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**Re: Response from Intelsat to Consultation Paper 14/2017
Consultation Paper on In Flight Connectivity (IFC), dated 29th September 2017**

Intelsat Corporation (Intelsat) greatly appreciates the efforts of the Telecommunications Regulatory Authority of India (TRAI) to support the Indian market for in-flight connectivity (IFC) services and provides the following comments in response to Consultation Paper 14/2017.

Intelsat operates the world's largest satellite services business, providing a critical layer in the global communications infrastructure. The company provides diversified communications services to the world's leading media companies, fixed and wireless telecommunications operators, data networking service providers for enterprise and mobile aeronautical, maritime and land communications services, and to multinational corporations and ISPs, among others.

In addition to its traditional Fixed-Satellite Service (FSS) fleet, Intelsat is deploying a high performance, next generation satellite platform that delivers global high-throughput technology without sacrificing user control of service elements and hardware. The Intelsat Epic^{NG} platform is an innovative approach to satellite and network architecture utilizing C-, Ku- and Ka-band frequencies, wide beams, spot beams, and frequency reuse technology to provide a host of customer-centric benefits. Designed as a complementary overlay to the world's largest FSS network, Intelsat Epic^{NG} is fully integrated with Intelsat's existing satellite fleet and the global IntelsatOne terrestrial fiber optic network.

Intelsat Epic^{NG} is based on open architecture and engineered for backwards compatibility, allowing broadband, media, mobility and government organizations to realize the cost-efficiency of using existing hardware. At the same time, increased control means these organizations can build on their success by offering their end-users customized, differentiated solutions -- even defining such service characteristics as speed, hardware and network topology.

IntelsatOne Flex for distribution partners serves the commercial air transport market, among other segments. IntelsatOne Flex aggregates Intelsat's global satellite fleet, Intelsat's Epic^{NG} high throughput satellite (HTS) fleet and the IntelsatOne terrestrial fiber optic network into a simplified ecosystem that enables Intelsat's distribution partners to easily and cost efficiently scale their service delivery capability to meet emerging in-flight demands. IntelsatOne Flex is an enterprise grade, customizable "Wholesale Mbps", managed mobility service that allows Intelsat's distribution partners and their aeronautical customers to access bandwidth when and where it is needed the most, without the complexity of managing multiple beams and satellites. In addition, this network provides tiered Committed Information

Rate (CIR) plans that allow Intelsat's distribution partners to offer unique and tailored services to the air transport sector.

India is an important market for Intelsat and for IFC services. India is situated along important commercial flight routes. Perhaps, more important, major Indian airlines seek to offer IFC services to enhance their passengers' experience and become more competitive internationally. Accordingly, Intelsat strongly supports TRAI's initiative to adopt a formal regulatory regime for IFC services in India.

Although TRAI must consider a range of policy issues in developing a regulatory regime for IFC services, Intelsat believes that India would be best served by adopting a "light-touch" regulatory approach that recognizes the following fundamental principles on the regulation of IFC offerings: (i) the unique nature of satellite-based IFC, (ii) the licensing of equipment used for IFC by an aircraft's registering nation, and (iii) the need for Indian airlines and Indian-registered aircraft to operate on an equal basis with their foreign counterparts. These principles, as well as other relevant issues, are discussed briefly below and inform Intelsat's response to the specific questions raised by TRAI in the Consultation Paper. From these core principles, TRAI can consider the range of India-specific policy issues in developing an appropriate IFC regulatory regime.

Satellite-Based IFC Offerings. Intelsat has supported IFC services with its global satellite network since the earliest days of this niche offering. Indeed, Intelsat's current satellites are optimized to support traditional FSS and mobility applications. As a result, Intelsat is uniquely positioned to enable additional IFC operations in India and around the world.

Intelsat would note several unique aspects of satellite-based IFC offerings. Because IFC is often initially introduced on long-haul aircraft (with a greater need for connectivity and entertainment options given longer flights), IFC operations are generally international and equipped aircraft typically cross multiple national boundaries. At the same time, satellites that support IFC have beams covering multiple jurisdictions with a single satellite-gateway pair. Thus, the satellite network infrastructure used to support IFC is not country-specific.

