Communications Regulatory Authority
State of Qatar

هيئة تنظيم الاتصالات
دولة قطر

Review of Class License for the Provision of Public Telecommunication Services On-board Aircraft

Consultation document

Deadline for responding to this consultation:
Sunday, December 10, 2017

CRARAC/2017/11/09
November 9, 2017

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1 Introduction and Background

1.1 Current License from 2014

1. The Class License for the Provision of Public Telecommunication Services On-board Aircraft dated 17 March 2014 ("***Current License***") authorizes Aircraft operators to provide public Telecommunications Services (internet access and GSM voice calls, SMS and mobile accessed via satellite roaming services) on a non-exclusive basis on-board Aircraft registered in Qatar but only when the Aircraft is flying at, at least, 3000 meters above sea level.

2. The Current License also authorizes Aircraft operators to install, establish and operate facilities required to provide public telecommunication services at least 3000 meters above sea level. These facilities must comply with all regulatory provisions relating to their installation and operation including, but not limited to, radio frequency licensing in accordance with the Telecommunications Law and civil aviation requirements arising from Law No. 15.

3. The Current License does not authorize the provision of Telecommunications Services outside of an Aircraft, in an Aircraft not registered in Qatar or when an Aircraft is flying lower than 3000 meters above sea level.

1.2 Developments since the introduction of the Current License

4. Prior to 2013 regulatory barriers in the United States limited the use of passenger Personal Electronic Devices ("***PEDs*" -** smartphones, tablets, e-readers and other electronic items) below 10,000 feet. Although there did not appear to be any documented evidence of risk to flight safety from the use of PEDs, for many years, these minimum altitude restrictions on Wi-Fi operations were associated with "Precautionary Principle" that required passengers to stow electronic devices during critical phases of flight (take off and initial climb/approach and landing) - these phases of flights being usually defined by the illumination of the seat belt signs – historically 10,000ft or 3,000m.

5. In October 2013 the United States (US) Department of Transportation's Federal Aviation Administration (FAA) announced that it had determined that airlines in the US can safely expand passenger use of PEDs during all phases of flight as they did not harmfully interfere with any of an aircraft's communication systems.[1] This effectively removed the minimum altitude restriction for the provision of internet based services but maintained the restriction on GSM based services via satellite roaming.

[1] This was followed by the European Aviation Safety Agency announcing on 26 September 2014 (ref: 2014/029/R), a relaxation in the use of PEDs to allow them to be used in all phases of flight (ground, take-off, landing).

6. The FAA based its decision on input from a group of experts that included representatives from the airlines, aviation manufacturers, passengers, pilots, flight attendants, and the mobile technology industry[2].

7. Southwest Airlines in the US were the first airline to offer '*gate-to-gate connectivity'*[3] in November 2013 on 435 of its aircraft. For $8US passengers had the option of connecting to the aircraft's wireless Internet service from the time they boarded the aircraft to the time they left (including stopovers). The service was made possible through the use of a satellite-based system from Global Eagle Entertainment.

8. Since then, Airlines outside of the US (Icelandair[4], Qantas[5] for example) have also deployed '*gate-to-gate connectivity*'. The number is forecast to increase over the next few years as High-Throughput Satellite (HTS) systems emerge from suppliers such as Inmarsat, Intelsat and ViaSat that may increase the amount of satellite-enabled bandwidth available[6].

1.3 Review of the Current License

9. On June 2, 2017 Qatar Airways and Inmarsat Global Limited announced a project to install Inmarsat's Global Xpress (GX) system on their aircraft to allow high-speed Wi-Fi internet access for passengers at all altitudes[7]. For this system to be fully operational in Qatar would require a change of the Current License to remove the altitude restriction.

10. In light of this announcement and the growth of *'gate-to-gate connectivity'* worldwide, the Communications Regulatory Authority of the State of Qatar (CRA) wishes to review the Class License for the Provision of Public Telecommunications Services On-board Aircraft, dated 17 March 2014 and in particular to understand the views of Service Providers (SP), key stakeholders and other interested parties regarding the possible removal of the restriction limiting telecommunications services to above 3000 meters only.

11. In order to inform this consultation, in August 2017 the CRA sent a comprehensive request for information (RFI) to industry stakeholders[8] regarding the provision of public telecommunications services above and below 3000 meters.

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[2] FAA, Press Release – "*FAA to Allow Airlines to Expand Use of Personal Electronics*", October 31, 2013. Available from FAA website.

[3] The term "*gate-to-gate connectivity*" refers to the possibility to have internet services available from the boarding gate of the departure airport until the disembarking gate at the arrival airport.

[4] Icelandair Press Release – "*Icelandair and Global Eagle Entertainment, announce the introduction of gate-to-gate Wi-Fi connectivity on the airline's full fleet of aircraft,*" February 16, 2016. Available from Icelandair website.

[5] Qantas Press Release – "*Qantas Turns On Fast, Free, Gate-to-Gate In-flight Wi-Fi*", April 7, 2017. Available from Qantas website.

[6] The number of connected commercial aircraft is expected to grow from 5,300 in 2015 to 23,100 aircraft by 2025, accounting for 62 percent of the global fleet. Eurconsult "*Prospects for In-Flight Entertainment and Connectivity"* April 21, 2016.

[7] See https://markets.ft.com/data/announce/detail?dockey=1323-13246775-0P3MOO76RSRN3JM9768634NIF2&mhq5j=e1

[8] Including (not a comprehensive list) Inmarsat, OnAir, Gogo, International Telecommunications Union (ITU) Australian Communications and Media Authority (ACMA), Office of Communications (Ofcom), Qatar Airways etc..

