Dear Sir's,

We respectfully submit the following inputs to your request for public comment; as per your Consultation Paper on In Flight Connectivity (IFC) 29th September 2017.

Whilst at IndiGo we are not Telecommunications operators nor Telecommunication experts, as the Airline customer/operator we are very interested in clearly understanding the proposed landscape and commercial competitiveness for the IFC market; as TRAI progresses the regulatory enablement of Communications for Inflight Internet services.

Two of our IndiGo core values are to be "Courteous" and "Hassle Free". With this as our foundation; and the objective to simplify and improve inflight services for our customers, we propose a number of responses to the Inflight Connectivity discussion paper and processes for TRAI consideration.

After reviewing your detailed consultation paper, we have supplied IndiGo inputs to your questions; Numbered 1; 4; 6; 10; 13; 14; 17; 18; as a we are not Telecommunications specialists, we do not have any contributions we can assist with on the remaining questions.

Thanks and Regards

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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

From a Regulatory and Technology supply point of view; both should be considered.

Supply of MCA services will though, raise a number of secondary questions:

- The Mobile spectrums to be allocated and used in Aircraft Pico cells.
- The potential for interference with ground mobile communications services.
- Whether NCU (Network Controls Units) will be required on Aircraft to block access to all mobile frequencies other than those used by the Picocell on the Aircraft. The NCU would be a mandatory requirement if the allocation of mobile frequency for sole use inside the aircraft was overlapping with frequencies already allocated to mobile communication ground services

From an Airline point of view, MCA; if this is to be considered, will create an additional and completely separate business case to that of Internet Services.

- The supply of Internet Services in Aircraft requires the implementation of Aircraft WIFI systems;
- The supply of MCA Services in Aircraft requires the implementation of Aircraft Picocell systems;

The Technologies of today have disrupted most of the traditional telecommunications services including MCA.

- Traditional Voice and Text services the hallmark of the legacy telecommunications industry is rapidly being replaced with Data.
- Airlines generally are no longer installing MCA and Pico cell technologies; as Internet Data Services, Messaging applications and Voice over IP is replacing most inflight MCA requirements.
- The additional expense, equipment, and weight associated with providing Aircraft installation and management of PICO cells to support MCA services is making these business cases very difficult.

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

No Inputs.

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?

No Inputs.

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?

From a Regulatory and Technology supply point of view; Gate to Gate capability and coverage should be considered.

With the Aircraft equipment in operations today, the historical concerns associated with electromagnetic interference with Aircraft systems has mostly been addressed. Systems still need to be Tested, Verified and Certified, however generally today there are no technology or operational limitations

Airline safety policies at this time would generally require that the Internet Services and MCA systems should be switched off during Aircraft take-off and Aircraft landing and below altitudes of 3000 m (when the seatbelt light is on). These are critical times in the Aircraft operations and Airlines would not wish for the passengers to be distracted during the safety demonstrations or cabin crew announcements as these relate to safe Aircraft operations.

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?

No Inputs.

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

From a Regulatory point of view we have no inputs; however Airlines would very much like to see a multi-party, competitive supplier and technology supply landscape.

There are evolving suppliers and resellers of the satellite technologies, across L Band, K Band, KU Band and KA Band.

There are also other dedicated regional satellite options.

There is also aviation Ground to Air broadband

- Ground/Air broadband is prevalent in the US and also now rolling out across Europe.

- For dense flight corridors and major airport hubs, where this makes operational and commercial sense; ground to air broadband has a lower cost of operations for Aircraft operators.

- In current EU implementation they have mixed both SATCOM and Ground based broadband with an integrated satellite and air-to-ground network. Designed specifically for high-traffic flight paths and busy airport hubs.

The IFC business case is a very difficult case to make for domestic Airline operations, the Aircraft are smaller, there are less passengers and the Aircraft flying times are not that long.

The investments and operating costs per Aircraft are significant, with Aircraft feet and maintenance planning occurring over many years. Airlines are ordering Aircraft deliveries 5 to 10 years in advance.

The Aviation industry needs regulatory and operational certainty of the technologies that will be available, and the market's competitive position, incorrect technology choices or choices changed over the lifetime of an Aircraft would render any potential IFC business case ineffective.

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?

No Inputs.

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 Inputs.

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?

No Inputs.

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

From a Regulatory point of view we have no inputs.

However ensuring all regulatory requirements, governance requirements and security requirements are met; the Aviation industry would prefer an open approach to the introduction of the IFC technologies and suppliers; to be in a position to give to our customers the best technologies at the best price. We also needs to consider that for international operations the suppliers and technologies will need to be interoperable across international jurisdictions.

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?

No Inputs.

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?

No Inputs.

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?

Understanding the requirements of the security agencies for lawful interception and considering the options canvassed in

- 3.19 (Mandate the use of Indian Satellite System while travelling over Indian Airspace);

- 3.20 (Permit use of Indian Satellite System or foreign satellite leased through DOS; IFC equipment connected to Ground Earth Stations located in India);

- 3.21 (IFC in Indian airspace to a node owned/operated by an Indian entity to address the requirement of lawful interception directly or in mirror mode);

- 3.22 (IFC operation in a domestic flight to be distinguished from that of an International flight)

    - IFC operations in the domestic flights be permitted only through Indian satellite systems.