In addition, although Intelsat has worked closely with IFC providers around the world to include advanced HTS mobility designs in new satellite deployments, in no instance can a single IFC provider, a single national market, or even all IFC providers and markets combined support the implementation and operation of satellite and gateway infrastructure dedicated exclusively to IFC operations. Rather, Intelsat and other satellite operators are deploying satellites that support a mix of mobility and traditional satellite applications on a regional (not national) basis.

Finally, given the geographic and time-varying nature of satellite applications that support mobility applications (the location and extent of satellite capacity demand varies by the location of the equipped aircraft and the time of day -- e.g., there is a reduced demand on overnight flights and on "thin" airline routes), satellite operators are augmenting traditional space segment distribution approaches with managed services that facilitate the use of underutilized satellite power and capacity for other services. This dynamic allocation of satellite network resources may suggest that traditional notions of IFC service provider regulation should be re-examined to consider regulation at the aircraft operator level, especially because the link to local regulation in the IFC context is the national registration or location of the IFC equipped aircraft.

Licensing by the Aircraft's Registering Nation. Intelsat has been working for years with IFC providers around the world to help facilitate global operations, and has been exposed to a range of national regulatory approaches. In Intelsat's experience, IFC regulatory approaches are driven by two jurisdictional links: (i) the national registration of the aircraft (i.e., the registration jurisdiction); and (ii) the location of the aircraft (i.e., the territorial jurisdiction) at a particular time. An important corollary to the registration jurisdiction recognized in international aviation and telecommunications law is that the registering nation of the aircraft has primary jurisdiction over equipment operations and services on-board the aircraft, but aircraft operations also must be conducted in accordance with the regulations of

overflowed nations. Thus, although territorial jurisdiction is plainly recognized, licensing by an aircraft's registering nation is the primary enabler of IFC offerings.

Taken together, these principles have resulted in a commonality of approaches (with some national variations) to IFC regulation. First, overflowed nations do not seek to regulate the services provided on-board foreign-registered aircraft to avoid "reaching into" a foreign aircraft that is subject to the jurisdiction of another sovereign nation, to deter other nations from "reaching into" their own registered aircraft to exert jurisdiction and to recognize that foreign-registered aircraft flying over their territory are not connected to, or a part of, their national telecommunications marketplace.

Second, to the extent possible, countries around the world have recognized the IFC licenses or authorizations issued to foreign-registered aircraft by another regulatory agency, rather than "relicensing" the equipment on-board the aircraft. Nations have exclusive jurisdiction to license radios on-board their registered aircraft, and overflowed nations typically adopt rules to enable operation of foreign-licensed equipment in their own airspace (e.g., the free circulation of IFC terminals in Europe, no-objection for overflight throughout much of Africa, Asia and South American, etc.). In this connection, nations tend to focus on the off-board link between the satellite supporting the IFC offering and the aircraft itself, rather than the in-cabin equipment on-board the aircraft since the latter operates at extremely low power levels and on a non-interfering basis. Although the off-board link is also designed to share spectrum and avoid interference to other radiocommunication services, it admittedly involves the use of spectrum outside the aircraft cabin that could affect other spectrum users and, thus, may be the subject of national regulations design to promote spectrum compatibility among services.

Third, nations around the world typically issue licenses for IFC radio equipment installed on their registered aircraft either through their telecommunications regulatory authority (often for the Ku-band satellite terminal installed on the aircraft), or through their Civil Aviation Authority (often for the in-cabin IFC equipment). The goal of such licensing is to ensure that the equipment on-board the aircraft complies with international standards, including Ku-band satellite terminals, Wi-Fi access points and other IFC equipment.

However, the need for service licensing on-board nationally-registered aircraft is more mixed. With respect to in-flight Internet, some countries require IFC providers to register as an Internet Service Provider (ISP) or an electronic communications provider, while others authorize the airline itself to provide such services to its passengers on-board the aircraft. Other countries forego such requirements entirely given the unique nature of in-flight Internet provided to a closed user group of passengers on flights that take place both within and outside national airspace using a global, satellite-based network. With respect to mobile communications on-board aircraft (MCA), a few nations believe a separate IFC provider authorization is necessary. Others recognize the telecommunications authorizations already held by MCA providers, and still others forego licensing MCA licensing entirely and rely instead on the licenses granted to the passengers' mobile service operators and their roaming agreements with MCA providers to enable the operation of passenger handsets and the provision of services.