12. The CRA is now seeking views as to whether any relaxation should apply only to the provision of on-board internet services below 3000 meters or should be extended to include GSM services also. However, with this in mind the CRA is aware that international technical standards for on-board GSM services require a minimum operating altitude of 3000 meters in order to prevent mobile devices from connecting directly to the terrestrial networks and to ensure compatibility between the on-board communications equipment and terrestrial wireless systems.

2 Instruction for responding to this Consultation

2.1 Consultation Procedures

13. In keeping with an open and transparent regulatory process, the CRA is consulting on the need to revise the Class License for the Provision of Public Telecommunication Services On-board Aircraft.

14. SPs and other interested parties are invited to provide their views and comments in response to all of the consultation questions and any other content in the consultation.

15. The CRA asks that, where possible, submissions be supported by relevant evidence.

16. Any submissions received in response to this Consultation Document (CD) will be carefully considered by the CRA. Nothing included in this CD is final or binding. However, the CRA is under no obligation to adopt or implement any comments or proposals submitted.

17. Comments should be submitted by email to raconsultation@cra.gov.qa. Please also copy in Ahmad Sultan (asultan@cra.gov.qa) and Stephen Nelson (snelson@cra.gov.qa).

18. The subject reference in the email should be stated as Consultation on "Review of Class License for the Provision of Public Telecommunication Services On-board Aircraft".

19. It is not necessary to provide a hard copy in addition to the soft copy sent by email.

20. The deadline for SPs to submit their comments is indicated on the cover page of this consultation**.**

2.2 Publication of comments

21. In the interests of transparency and accountability, the CRA intends to publish the submissions to this consultation on its website at www.cra.qa.

22. All submissions will be processed and treated as non-confidential unless confidential treatment has been requested.

23. In order to claim confidentiality of information in submissions stakeholders must provide a non-confidential version of such documents in which the information considered confidential is blacked out. This "blackened out" portion/s should be contained in square brackets. It must be clear where information has been deleted. To understand where redactions have been made, stakeholders must add indications such as "confidential" or "confidential information".

24. A comprehensive justification must be provided for each submission required to be treated as confidential. Furthermore, confidentiality cannot be claimed for the entire or

whole sections of the document as it is normally possible to protect confidential information with limited redactions.

25. While the CRA will endeavour to respect the wishes of respondents, in all instances the decision to publish responses will be at the discretion of the CRA.

26. By making submissions to the Authority in this Consultation, respondents will be deemed to have waived all copyright that may apply to intellectual property contained therein.

27. For more clarification concerning the consultation process, please contact Ahmad Sultan (asultan@cra.gov.qa) or Stephen Nelson (snelson@cra.gov.qa).

3 Legal Basis

3.1 Introduction

28. Law No. 15 of 2002 on Civil Aviation applies to civil aircraft registered in the State of Qatar. It states that, in the absence of relevant provisions in Law No. 15, other International Aviation Conventions to which Qatar is a signatory shall apply to civil aviation concerning the State of Qatar.

29. The Chicago Convention and the Tokyo Convention establish that cabin space of any commercial aircraft ("Aircraft") is the territory of the State in which the Aircraft is registered and, in addition, Article 37, paragraph 1, of Law No. 15 states that: 'The aircraft [registered in the State of Qatar] shall be considered to be a mobile asset in terms of the application of the enforcement Laws, Rules and Regulations of the State'.

30. It follows therefore that the provision of Telecommunications Services on board Aircraft registered in Qatar is subject to the Telecommunications Law of the State of Qatar and, further, that the Laws of Qatar shall apply even when the Aircraft is not located within the geographic boundaries of the State of Qatar.

31. The State of Qatar has empowered and authorized the CRA to regulate the Communications sector under the Emiri Decree No. (42) of 2014 Establishing the Communications Regulatory Authority (**Emiri Decree**), the Decree Law 34 of 2006 (**Telecommunications Law**), and the Executive By-Law of 2009 for the Telecommunications Law (**By-Law**).

32. The legal basis for the CRA to revise and re-issue a Class License is outlined in detail below.

3.2 The Emiri Decision

33. Under Article 15 of the Emiri Decision, the CRA is responsible to, amongst others,
    (a) Set the criteria, procedures and systems for the licenses, in addition to their terms and conditions, in a fair, objective and transparent manner, and publish the licenses' forms [models] and scope of the licensed activities on the Authority's website;
    (b) Set conditions and criteria for granting licenses and approvals in relation to the services of telecommunications, information technology, postal, and access to digital media, issue licenses and approvals in this regard and check compliance with the conditions stipulated in them.

3.3 The Telecommunication Law

34. CRA has mandated objectives and goals to achieve under the Telecommunications Law. Article 2 outlines the main objectives that apply for the purposes of this Order:
    (a) Enhancing the telecommunications sector's performance in the State of Qatar through encouraging competition and fostering use of telecommunications (article 2(2));

(b) Encouraging sustainable investment in the telecommunications sector (article 2(5));
(c) Establishing a fair regime that meets the requirements of the competitive market place through the implementation of interconnection between service providers and all procedures related thereto (article 2(9));
(d) Ensuring that the regulation of the telecommunications sector remains in line with international rules (article 2(12));
(e) Ensuring the orderly development and regulation of the telecommunications sector (article 2(13)).

35. The CRA has the legal basis to establish a Class License under Article (4) of the Telecommunications Law which allows the granting, amending, renewing, suspending and revoking [of] Class Licenses, Radio Spectrum Licenses and authorizations and determining the terms and procedures necessary for their issuance.

