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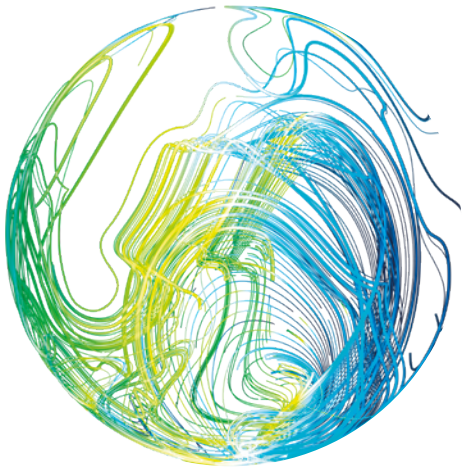

Fasten your seatbelts: in-flight connectivity takes off

Deloitte Global predicts that in 2018, one billion passenger journeys on planes (about a quarter of the total) will be on aircraft equipped with in-flight connectivity (IFC).[277, 278] IFC can be used for data and, where allowed, voice communications. This would be a 20 percent year-on-year increase. IFC revenue for airlines should be close to $1 billion, with most generated by airtime sales to about a tenth of passengers who purchase access on routes where IFC is available and charged for.[279, 280]

While IFC has been available for many years in markets such as North America, it should be more popular and lucrative than ever in 2018, thanks to the rising number of routes covered, higher connection speeds and greater data capacity per flight.[281]

This trend implies that within a few years, the airplane may no longer be one of the last remaining connectivity-free zones – in any part of the world.

How IFC works

There are two ways of providing connectivity to planes; on occasion, both approaches are deployed in tandem:

- Air to ground (ATG): A network of specialized ground-based mobile broadband towers relays signals up to antennas located on the underside of a plane's fuselage. As with a terrestrial cellular network, the plane automatically connects to the closest tower. ATG has been cheaper and has lower latency than satellite-based services, but for evident reasons works only while over or close to land. One of ATG's major constraints is the amount of spectrum available for the service.

- Satellite: A constellation of satellites, typically in geostationary orbit, sends to and receives signals from earth via receivers and transmitters. Connectivity is via an antenna on the roof of the aircraft. Satellite-based systems provide coverage across the globe, including over oceans, but have typically been more expensive and have higher latency.

277. More than four billion passengers are expected to travel in 2018. See 2036 Forecast Reveals Air Passengers Will Nearly Double to 7.8 Billion, International Air Transport Association, 24 October 2017: http://www.iata.org/pressroom/pr/Pages/2017-10-24-01.aspx.

278. Deloitte Global estimates that around a third of all planes will be equipped with IFC by the end of 2018. This estimate is based on conversations with industry experts and a variety of publicly available sources. See Nearly 7,000 aircraft now have in-flight connectivity, Get Connected, 18 September 2017: http://www.getconnected.aero/2017/09/7000-aircraft-inflight-connectivity/; In-flight connectivity revenue $32bn by 2026, Advanced Television, 23 May 2017: http://advanced-television.com/2017/05/23/in-flight-connectivity-revenue-32bn-by-2026/.

279. Broadband in the sky will be a $130 billion market by 2035, Inmarsat, 26 September 2017: https://www.inmarsat.com/news/34067/.

280. The figure referring to the percentage of paying customers is a Deloitte Global estimate based on a variety of publicly available sources, including Gogo announces fourth quarter and full year financial results, PR Newswire, 27 February 2017: http://www.prnewswire.com/news-releases/gogo-announces-fourth-quarter-and-full-year-2016-financial-results-300413630.html; 2017 Wi-Fi report, Routehappy.com, as accessed on 31 October 2017: https://www.routehappy.com/insights/wi-fi/2017.

Until recently, many airlines outside of North America had taken a wait-and-see approach to IFC or had only partially equipped their fleets. About a third of commercial planes will be equipped with IFC at the start of 2018. Deployment was partial for a combination of factors, including the inability to offer quality service, the impact of legacy technology on the plane's weight and the costs involved.

But in 2018 and beyond, the business case for IFC should become more compelling due to technological advances in satellite and ATG connectivity. IFC is likely to enjoy better speeds per user and greater capacity, enabling both improved experience and lower prices. Deloitte Global expects an additional 1,600 to 2,000 airplanes to be equipped with IFC in 2018. We also expect upgrades to planes already equipped with prior-generation IFC equipment, delivering better connectivity as a result.

The principal upgrade from satellite providers is the move to high-throughput satellite (HTS), which employs frequency reuse and multiple spot beams to raise throughput. HTS should increase capacity and data speeds substantially and lower costs significantly. HTS increases peak speed to the aircraft to more than 100 Mbit/s.[282] Non-HTS satellite-based services deliver between 10 and 70 Mbit/s to an aircraft. The exact speed realized depends on the combination of equipment in a given system – satellite, antenna, modem – and latitude.[283] This capacity is shared among all passengers who wish to use the service.