Intelsat believes that TRAI will benefit by considering all these approaches in the unique context of its governing statute, regulations and policies, with the ultimate objective of maximizing the benefits of IFC offerings within India for India airlines, Indian-registered aircraft and consumers. This includes those benefits that result from IFC operations on-board aircraft located in Indian airspace and from IFC operations on Indian passengers traveling in international and foreign airspace.

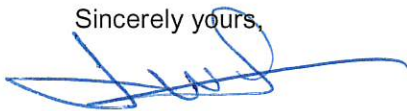
Indian Airlines Should Have the Same Access to IFC as Foreign Airlines. TRAI has clear authority to regulate all aspect of IFC services offered on-board an Indian-registered aircraft (which includes both equipment and service licensing requirements). It is important to note, however, that IFC requirements should not be so complex or burdensome as to make IFC operations in India economically non-viable, and should not place Indian airlines or Indian-registered aircraft at a competitive disadvantage vis-à-vis foreign airlines that offer IFC services.

As noted above, IFC offerings are a niche part of the satellite communications market, and alone cannot economically support satellite and earth station infrastructure on their own. Offered on a regional basis and combined with other satellite services, however, IFC can be a powerful competitive advantage in the national and international air transportation marketplace. These principles apply equally to India as they do in other parts of the world, and TRAI should ensure that any IFC regulations it proposes facilitate the introduction of the service in India rather than discourage or effectively preclude such services.

Similarly, Intelsat believes that TRAI would benefit from looking beyond India to evaluate the IFC requirements adopted in other countries around the world for these offerings. To the extent that other countries have adopted less costly and complex approaches to IFC, their airlines can provide less expensive IFC services to their passengers. Furthermore, to the extent TRAI follows the international trend of a "light-touch" regulatory approach for foreign airlines already licensed by their registering nations, Indian airlines should not be subject to more costly and complex requirements to provide the same IFC services to their passengers. Indeed, because IFC is offered to a closed user group of passengers on-board aircraft in flight, TRAI need not impose the same level of regulation applied to mass-market communications services provided generally to the Indian national consumer marketplace.

Intelsat reiterates its appreciation to TRAI for its efforts to support the Indian market for IFC services, and looks forward to the opportunity to work closely with TRAI on defining the applicable regulatory regime.

Sincerely yours,



Jeffrey White
Associate Counsel/Intelsat

Consultation Paper 14/2017
Response from Intelsat to 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**

TRAI should consider allowing both Internet and MCA services in India. In-flight Internet services and MCA services are variations of the same service, and can be complimentary offerings. Both services aid passenger and crew safety, and provide satisfaction and convenience while on-board an aircraft. Allowing both services enhances competition in IFC offerings and gives flexibility to the airlines and aircraft operators to choose the best path to implementation, balancing customer needs with cost and technical demands.

Internet services on-board aircraft provide high throughput Internet access to passengers and crew via on-board Wi-Fi connectivity, supported by specialized antennas and satellite links. MCA services enable passenger and crew mobile devices associated with licensed wireless carriers to connect to low-power airborne access systems (AASs) on-board an aircraft flying at or near cruise altitude, and integrating the AAS equipment with a licensed off-board link and backhaul transmission capabilities. Because the MCA service is uniformly provided through an already-licensed wireless carrier, there is no need for TRAI to impose separate service licensing of the AAS-to-mobile link. Passenger access to mobile broadband applications is enabled by an airline or aircraft operator, and is available only if the passenger's wireless carrier has executed a roaming agreement with the on-board MCA service provider. Many foreign airlines around the world have added MCA service to their connectivity offerings to afford passengers an alternative to existing Wi-Fi solutions.