36. This is further enshrined under Article (9) of the Telecommunications Law which states that no person shall without a License engage in any of the following practices:
(a) provision of telecommunications services to the public in return for a direct or indirect fee, whether the services are provided to all the public or a segment thereof, including the resale of telecommunications services obtained from another person, even if only one person benefits from such a service;
(b) own or operate a telecommunications network used for the provision of telecommunications services to or for the public in return for a direct or indirect fee;
(c) own or operate any other telecommunications network.

3.4 **The By-Law**

37. Chapter 2 of the By-Law contains a number of Articles pertaining to the CRA's powers with respect to issuing a Class License. The relevant articles are Article (8), (9), (11), (12), (14) and (15). Of particular importance is Article (14) which states that the […….] General Secretariat may amend Class Licenses in one of the following cases :
(a) in accordance with the Law, this By-Law, rules, regulations or the applicable License;
(b) following changes to international treaties or any other applicable laws that require an amendment;
(c) where an amendment has been requested or agreed to by the Licensee; and
(d) the Licensee have committed repeated violations of the provisions of the Law, this By-Law, regulations, orders, decisions of the Board or the General Secretariat, or License terms.

4 Review of the Class License for the Provision of Public Telecommunications Services On-board Aircraft.

4.1 Overview

38. In 2003, the International Telecommunication Union (ITU) World Radiocommunication Conference (WRC), allocated Ku-band spectrum to allow the use of small satellite dishes called Aircraft Earth Stations on top of aircraft. This enabled traffic to be carried off board, routed via satellites to the PSTN and distributed terrestrially. Passengers when above certain altitude limits could, for premium charges use their hand held devices, lap tops and computers to make voice calls or to connect to in-flight broadband services.

39. More recently, in 2013, the United States Federal Aviation Authority (FAA) and the European Aviation Safety Administration (EASA) removed the restriction dependent on altitude for access to internet services but continued, due to potential interference issues, with the altitude restriction for GSM. This allowed passengers to use Personal Electronic Devices (PEDs), including laptops, tablets and mobile phones to connect to in-flight broadband services in "all phases of flight. This policy change followed testing and assessment against safety standards to establish that no risk of interference to communications systems resulted during an aircraft's taxi, take-off, climb, cruise, descent, approach or airport gate phase from the use of PEDs to access broadband services.

40. Following the US and European actions the International Civil Aviation Organisation (ICAO – Circular 340) and the International Air Transport Association (IATA) issued guidance that aircraft operators were responsible for proving that there was no flight safety risk and that PEDs did not cause interference to the navigation or communication systems of their aircraft before authorizing their use at all altitudes to access internet services.

41. Around the world national regulatory authorities (NRAs) have begun to allow "*gate-to-gate connectivity* in their jurisdictions, approving the use of Ku-band terminals while the aircraft is parked, taxiing, and in flight.

4.2 The Provision of in-flight Telecommunication Services above 3000 meters

42. The in-flight systems that permit passengers to use their own laptop computers, mobile phones and tablets to make phone calls, connect to the Internet and send messages while travelling on board aircraft operate through satellite roaming[9]. The systems were developed after the 2003 International Telecommunication Union (ITU) World Radiocommunication Conference (WRC) allocated Ku-band spectrum as well as

[9] There are also examples of inflight telecommunications services being accessed via air-to-ground connectivity (ATG). United State provider GoGo has built a network of 3G ground stations all across the US, and planes communicate with these as they fly overhead. ATG will not be discussed in this document

developing technical recommendations for small satellite dishes, called Aircraft Earth Stations (AES), in the Aeronautical Mobile Satellite Systems (AMSS) service. AES are installed on top of aircraft and are linked to Wi-Fi routers and cabling within the aircraft, enabling traffic to be carried off board and routed via satellites to the PSTN and distributed terrestrially. The form of public telecommunications services offered above 3000 meters in-flight on an Aircraft registered in the State of Qatar consist of:

42.1 Public mobile services (voice, mobile data and SMS) - mobile subscribers can avail these on-board services through satellite roaming agreements between their mobile provider and the aircraft service provider. For mobile subscribers in Qatar, outbound roaming rates (available on the mobile provider's website) apply to in-flight calls as per the Table 1 below[10]:

	Local Calls	**Calls back to Qatar**	**GCC**	**International Calls**	**Receiving calls**	**SMS**	**Data**
	QR/min	**QR/min**	**QR/min**	**QR/min**	**QR/min**	**QR/SMS**	**QR/MB**
Ooredoo Qatar -Satellite & In-flight Services	30.00	30.00	30.00	30.00	30.00	2.00	75
Vodafone Qatar -Satellite & In-flight Services	30.00	30.00	30.00	30.00	30.00	2.00	75

Table 1 - Outbound roaming rates for Vodafone Qatar and Ooredoo Qatar (Source: Service Provider's websites)

Public mobile services on board aircraft are mainly based on 2G technology (i.e. GSM1800). 3G based services (UMTS2100) are available as well, while 4G technology (i.e. LTE1800) are being developed. The technology associated with providing public mobile services on board aircraft (see Figure 1 below how on-board public mobile services (voice, data and SMS) works) is composed of the following equipment:

(a) The low-powered, pico-cell on-board base station (BTS) whose technology is based either on GSM1800 or LTE1800 or UMTS2100;

(b) The network control unit (NCU) which increases the noise floor within the aircraft cabin in the UMTS frequency bands and which prevents on-board phones connecting with land-based networks. and

(c) An Aircraft GSM Server (AGS) that integrates the main modules on-board, i.e. the BTS, the NCU and the Satellite Modem (connects the aircraft to the backhaul satellite).