    - IFC of international airlines flying over multiple jurisdictions may be asked to use either Indian system or foreign satellite leased through DOS while it is in Indian airspace; Or not to put any such restriction on the international airlines.

We firstly are required to consider what we are attempting to solve.

1. Lawful interception, requires that we can identify and track the particular individual/user to be tracked. This presents the first problem; as this requires that the person using the system is identifiable and that then the communication traffic for the identified person can then be intercepted and accessed. The customer is connecting into the Aircraft Wifi, along with a number of other passengers; inside the aircraft the customer will be issued with an IP address for their connected device. However generally this IP address with the customers identification is not associated.

2. The identification of the customer, assuming WIFI is not free is only inside the Aircraft, this is not part of the satellite communications. If the aircraft WIFI is free then there may be not be any personal identification at all. It is similar to the recent enablement of the free WIFI at the Delhi Metro Blue line supplied by the Metro. Metro passengers, search for the network, and login to the free "Oui DMRC Free Wi-Fi". The Metro data traffic could be lawfully intercepted either at the WIFI router or at the ISP that this WIFI is connect to, however the Individual customer cannot be easily tracked.

3. The commercial connections between the Aircraft and the Satellite is by Aircraft therefore the traffic is consolidated by Aircraft; Within this traffic there are multiple possible concurrent users, identified by their in Aircraft allocated WIFI IP address, this is not personally identifiable externally any other way; unless this is built into the systems and processes to be supplied by the IFC Suppliers, and linked into the respective Airlines inflight WIFI processes.

4. Most data messaging applications of today develop VPN encryption point to point, therefore the traffic whilst possibly accessible cannot be then be effectively intercepted. This is the process today with Facebook, Whatsapp, Hyke, Skype. Nearly all connected users know the rules and best practices, the general advice is never connect through an open WIFI; these are not safe;

always establish a secure connection before any activity. Devices and applications today automate secure data connections as a standard.

To solve the requirements of the security agencies for lawful interception.

- The IFC would need to develop and supply the necessary systems and processes to be used by the Airlines such that each connecting WIFI point and its associated traffic can be attributed to the individual passenger and identifiable for the purposes of Lawful interception.

- Point to point encryption of data, is an inherent challenge for all security agencies across the connected encrypted internet world.

On the basis that we can with the IFC supplier and systems identify and capture the internet traffic, then this traffic needs to be available in India for the for the purpose of Lawful Interception

There are a number of considerations depending upon the nature of the operations.

- Indian registered Aircraft, operating in Indian Airspace. Domestic operations.

  India has regulatory Jurisdiction over Airline, Aircraft and Communications;

- Foreign registered Aircraft, operating in Indian Airspace; landing in India. International Operations.

  India has limited regulatory Jurisdiction over Airline, Aircraft or Communications; however has some influence due to international Aviation agreements and the issued Airline landing rights. This influence today allows for the enforcement of Airline's turning off the WIFI services while in India Airspace.

  Any IFC contracts and regulation will be based outside India; therefore it unlikely to be able to specifically Identify any connected Individual for Lawful Interception.

- Foreign registered Aircraft, operating in Indian Airspace; Not landing in India. E.g. Colombo to Dubai International Operations.

  India has No regulatory Jurisdiction over Airline, Aircraft and Communications.

  These airlines likely today leave all Airline systems including WIFI on; even though the aircraft may be traversing India Airspace.

- Indian registered Aircraft, operating in International Airspace.

  India has regulatory Jurisdiction over Airline, Aircraft and Communications; International operations. However the passengers countries of origin will have Jurisdiction over the Foreign nationals and can also apply stringent privacy requirements for countries and businesses supplying services to these foreign nationals.

- Foreign registered Aircraft, operating in International Airspace.

  India has no regulatory Jurisdiction.

- Indian registered Aircraft, operating in Foreign Airspace. International Operations.

  India has regulatory Jurisdiction over Airline, Aircraft and Communications; However the passengers countries of origin will have Jurisdiction over the Foreign nationals and can also apply privacy requirements for countries and businesses supplying services to these foreign nationals. The Foreign Airspace communications regulators will also have direct Jurisdiction over Communications.

- Foreign registered Aircraft, operating in Foreign Airspace.

  India has no regulatory Jurisdiction.

Therefore for Foreign registered Aircraft with IFC arrangements sourced outside of India it is unlikely for India to be able to specifically Identify any connected Individual for Lawful Interception. This is whether or not the Satellite traffic occurring over India Airspace is captured.

India does not have direct regulatory controls over these Airlines, however for those Airline services landing in India, India can exert influence to guide these airline whether to enable or disable WIFI whilst operating in India Airspace.

For India registered Aircraft, through the direct regulatory control over Airline, Aircraft and Communications; India can mandate and require that Airlines and IFC suppliers implement the appropriate processes and controls so that all individual WIFI connections can be identified and tracked. Some care will be needed to consider the privacy rights of foreign nationals on these services when these services are operating in International or Foreign airspace. The EU has in the past; to protect the privacy rights of its EU citizens, taken steps remove the rights of suppliers to operate into or with the EU markets.