Intelsat believes, however, that the introduction of MCA services impacts a smaller number of passengers and the regulatory framework for MCA is currently less developed and involves more stakeholders. Therefore, as it will have the greatest public benefit in a relatively short period of time, Intelsat recommends that TRAI conclude the regulatory framework for inflight Internet services over the short term and not delay the introduction of much simpler Internet IFC services in India while contemplating MCA services.

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

Yes, Table 2.1 (Global standards of AES/ESIM) in the Consultation Paper should provide guidance on this matter. As aircraft equipped with aircraft earth stations (AES)/earth stations in motion (ESIM) often fly internationally, TRAI should support internationally harmonized standards for AES/ESIM operations. The frequency bands for AES, however, should not be limited to the specific satellite frequency bands mentioned in those standards. As IFC services grow and evolve over time, India should consider allowing the flexible use of additional satellite downlink frequencies on a non-protected basis to meet this demand. The power-flux density (PFD) limits in the relevant International Telecommunication Union (ITU) Recommendations will be sufficient to allow the use of satellite downlink transmissions without harmful interference to other radiocommunication services. For additional satellite uplink bands, TRAI should support a flexible approach that can allow possible usage with a showing that harmful interference to other services would not exist -- such as use at altitudes with different AES/ESIM antenna orientations.

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?

Any potential risk that radio transmissions from AES/ESIM or MCA equipment operating on-board an aircraft while on the ground at an airport could degrade the performance of electronic navigation and control equipment used on the ground and also on board other aircraft could be dealt with as per current protocols based on regulations adopted by the European Conference of Postal and Telecommunications Administrations (CEPT).

In some countries, operation of AES/ESIM equipment when the aircraft is on the ground is subject to prior agreement with administrations, and/or airport authorities, and/or Civil Aviation Authorities. Intelsat recommends that TRAI to review current CEPT Decisions that addresses such measures, e.g. ECC/DEC/(05)11 for AESs.

For the avoidance of doubt, some administrations may require that the aeronautical mobile satellite service (AMSS) network operator obtains a frequency authorization due to specific national requirements, while other administrations may require some form of notification, or exempt the AMSS network operator entirely from these two requirements.

For the purpose of resolving interference situations, AMSS network operators could provide -- via a simple notification procedure -- notice to the Civil Aviation Authority in India relating to the operation of their AMSS network while in India.

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?

No, Intelsat does not foresee any challenges associated with 'gate to gate' IFC services. Wi-Fi is a low-power and non-interfering service, and satellite links used for connectivity to an aircraft operate in spectrum that is generally not shared with terrestrial services.

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

For Indian airlines and Indian-registered aircraft, although it may be possible to extend the UL approach to include Internet service, the licensing regime was adopted for a very different set of services (national, mass market offerings), and requiring a UL could potentially put Indian airlines and Indian-registered aircraft at a competitive disadvantage. Intelsat believes that consideration by TRAI of a separate IFC Service Provider license approach is warranted (see answer below).

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

Yes, this requirement can be adopted for airlines and aircraft operating in, and registered by, India. As already stated in our response, IFC is a niche service, a distinct and limited offering from other telecommunication services provided to the national market. As such, a licensing approach focused on the Government of India's legitimate regulatory and public policy interests with respect to IFC would best serve Indian airlines, Indian-registered aircraft and the Indian public.

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?

Yes, for Indian airlines and Indian-registered aircraft operating in India this approach could be possible but may have drawbacks -- as discussed above -- such as creating a disadvantage for Indian airlines and Indian-registered aircraft operating globally.

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?

No. The Unified Licensee remains responsible for its licensed IFC services and associated spectrum licenses (for the satellite backhaul and any MCA services, if allowed), and should have all the relevant details of the IFC service provider.

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?

Any license holder can be permitted to tie up with an IFC service provider to offer IFC services in Indian airspace, but there may be a need to distinguish between Internet versus MCA services.

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

It is advisable for TRAI to adopt a "light-touch" regulation approach within the context of international aviation. The focus of IFC regulation should be on consumer protection and implementing security mandates, but not on system and service implementation requirements.

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?