42.2 The in-flight connectivity (IFC) service which is a Wi-Fi internet service involving 'hotspots' made available to any passenger with a compatible device (smartphone, laptop, tablet etc.). As Figure 2 below shows the service is typically provided using a network of equipment inside the aircraft linking a Wi-

[10] A welcome SMS is sent to the phone subscriber the moment their handset connects to the aircraft service provider. In the welcome SMS the rates for the services are provided.

Fi router and related equipment, with a satellite antenna installed atop an aircraft, which permits Internet traffic to be carried off-board aircraft to a satellite. The satellite links to a ground station in the network, from where traffic is routed to a Network Operations Center and then out through the Internet. The operating frequency band of the Wi-Fi internet service is 2.4 GHz and/ or 5.8 GHz but due to the aircraft attenuation and the low transmitted power, harmful interference is not experienced.

An airline must make their own decision on how they will implement Wi-Fi services[11]. Their choice will include determining the on-board connectivity, portal supplier and payment processing handling (i.e. merchant record).Wi-Fi tariffs may be set by each airline[12]. The airline may also choose to offer complimentary Wi-Fi service (especially in premium cabins). In the specific case of Qatar Airways, the Tariff is US$11.95 for 1hr no MB Cap, and US$21.95 for the full flight with no MB Cap. Tariffs are usually advertised within in-flight magazines, information cards and additionally on the landing page prior to logging on / subscribing. Payment methods can include Credit Card; Paypal; Apple Pay; or Vouchers.

Agreements may exist between the airline and internet provider that stipulate stringent Guaranteed Data Rates. However, there are no enforcement of quality of service (QoS) by National Regulators. Passengers may be provided with email/telephone contact details during their purchase (on screen display) and on their emailed receipt. These detail can be used as a point of contact for complaints related to the service. In some instances cabin crew trained in the basic functionality of the system may also be a point of contact for passenger enquiries. Finally, there may be a FAQ section / Help Desk facility/on-line chat on the portal web-page that will allow passengers to investigate known issues/ user errors.

[11] Inmarsat's 'Global Xpress' (GX) provides In-flight connectivity requirements to Qatar Airways. The GX service is made up of four Ka-band, high-speed broadband communications satellites, and offering downlink speeds of up to 50 Megabits per second and up to 5 Megabits per second uplink.

[12] Other models also exist:

- *Retail model*: The Service Provider defines the pricing and service packages, deals directly with ISPs & content providers, manage the bandwidth to the aircraft and directly charge passengers. The airline gets a percentage of the revenues.
- *Wholesale model*: The Service Provider act a wholesaler while the airline directly charge passengers and define how the service is provided. The trend is for airlines to want more branding control though such a model.
- *Sponsored model*: Passengers are provided with free flight sessions by the airline, which secure revenues through third-party sponsored content on-board.

1. Passenger use their mobile phones just as they do on the ground;
2. Pico-base stations in the aircrafts fuselage picks up the signal using the standard GSM radio interface;
3. The signal is processed by the on-board mobile server
4. The signal is transmitted via satellite to a ground earth station (this may be located outside of Qatar); and
5. The vendor (in this instance - SITAONAIR's) has ground mobile infrastructure that processes the signal and directs the passenger's traffic to its required destination

Figure 1 On-board public mobile services (voice, data and SMS) (Source: SITAONAIR response to the CRA's request for information, September 2017)

1. Passenger connects to the onboard 'Hotspot' via their mobile device such as laptop computers or Wi-Fi enabled smartphones;
2. Data request is processed by the onboard connectivity server;
3. Signal is transmitted via satellite to an earth station (this may be located outside Qatar);
4. Internet ground infrastructure processes passenger payments in real-time; and
5. Internet-based traffic managed by ground infrastructure located of the service provider (in this instance – SITAONAIR).

Figure 2 On-board public mobile services (voice, data and SMS) (Source: SITAONAIR response to the CRA's request for information, September 2017)

43. There are a number of different service providers involved in the process of providing in-flight telecommunications services to passengers:

43.1 Aircraft Operator – it is normally the aircraft operator who owns and operates the on-board equipment that provides access to IFC services. The requirement to have a license to operate the equipment depends on the country of registration of the airline. In the particular case of Qatar Airways its aircraft license includes the equipment and the operating frequencies related to in-flight connectivity. It is also the responsibility of the aircraft operator to ensure all equipment is tested and complies with the required technical standards.[13]

43.2 In-flight Connectivity Providers – Companies such as Panasonic, Gogo, Global Eagle (formerly Row 44), AeroMobile (a subsidiary of Panasonic) and OnAir own their own satellites or lease satellite capacity from satellite operators around the world such as Intelsat or Inmarsat etc.[14]. Satellite capacity is used for providing the connectivity link between the airplane and the ground, where the traffic is routed through a ground network to its final destination. The IFC provide may provide internet services only (Gogo), mobile voice telephony services only (AeroMobile), or both internet and mobile telephony services (Panasonic, OnAir).

43.3 ISP - In some cases the IFC provider acts as the ISP, providing passengers' access to the Internet. In certain rare circumstances other parties may perform ISP functions.

44. The business model work such that for public mobile services, the customer's mobile provider bills the customer at roaming rates. The IFC provider then bills the customer's mobile provider and shares a percentage of this revenue with the airline operator, the satellite network carrier and the telecommunications carrier who carries the terrestrial part of the call to its point of termination. In the particular case of Qatar Airways, AeroMobile has roaming agreements with ground mobile operators (such as Ooredoo and Vodafone). For Wi-Fi services the IFC provider provides/sells a Wi-Fi service directly to the passenger, using a web portal branded in its own name or alternatively the IFC service provider provides/sells a service on a "wholesale" basis to the airline or

[13] To be able to activate such services, the airlines operators need to obtain an airworthiness certification of the inflight communication system to ensure that it would have no adverse effect on the avionic system. Such demonstration is done via a radio-frequency test as known as "T-PED test" performed within the aircraft cabin. Such a test consists of a signal generator transmitting signal within the mobile and Wi-Fi band inside the aircraft cabin. The relevant aircraft systems are observed during all the test phase by the observers. The test is passed when there is no failure. The test is necessary due to the intentional electromagnetic emissions of inflight communication system and is required to be performed for the airworthiness certification of wireless services onboard aircraft. The procedure applied for testing must comply with the EUROCAE ED-130/RTCA DO-290 document "*Guidance for the use of portable electronic devices (PEDs) on board aircraft*".