For the IFC it could also be mandated that the IFC have Ground stations in India and/or provide a direct/mirror feed of all data from all worldwide connections to a node owned/operated by an Indian entity to address the requirement of Lawful Interception.

This could be further simplified to the point, that the regulatory mandate may consider that for all Traffic worldwide for India Registered Aircraft the IFC must route the internet traffic through to a registered India Based ISP. Then the current provisions with these ISP's for Lawful Interception, would apply.

In reviewing the options proposed.

- 3.19 (Mandate the use of Indian Satellite System while travelling over Indian Airspace);

This would create an India based monopoly supplier and also create compatibility problems for Aircraft that operates domestically and internationally.

Airlines would not prefer this as a solution as this will not achieve a multi-party competitive supplier and technology supply landscape.

If however the India Satellite System was part of the competitive landscape with other suppliers, bidding based on service quality and price along with all the other satellite option this would be welcomed.

- 3.20 (Permit use of Indian Satellite System or foreign satellite leased through DOS; IFC equipment connected to Ground Earth Stations located in India);

The Satellite systems can only connect to ground stations within their regional line of site. Depending upon the exact location of the satellites geostatic orbit ground stations only in these areas can be selected. Therefore a satellite with coverage only to the edge of India will only be able to connect to a ground station also on this edge of India. For the KU and KA band services the satellite suppliers generally maintain two ground stations in operation for each satellite, as these frequency bands are susceptible to signal interference from rain. These two stations are geographically separated to minimise the risk of both ground station be in rain at the same time.

Therefore consideration is also required to the required ground station service levels, and the relative cost of additional worldwide base stations. There will be a need for multiple geo-located stations to ensure adequate service levels are maintained for the KA/KU bands that are susceptible to rain and weather. The cost of building managing and maintaining any regulated India base stations would be borne by the Airlines/India consumers as part of the cost of services, making these service more expensive.

Airlines would not prefer this as a solution as this will add to costs and not achieve a multi-party competitive supplier and technology supply landscape.

If the India located satellite base station as part of a competitive landscape with other countries, suppliers and base stations, with bidding based on service quality and price along with all the other satellite options this would be welcomed.

If the India Satellite System was part of the competitive landscape with other suppliers, bidding based on service quality and price along with all the other satellite options this would be welcomed.

- 3.21 (IFC in Indian airspace to a node owned/operated by an Indian entity to address the requirement of lawful interception directly or in mirror mode);

This is possibly the most serviceable and effective option.

For Foreign registered Aircraft it is unlikely for India to be able to specifically Identify any connected Individual for Lawful Interception, therefore the consideration is whether to Open up WIFI for Foreign Airline or keep this closed. It may create some challenges if India opens up WIFI for India Registered Aircraft yet still disallows this for Foreign registered Aircraft.

For India Registered Aircraft through the direct regulatory control over Airline, Aircraft and Communications; India can mandate and require that Airlines and IFC suppliers implement the appropriate processes and controls so that the persons for all individual WIFI connections can be identified and tracked. Then IFC's can be required in direct mode to route all IFC Traffic worldwide for India Registered Aircraft through to a registered India Based ISP. Then the current provisions with these ISP's for Lawful Interception, would apply.

- 3.22 (IFC operation in a domestic flight to be distinguished from that of an International flight)
    - IFC operations in the domestic flights be permitted only through Indian satellite systems.

        Airlines would not prefer this as a solution as this will not achieve a multi-party competitive supplier and technology supply landscape.

    - IFC of international airlines flying over multiple jurisdictions may be asked to use either Indian system or foreign satellite leased through DOS while it is in Indian airspace; Or not to put any such restriction on the international airlines.

Airlines would not prefer this as a solution as this will not achieve a multi-party competitive supplier and technology supply landscape.

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

Airlines would not prefer this as a solution as this will not achieve a multi-party competitive supplier and technology supply landscape. If however the India Satellite System was part of the competitive landscape with other suppliers, with bidding based on service quality and price along with all the other satellite options this would be welcomed.

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?

No Inputs.

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

(a) Foreign registered airlines.

(b) Indian registered airlines.

No Inputs.

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

The Satellite frequency spectrum for the international markets has already been allocated. These are generally fixed in the ranges for L Band, K Band, KU Band and KA Band. Within these bands the respective Satellite operators and resellers have constructed their business by segmenting part of these frequencies.

How these are to be licensed/operated in India remains a regulatory decision, however regarding allocations of bands/ frequencies the Aviation industry would prefer an open approach to the introduction of the IFC technologies and suppliers; to be in a position to give to our customers the best technologies at the best price.

We also needs to consider that for international operations the suppliers,

technologies and frequency spectrums will need to be interoperable across international jurisdictions.

Some consideration should also be given to an open and comprehensive supplier landscape, to also consider alternative satellite providers such as (Iridium) and Ground to Air broadband

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?

Airlines would very much like to see a multi-party competitive supplier landscape, and prefer an open approach to the introduction of the IFC technologies and suppliers.