1-2 GHz), C-band (4-8 GHz), Ku- band (12-18 GHz) and Ka-band (27-40 GHz). C-band does not allow the use of small footprint antennas and hence not suitable for IFC. Service providers mostly use Ku and Ka band. As discussed in Para 2.4, following are the frequency Ranges in Ku and Ka band.

- 14.00 - 14.50 GHz (Earth-to-space);
- 10.70 - 11.70 GHz (space-to-Earth);
- 12.50 - 12.75 GHz (space-to-Earth).

} Ku Band

- 19.7-20.2 GHz (space-to-Earth);
- 29.5-30.0 GHz (Earth-to-space).

} Ka Band

3.25 As far as permitting satellite connectivity is concerned, there are two options. It may be permitted in specific bands. Alternatively, it can be provided on spectrum neutral basis and operators should be let free to consider which bands are best suited for their needs in order to deliver connectivity services in the most efficient and productive manner.

Issue of Consultation

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

CHAPTER- IV: ISSUES FOR CONSULTATION

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

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

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?

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?

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?

Q.6 Whether a separate category of IFC Service Provider be created to permit 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?

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?

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?

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

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?

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?

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?

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

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?

Q.16 Please suggest how the IFC service providers be charged in the following cases?

(a) Foreign registered airlines.

(b) Indian registered airlines.

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

Annexure 1.1

(Without its Annexure)

F.No. 20-504/2016/AS-I
Department of Telecommunications
(Access Services-I)
20 Ashoka Road, Sanchar Bhawan, New Delhi
Dated the 10th August, 2017.

To

The Secretary,
Telecom Regulatory Authority of India,
Mahanagar Door Sanchar Bhawan,
Jawahar Lal Nehru Marg,
Old Minto Road,
New Delhi.

Subject: In-Flight connectivity (IFC) for Voice, Data and Video Services.

Sir,

It is proposed to introduce In-Flight connectivity (IFC) for Voice, Data and Video Services over Indian Air space for domestic, international & overflying flights in Indian Air space. A Note was submitted for consideration of Committee of Secretaries for allowing In-Flight Connectivity for Voice, Data and Video services on 9th January 2017 (Annexure-A). A meeting of Committee of Secretaries was held on 30th January 2017 for the same and the proposal was agreed in principle with the direction that draft Rules may be framed. The minutes of meeting of COS are annexed at Annexure-B.

Before framing the draft rules, TRAI is requested to furnish their recommendations on licensing terms and conditions for provision of In-Flight connectivity (IFC) for Voice, Data and Video Services and associated issues such as entry fee, license fee, Spectrum related issues including usage charges & method of allocation and other conditions, as per clause 11(1)(a) of TRAI Act 1997 as amended by TRAI amendment Act 2000.

This issues with the approval of Secretary, Department of Telecommunications .

Yours faithfully,

(R.K. Soni) 10/8/17
Dir (AS)
Tel: 23036284

Annexure 2.1

Adoption of MCA system: International Instances

UK

1. Following the publication of the European Commission's MCA Decision on 7 April 2008 on harmonised conditions of spectrum use for MCA and the MCA Recommendations on 7 April 2008 on authorisation of mobile communication services on aircraft in the European Community, Ofcom issued IUS Statement "*Mobile Communications on board Aircraft (MCA): Ofcom statement on authorising MCA services*" on 26 March 2008. In this Statement, OFCOM inter alia decided that (a) Radio equipment for MCA systems (the pico-cell base station and NCU) on UK aircraft will be licensed (rather than licence-exempt) under the Wireless Telegraphy Act 2006; (b) licences will be issued to UK aircraft operators on request, via a variation to their existing spectrum licences; (c) no additional fee will be payable; and (d) mutual recognition will be given to EU registered aircraft which adhere to the common EU technical and authorisation standards.

2. Further, through the Wireless Telegraphy (Mobile Communication Services on Aircraft) (Exemption) Regulations 2008, OFCOM exempted the use of mobile phones from the licensing requirement under the Wireless Telegraphy Act 2006, when connecting to a MCA service above 3000 meters. These Regulations also enact European Commission Decision 2008/294, which harmonised the technical parameters for on-board equipment for in-flight mobile phone use through the EU. The Regulations came into force on 1st October 2008. 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.

3. **OFCOM's Decision to make the Wireless Telegraphy (Mobile Communication Services on Aircraft) (Exemption) Regulations 2017**: This statement relates to Ofcom's decision to make new regulations by statutory instrument that would enable airline passengers to use mobile devices (with 2G, 3G and 4G technologies) on board aircraft, if certain standards and requirements are met, without the need for a new wireless telegraphy licence. These regulations implement a Decision by the European Commission dated 14th November 2013[19]. OFCOM also decided to vary aircraft radio wireless telegraphy licences through a Notice of Variation to the aircraft licence in order to ensure that operators comply with the new technical and operational requirements. The Regulations comes into force on 15 June 2017.

Singapore

4. The Info-communications Media Development Authority (IDA) has adopted a two-pronged licensing approach: (a) Facility Based Operators (FBOs) licences are given to operators intending to deploy any form of telecommunication network, systems and facilities to offer telecommunication switching and/or telecommunication services to other licensed telecommunication operators, business, and/or consumers. (b) Service Based Operators (SBOs) licences are operators which lease telecommunication network elements such as transmission capacity, switching services, ducts and fibre from any FBO licensed by IDA to provide telecommunication services to third parties or resell the telecommunication services of FBO.

[19] On 14th November 2013, the EC issued a new decision modifying the existing EC Decision in order to allow for additional frequency ranges and technologies, such as UMTS and LTE, to be used in aircraft.

5. The SBO licences issued by IDA fall under two categories: the **SBO (Individual) Licence** category, where individual licensing is required for the stipulated types of operations and services; and the **SBO (Class) Licence** category, where interested parties will only be required to register with the Authority before providing the stipulated types of services. Parties providing SBO operations and services will thus either be individually or classed licensed by the Authority, depending on the scope of the operations and nature of the services. All SBO (Individual) licences are valid for a period of five years and renewable every five-yearly.

6. Mobile Communications on Aircraft (MCA) service fall under the SBO (Individual) Licence category and it enables the Licensee to operate Mobile Communications on Aircraft ("MCA") on aircraft registered in Singapore or in another country.

7. IDA has defined MCA as a service which is provided by one or more pico cell Base Transceiver Station. The MCA is a part of the GSM system of a home terrestrial GSM network operator. All GSM-related functions such as authentication, call-routing, data retention, subscription information, etc. are controlled by the GSM network operator. The operation of MCA effectively extends the service coverage of the GSM network into the sky. Following are the other provisions of MCA as prescribed by IDA:

   - **Registration of Subscribers:** The Licensee shall not operate the MCA as a separate network from all other GSM networks. The Licensee shall not register users of the MCA as subscribers to a separate network. The Licensee shall make arrangements with a GSM network operator under a roaming agreement to collect the service fees for the use of MCA. The service fees shall be charged through the user's mobile phone account with the GSM network operator.

- The 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)0720 and shall only operate the MCA at a minimum height of 3000 meters above ground in Singapore airspace.
- The Licensee shall obtain separate approval from the Authority before carrying out any installation and testing of MCA on the ground in Singapore.
- The Licensee shall obtain all necessary approvals from the relevant authorities in Singapore for the operation of MCA within Singapore airspace.
- The Licensee shall not be accorded any Spectrum Right for the operation of MCA in GSM 1800 MHz frequency band.
- The operation of MCA in the GSM 1800 MHz frequency band shall be on a non-protection, non-interference and non-exclusive basis.

[20] 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).