[14] Commercial Ku-Band Geostationary satellites in the 14.0-14.5 GHz band (transmit) and 10.7-12.75 GHz band (receive) as these satellites carry a large quantity of transponders available for lease on a short-term or long-term basis. The key advantages of the Ku-Band (over, for example the L-Band) is the large number of satellite operators to choose from and the well-established regulatory regime allowing smooth operation of services across country borders.

other third party, which in turn provides it to the passenger, either as a paid service or free of charge.

45. In establishing the relevant technical standards, the ITU and standards bodies such as European Telecommunications Standards Institute (ETSI) and European Conference of Postal and Telecommunications Administrations (CEPT) have considered interference scenarios and developed technical and operational measures to ensure operation free from interference to terrestrial and satellite networks[15]. There are a large number of technical and regulatory standards that must be met before in-flight telecommunications services are permitted. Some of the more relevant are listed in Table 2 below:

Standard	Service	Description
• ETSI Standard 302 186 V1.1.1 (2004 01) • EASA Decision 2014/029/R (24 September 2014)	• Personal Electronic Devices (PEDs)	• Establishes no restrictions on altitude use of PEDs inside the aircraft. • Possible for passengers of European airlines to use their in transmitting mode during all phases of flight i.e. without the need to be in "airplane mode"
• IEEE 802.11	• Wireless Access Points (operating in the 2.4 and 5 GHz bands)	• Must transmit in the channels and at power levels as authorised in the country that the aircraft is registered as well as needing to meet the radio type approval conformity assessment requirements such as ETSI's EN 301.893, EN 300 328, EN 301 489-1 and EN 301 489-17
• ECC/DEC(05)/11 - as amended March 2015 (ECC Decision of 24th June 2005) • Recommendation ITU-R M.1643	• Aircraft Earth Stations (AES)	• On the free circulation and use of Aircraft Earth Stations (AES) in the frequency bands 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). It does not put any limitations on the height operation of AES
• ETSI Standard 302 489-12 V1.2.1 (2003-05)	• Spectrum	• Outlines electromagnetic capability and radio spectrum matters
• ETSI Standard EN 302 186 v2.1.1 (2016-15)	• Satellite Earth stations and Systems (SES);	• Harmonized EN for SES and AES operating in the 11/12/14 GHz frequency bands covering essential requirements under article 3.2 of the R&TTE Directive.
• ITU Resolution 156	• Earth Stations in Motion (ESIMs) - previously known as Earth Stations on Moving Platforms (ESOMPs)	• Gives International recognition by the ITU (at the World Radio Conference in 2015 (WRC-15) where the Conference approved new footnote RR. 5.527A and

[15] In addition, national civil aviation authorities hold responsibility for certifying the safety of operation of systems ("airworthiness") installed on board aircraft through a Type Certificate (TC) or Supplemental Type Certificate (STC) process. In this, systems are extensively tested for electromagnetic compatibility, among other things, to ensure safe operation of aircraft systems. IFC systems installed must have completed an STC process in order to be allowed to operate on aircraft in flight.

Standard	Service	Description
• ECC Decision (13)01 and ETSI EN 303 978		ITU Resolution 156) to a number of regulatory and technical terms and conditions for the safe operation of ESIMs based on ITU-R reports, such as S.2223 and S.2357 • Covers the harmonised use and free circulation of ESOMPs and sets out the technical requirements and limitations, which should be observed to ensure that ESOMPs do not cause interference to other radio services
• ECC Report 093	• GSM1800 service on-board aircraft (GSMOB)	• Considered the technical impact on terrestrial mobile networks of introducing a GSMOB operating at a height of at least 3000 m above ground level
• ECC report 187	• UMTS or LTE technologies operating at height of at least 3,000	• Considered the technical impact on ground-based systems of introducing a new Mobile Communication service on-board aircraft based on UMTS or LTE technologies operating at height of at least 3,000 meter above ground in the 1800 MHz (1710-1785 MHz for the uplink and 1805-1880 MHz for the downlink) as of LTE and in the 2100 MHz (1920-1980 MHz for uplink and 2110-2170 MHz for downlink) as of UMTS[16]

ETSI- European Telecommunications Standards Institute
EASA- European Aviation Safety Agency
IEEE - Institute of Electrical and Electronics Engineers
ECC – European Communications Committee (European Conference of Postal and Telecommunications Administrations (CEPT))
ITU- International Telecommunications Union

Table 2 - In-flight Telecommunications Technical and Regulatory Standards
Source: Various regulatory websites)

[16] "*Since the inception of the inflight mobile services, SITAONAIR has not received any reports of interference to ground-based networks resulting from MCA operations, and is not aware of any national regulatory authority having done so. Given that there are approximately 90,000+ commercial flights per day worldwide and that only 2-3% of those flights are currently equipped with MCA equipment, if uncontrolled user equipment on board aircraft does represent an interference risk to ground-based networks, it would exist extensively today and likely would occur in the vicinity of airports. We believe that any interference would be well publicised and documented. Given that no administration has raised interference from MCA, we believe that there is no interference from user equipment on board to ground-based networks*" SITAONAIR response to CRA Request for Information – September 2017

Question 1	Do you agree with the CRA's observations on the provision of inflight telecommunications services above 3000 meters? Please clarify your position if you do not agree.
Question 2	Is there important information the CRA has not taken into consideration when describing inflight telecommunications services above 3000 meters? If so please clarify your position and provide the information.
Question 3	Is there currently any important issues or debates regarding inflight telecommunications services above 3000 meters that should be brought to the attention of the CRA?