AES are AMSS earth stations located on-board aircraft, and operate in the secondary AMSS allocations at 14 GHz. These AES will be authorized for installation and for their operations by the national regulatory authority and/or Civil Aviation Authority in the country where the aircraft is registered.

The AES will operate within the airspace of many countries. Therefore, it is highly desirable that these administrations do not require additional authorization for operation of each AES.

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?

Yes, certainly for Indian-registered aircraft and Indian airlines. There is a need, however, to distinguish between in-cabin and off-board link operations for foreign-registered aircraft.

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?

Intelsat understands the legitimate security interests of India and encourages TRAI not to create a requirement for IFC service on international or domestic flights to use Indian Satellite Systems while in Indian airspace. In addition, international flights in Indian airspace should not be required to use Indian Satellite System capacity or foreign satellite capacity leased through the Department of Space. Mandating the use of Indian, or Indian controlled, satellite capacity for domestic or foreign-registered aircraft while over-flying India will: (i) create extra

costs due to necessary network architecture changes and reduce competition; (ii) potentially negate the benefits of redundant and seamless coverage that can be provided and efficiently managed by global satellite networks; and (iii) not singularly aid in the legal intercept capability that may be required by Indian law enforcement agencies.

The better method to insure the access required by Indian law enforcement and security agencies is to connect all IFC traffic over India to a ground earth station located in India or, alternatively, use a non-Indian ground earth station that "mirrors" and transmits approved traffic to a secure location, or Indian-controlled node, in India in order to enable lawful interception by Indian authorities. Intelsat welcomes the opportunity to further discuss with TRAI the various possible methods of securing required traffic intercepts.

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

IFC providers should optimize their offerings since even domestic India offerings are part of a global satellite-based network. Requiring Indian Satellite System capacity would add cost and complexity for domestic IFC services that could make the offering non-viable and could impact the provision of seamless, redundant and quality IFC communications. Aeronautical services are global in nature, and aircraft within fleets can be repurposed and placed on different routes per the needs of the commercial airlines, aircraft operators or users of the aircraft. Any regulatory decisions should consider the benefits of seamless coverage across regions, the economic pricing constraints applicable to the service being provided, redundant systems for safety, and reciprocity of regulatory regimes.

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?

Yes, either should be permitted. As described in the responses to Q14 above, the nature of global aeronautical communications services demands flexibility, redundancy and seamless operations.

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

- (a) Foreign registered airlines.
- (b) Indian registered airlines.

IFC service providers operating on-board foreign airlines should not be charged, because such a requirement may invite other countries to impose charges on IFC on-board Indian airlines flying through their airspace. With respect to Indian airlines and Indian-registered aircraft, the small size of the IFC market suggests that no special charging regime should be applied. Rather, applying standard tax and regulatory fee policies will provide the Government of India with adequate revenue from IFC turnover on Indian airlines and Indian-registered aircraft.

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

Because international IFC standards and regulations continue to evolve, it may be important for TRAI to adopt a technology neutral approach for authorizing Internet and MCA services. With respect to Internet services, on-board Wi-Fi equipment must be distinguished from off-board satellite terminal operations. The former are low-power access points confined to the aircraft cabin and, thus, of limited concern. The off-board link terminal, however, must be able to accommodate other systems and services that use the same spectrum. Therefore, IFC applicants must demonstrate that proposed systems are compatible with other operations in India.

With respect to MCA services, mobile frequency bands will continue to evolve over time, and MCA standards and equipment will do so as well. IFC operators should be permitted to introduce equipment that operates in new frequency bands subject to demonstrating there is no material potential for interference to other spectrum users in India from these proposed new operations.

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?

Within CEPT there is currently a request to carry out studies on the technical compatibility between FSS airborne platforms on-board aircraft and Fixed Service (FS) platforms in the 12.75-13.25 GHz frequency band. It should be noted that the studies so far show that it is indeed possible to operate in this band for aeronautical services while also protecting FS stations which share the same frequencies. These studies suggest producing a PFD mask, the form of which leaves a significant margin to accommodate aircraft mobile platforms while also protecting FS stations from these aircraft mobile platforms. The satellite frequency bands for the provision of IFC services should be specified and be consistent with international regulatory decisions and standards.