4.3 The Provision of In-flight Telecommunication Services below 3000 meters

46. In 2013, the United States Federal Aviation Authority (FAA)[17] and in 2014 the European Aviation Safety Administration (EASA)[18] developed policies that allowed airlines – after extensive testing and assessment against established safety standards to prove that there is no risk of interference to aircraft systems[19] – to permit passenger to use of their personal electronic devices for "gate to gate" service, meaning the aircraft's taxi, take-off, climb, cruise, descent, approach, and landing phases, as well as at the airport gate to gain access to in-flight Wi-Fi internet services.

47. Following the US and European actions, number of countries have permitted in-flight Wi-Fi internet services without an altitude limit (see Table 3 below). In Europe, the key guidance was contained in the amended CEPT ECC Decision, ECC/DEC(05)11 (see Table 2 above), which took account of the free circulation and use of Aircraft Earth Stations. Within Europe, key countries that have permitted ground service include the United Kingdom, Germany, Spain, Switzerland, Belgium and Austria. Further European countries are in the process of implementing the ECC Decision. Outside of Europe the key countries having implemented a policy permitting services in all phases of flight in the Americas include the United States, Canada, Brazil, Mexico, and Chile. In Asia, key

[17] See "FAA to Allow Airlines to Expand Use of Personal Electronics Devices", FAA Press Release, October 31 2013: https://www.faa.gov/news/press_releases/news_story.cfm?newsId=15254

[18] European Aviation Safety Agency (EASA) published decision 2014/029/R on 24 September 2014,which amended its previous decision (2014/015/R of 24 April 2014) on adopting acceptable means of compliance and guidance to Part-CAT (Commercial Air Transport) operation of Regulation (EU) No.965/2012.4 These amendments are summarised below:

- Annex IV of decision 2014/015/R was amended to allow use of PEDs during all phases of flight.
- EASA Rulemaking Task (RMT.0637), on the acceptable means of compliance and guidance which addressed a regulatory issue related to PEDs, was amended to allow such use dependent on meeting the technical condition scenarios listed in annex IV.

[19] According to the FAA, EASA, ICAO and IATA policies, aircraft operators are responsible for determining that PEDs / TPEDs will not cause interference to the navigation or communication systems of the aircraft, and for proving that there is no flight safety risk before authorizing use. Aircraft equipped with broadband systems for passenger use must be tested extensively through safety risk assessments, aviation standards, to ensure that they will not interfere with the aircraft's avionics and navigation systems. Once an airline verifies the tolerance of its fleet, it can allow passengers to use handheld, lightweight electronic devices at all altitudes and during all phases of flight including while the aircraft is on the ground. Based on their individual safety assessments, each airline may develop its own approach regarding PED use, but these are required to be within applicable CAA and ICAO requirements.

countries include Japan, Australia, New Zealand, and the Philippines. In Africa, key countries include South Africa and Kenya. The CRA understands that the provision of Wi-Fi internet services without an altitude limit is not permitted currently on-board Aircraft registered in other member States of the Gulf Cooperative Council (GCC – Sultanate of Oman, State of Kuwait, Kingdom of Saudi Arabia, United Arab Emirates and Kingdom of Bahrain). Table 3 below give a summary of the countries as at 31 December 2016 that have approved 'gate-to-gate connectivity' for their national carriers and/or at airports within their country.

Country	Permit	Authority	Legal instrument	Method of permit	Type of Permit	Date of permit
• Belgium	• Yes	• Belgian Institute for Postal services and Telecommunications (BIPT)	• ECC Decisions (05)11 • ECC Decisions (13)01	• Email Approval	• No Objection	• 18-Nov-16
• Chile	• Yes	• Sub-Secretariat for Telecommunications (Subtel)	• Modification in regulatory instrument	• Undersecretary of Telecommunications Approval	• Press Release	• 10-Mar-16
• Cyprus	• Yes	• O f f i c e o f Electronic Communications& Postal Regulations (OCECPR)	• ECC/DEC(05)11	• Full implementation of ECC related decision	• License Exemption	• 26-Oct-15
• Denmark	• Yes	• Danish Business Authority	• Radiofrequencies Act ECC/DEC(05)11	• Email Approval	• No Objection	• 18-May-15
• Germany	• Yes	• Federal Network Agency for Electricity, Gas, Telecommunications, Posts and Railway (BNetzA)	• ECC/DEC(05)11	• Full implementation of ECC related decision	• License Exemption	• 14-Jul-15
• Honduras	• Yes	• La Comisión Nacional de Telecomunicaciones (CONATEL)	• The Regulation of the Telecommunications Framework Law (RGLMT)	• Email Approval	• No Objection	• 01-Oct-16
• Ireland	• Yes	• Commission For Communications Regulation (COMREG) • Irish Aviation Authority (IAA)	• ECC/ DEC(05)11 • ECC/DEC(05)11	• Email Approval • Email Approval	• No Objection • No Objection	• 15-Mar-16 • 22-Mar-16
• Italy	• Yes	• I t a l i a n communications authority (AGCOM)	• ECC/DEC(05)11	• Full implementation of ECC related decision	• License Exemption	• 02-Nov-15
• Latvia	• Yes	• L a t v i a Telecommunications State Inspection (LTSI)	• ECC/DEC(05)11	• Full implementation of ECC related decision	• License Exemption	• 29-Mar-16
• Malta	• Yes	• Malta Communications Authority(MCA) • Civil Aviation Directorate	• ECC/DEC(05)11 • ECC/DEC(05)11	• Email Approval • Email Approval	• No Objection • No Objection	• 07-Nov-16 • 01-Dec-16
• Netherlands	• Yes	• Netherlands Radiocommunications Agency (NRA)	• ECC/DEC(05)11	• Email Approval	• No Objection	• 14-May-15
• Norway	• Yes	• N o r w e g i a n Communications Authority (Nkom)	• ECC Decisions (05)11 • ECC Decisions (13)01	• Email Approval	• No Objection	• 22-Nov-16
• Philippine	• Yes	• National Telecommunications Commission (NTC)	• AES Authorization	• Email Approval	• Regulator Confirmation	• 14-Oct-14

Country	Permit	Authority	Legal instrument	Method of permit	Type of Permit	Date of permit
• Slovak Republic	• Yes	• Regulatory Authority for Electronic Communications and Postal Services (Teleoff)	• ECC/DEC(05)11	• Full implementation of ECC related decision	• License Exemption	• 22-Aug-16
• Spain	• Yes	• Comision del Mercado de las Telecomunicaciones (CMT) • Ministry of Energy, Tourism and the Digital Agenda (MInETAD)	• ECC/DEC(05)11 • ECC/DEC(05)11	• Full implementation of ECC related decision • No Objection	• License Exemption • Email Approval	• 22-Oct-15 • 15-Dec-16
• Uk	• Yes	• Civil Aviation Authority Air Transport	• Regulation	• Email Approval	• No Objection	• 22-Mar-16
• USA	• Yes	• Federal Communications Commission (FCC) • Federal Aviation Authority (FAA)	• FCC InFO 13010 • FAA InFO13010SUP	• Implementation of FCC InFO 13010 • Implementation of FAA InFO13010SUP	• FCC permission • FAA permission	• 28-Oct-13 • 09-Jun-14

Table 3. International Jurisdictions that have approved 'gate-to-gate connectivity' December 2016
Source: Access Partnership. Available at www.accesspartnership.com

48. However, despite the allowance of on-board internet connectivity below 3000 meters (once additional tests to obtain the airworthiness certificate of the system has been completed), with respect to public mobile services, the same level of technical testing has not been undertaken to establish interference issues on terrestrial mobile networks below 3000 meters. Mobile devices located on the ground connect to a wireless network through the nearest base station. The signal is however, attenuated by terrain and obstacles such as buildings, and blocked by the curvature of the earth. On an airborne aircraft, unlike the terrestrial case, signals are not attenuated by terrain and obstacles, or affected by the curvature of the earth. Therefore, at lower altitudes, there is greater potential to cause co-channel interference at multiple terrestrial cell site from airborne handset with an unobstructed line of sight.

49. When deciding whether public mobile services should be permitted on an aircraft at an altitude of below 3000, most countries take guidance from ECC Decision (06)(07)[20], updated 30 June 2017 which states that:

"*on-board mobile communications terminals must be prevented from attempting to register with …… mobile networks on the ground. This could be ensured:*

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

……. This decision applies to operation of the System at a minimum height of 3000 m above ground" (ECC/DEC/(06)07 Page 6 available at: https://cept.org/)

As a consequence there are currently no countries in the GCC/MENA region that allow public mobile services to be offered on Aircraft at an altitude of below 3000 meters. This ban also extends to other regions of the world.

50. Based on the findings above the CRA is not currently minded to allow the introduction of public mobile services on aircraft below 3000 meters. The CRA will continue to monitor the situation for new developments.

51. In contrast, technically Wi-Fi internet services work on the same basis above and below 3000m, (see Figure 2 above) with the only difference being that the system remains enabled in all phases of flight when the service is offered below 3000 meters. Due to the low power level of the Wi-Fi equipment on the aircraft and basic design of aircraft structure acting as a partial Faraday cage, at an altitude of below 3000 meters, interference[21] with terrestrial networks and aircraft equipment is minimal and

[20] The harmonised use of airborne GSM and LTE systems in the frequency bands 1710-1785 MHz and 1805-1880 MHz, and airborne UMTS systems in the frequency bands 1920-1980 MHz and 2110-2170 MHz. Approved 1 Dec 2006, amended 18 Nov 2016, updated 30 June 2017

[21] Interference to other aircrafts can be categorized as below:

1. Interference to the Aircraft navigation systems.
2. Interference to Mobile Communication Systems - defined as an inter site to site interference and can be prohibited by:
   - Transmitting the signal with the minimum power value that will ensure that the signal is confined inside the targeted Aircraft. The value can be defined through coverage simulation and verified by field measurements. Or

passengers on-board the aircraft are not able to connect their devices to a Wi-Fi access point located outside the aircraft.

52. From a commercial point of view, gate-to-gate connectivity extends the period of time when the service is available to the airplane passengers. Operationally, Wi-Fi internet services also work on the same basis above and below 3000 meters in that the IFC provider provides/sells a Wi-Fi service directly to the passenger, using a web portal branded in its own name or alternatively the IFC service provider provides/sells a service on a "wholesale" basis to the airline or other third party, which in turn provides it to the passenger, either as a paid service or free of charge.

53. As a consequence of the finding above with respect to the provision of on-board internet services below 3000 meters the CRA is minded to allow this services on board aircraft registered in the State of Qatar. Annex II displays the updated Class License for the Provision of Public Telecommunication Services On-board Aircraft to reflect the CRA's decision to remove the altitude restriction on provision of on-board internet services (changes in red text).

54. In the State of Qatar, service providers (i.e. Panasonic Avionics) were at one stage required to hold a spectrum license to operate Aeronautical Mobile Satellite Systems (AMSS) while the aircraft was cruising above 3000m in Qatari Airspace. However, more recent CRA regulations has allowed on-board telecommunications services in aircraft to be covered under the airline's service license, and spectrum is covered under the aircraft's license. Radio communication and spectrum licenses are beyond the scope of this CD, however, the CRA does not intend to make any changes to the current conditions of these licenses.

55. It should be ensured that the security concerns are fully addressed before permitting on-board Wi-Fi services to be available at below 3000 meters. Designated security agencies should have the ability to monitor the traffic to and from a user's terminal while that user is in Qatari airspace if so desired. This may currently be the case for services above 3000 meters and it should be extended to services below 3000 meters.

Question 4	Do you agree with the CRA's conclusion to allow onboard internet services below 3000 meters on aircraft registered in the State of Qatar? If not please provide a detailed reason.
Question 5	Do you agree with the CRA's decision not to allow onboard public mobile services below 3000 meters on aircraft registered in the State of Qatar? If not please provide a detailed reason.
Question 6	Do you foresee any challenges, if 'gate to gate' internet services are made available on aircraft registered in the State of Qatar i.e. from the boarding gate of the departure airport until the disembarking gate at the arrival airport?

- Perform a frequency/physical layer identification plan to avoid any decoding collusion among different cell/sites.

Question 7	If ‘gate to gate’ internet services are made available on aircraft registered in the State of Qatar should any restrictions to the service apply?
Question 8	Do you think that allowing internet services below 3000 meters on-board aircrafts will have any negative effects on the terrestrial internet service market in Qatar?
Question 9	Are there any additional state security issues likely to arise as a result of ‘gate to gate’ internet services being made available on aircraft registered in the State of Qatar?
Question 10	Are there any other issues or concerns that should be brought to the attention of the CRA with regards to onboard connectivity services being made available below 3000 meters on aircraft registered in the State of Qatar?
Question 11	Do you have any comments on amendments made to the Class License for the Provision of Public Telecommunication Services On-board Aircraft as contained in Annex II of this document?

A full list of questions is contained in Annex I

5 Conclusion

56. There are currently a large number of airlines that allow on-board connectivity above 3000 meters for public mobile services and Wi-Fi internet services[22]. These include Air France, Air New Zealand, British Airways, Emirates, Qatar Airways Virgin Atlantic and many others. Coupled with this the jurisdictions, including Asia, Australia, the European Union and North America have all sanctioned on-board connectivity above 3000 meters. The State of Qatar issued a Class License for the Provision of Public Telecommunication Services On-board Aircraft in March 2014.

57. On-board connectivity above 3000 meters have successfully been operated without causing harmful interference to either aircraft operations or terrestrial commercial wireless networks for number of years now and there are a number of technical specifications and standards in place that dictate the usage and performance of on-board connectivity above 3000 meters. The CRA has no concerns with allowing the continuation of on-board connectivity above 3000 meters on aircraft registered in the State of Qatar.

58. Over recent years there has been a shift away from the provision of basic on-board connectivity towards faster systems. The introduction of High Throughput Satellites in both the Ku and Ka bands has resulted in increased data speeds at lower costs when compared to earlier generation satellite systems. With this has come the growth of '*gate-to-gate connectivity*' and expectations of future growth as number of connected commercial aircraft is expected to grow from 5,300 in 2015 to 23,100 aircraft by 2025.

59. Worldwide, the established regulatory and advisory frameworks for the provision of on-board internet services does not prevent the service being offered at all altitudes. Particularly:

    59.1 The state of registry of the aircraft is responsible for licenses and certifications for systems on board the aircraft;

    59.2 The provisions of key technical recommendations, principally ITU-R M.1643, places no restrictions on altitudes at which in-flight internet services may be safely used;

    59.3 Systems that allow in-flight internet services must be extensively tested according to applicable CAA standards and certified as airworthy by the aircraft's flag state for use in all phases of flight; and

    59.4 For Ku-band terminals, ETSI Standard 302 186 V1.1.1 (2004 01) establishes they can be operated on the ground at airports with no risk of interference to other systems and without the need for additional licensing

    ;

[22] Routehappy 2017 Wi-Fi Report (available at https://www.routehappy.com/insights/wi-fi/2017) state that 70+ airlines now offer in-flight Wi-Fi services. There is now a 39% chance of a passenger gaining access to Wi-Fi services on an aircraft. This is an 8% increase since 2016.

60. However, the same cannot be said for the provision of public mobile services on-board aircraft at below 3000 meters as adequate technical testing has not been undertaken to establish interference issues on terrestrial mobile networks below 3000 meters. As a consequence, there are currently no countries in the GCC/MENA region that allow public mobile services to be offered on Aircraft at an altitude of below 3000 meters. This ban also extends to other regions of the world.

61. Subject to comments received in this consultation process, the CRA is minded to:

61.1 Remove the altitude restriction that currently prevents the usage of internet Wi-Fi services on-board aircraft registered in the State of Qatar below 3000 meters; and

61.2 Retain the altitude restriction to usage only above 3000 meters for public mobile services on-board aircraft registered in the State of Qatar.

The change with regards to internet Wi-Fi services on-board aircraft will be reflected in amendments to the Class License for the Provision of Public Telecommunication Services On-board Aircraft. These amendments are provided for comment in Annex II to this CD.

Annex 1: List of questions

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Annex II: Class License for the Provision of Public Telecommunication Services On-board Aircraft - revised