HTS deployment, which was introduced to commercial satellite communications within the past decade, is likely to ramp up in the medium term. According to Euroconsult, total HTS capacity dedicated to IFC will increase to 21 Gbit/s by the end of 2018, up fivefold from the end of 2016.[284]

Further growth in the volume of satellite capacity targeting the IFC market is expected beyond 2018 as more HTS systems are launched. NGSO (non-geostationary) HTS constellations such as Space X and OneWeb that promise to deliver large-capacity supply are also being planned. IFC is likely to be one use of this capacity.

In 2018, ATG providers are expecting to be able to deliver peak speeds to the aircraft of up to 100 Mbit/s using solutions based on LTE technology and, in some cases, unlicensed spectrum. This is about 10 times faster than existing ATG solutions and at a much lower cost.[285] GoGo, the main ATG provider today, is expected to launch its next-generation ATG network in 2018.[286] The ATG market is likely to see new entrants, with their services expected to begin to be available at the end of 2017.[287]

The receiving technology on planes has also improved in recent years; the introduction of flat-panel antennae reduced drag. One criticism of legacy satellite antennas was that they made planes less aerodynamically efficient.[288] There will also be improvements to the receiving technology in aircraft. One vendor is using multiple receivers instead of one, enabling a more consistent service. One receiver allows users to stay connected, while a second acquires the new spot beam as an aircraft moves from one beam to another.[289]

Another vendor is expecting to introduce modems that can increase speeds in the aircraft to up to 400 Mbit/s, markedly faster than existing modems which allow for speeds of 15 Mbit/s available on some planes with legacy IFC technology.[290]

One ATG vendor has introduced the use of four antennas to pick up signals more effectively and offer faster speeds.

In 2018, more consumers across the globe are likely to be on planes with IFC. In 2017, 80 percent of flyers in North America traveled on routes with IFC.[291]

However, in other markets such as Europe and Asia-Pacific (APAC), IFC rollout was limited. This is likely to change in coming months as more airlines launch IFC services on more planes and more routes, including in formerly underserved regions.

In Europe, International Airlines Group (IAG), the parent company of Aer Lingus, British Airways, Iberia and Vueling, aims to have 90 percent of its short-haul fleet equipped by early 2019.[292] Initiatives such as the European Aviation Network (EAN) and the deployment of over 300 on-ground base stations specifically designed for IFC should aid the European deployment.[293]

281. Valour Consultancy estimates that as of 2017, there were 19,131 IFC systems installed on VIP and business aircraft; see Business jet inflight connectivity take-up may double in 10 years, 26 June 2017: http://www.getconnected.aero/2017/06/report-business-jet-inflight-connectivity/. Valour Consultancy's estimate for commercial planes with IFC built at the end of Q2 2017 is 6,758; see Nearly 7,000 aircraft now have in-flight connectivity, Get Connected, 18 September 2017: http://www.getconnected.aero/2017/09/7000-aircraft-inflight-connectivity/.

282. For information on technology that can deliver speeds to the aircraft of up to 400 Mbit/s, see Hughes unveils new JUPITER aero system for IFC, Get Connected, 8 March 2017: http://www.getconnected.aero/2017/03/hughes-jupiter-aero-system-ifc/.

283. From a satellite in geostationary orbit, beams are tightest at the equator and more dispersed at the poles. Therefore, a flight would have higher speeds at the equator than over the pole.

284. Sector dynamics, analysis & forecasts addressing the IFEC market, Euroconsult: http://www.euroconsult-ec.com/ifec.

285. Gogo announces next-generation LTE ATG ground network, Get Connected, 28 September 2016: http://www.getconnected.aero/2016/09/gogo-next-generation-4g-lte-ground-network/; SmartSky 4G LTE air-to-ground network being deployed, Get Connected, 4 August 2017: http://www.getconnected.aero/2017/08/smartsky-4g-lte-atg-network-deployed/.

286. Gogo to launch next gen ATG network in 2018, Avionics, 1 March 2017: http://www.aviationtoday.com/2017/03/01/gogo-launch-nextgen-atg-network-2018/.

287. SmartSky 4G LTE air-to-ground network deployment initiated, SmartSky Networks, 3 August 2017: http://smartskynetworks.com/network-deployment-initiated/; 4G LTE for airports and air-to-ground, Nokia, as accessed on 31 October 2017: https://networks.nokia.com/solutions/4g-lte-airports-and-air-ground; European Aviation Network is airborne, T-Mobile, 28 November 2016: https://www.telekom.com/en/media/media-information/archive/ean-is-airborne-444776.

IFC prospects are also picking up in APAC. For example, Virgin Australia and Qantas plan to equip the majority of their fleet with IFC by the end of 2018.[294] Chinese airlines are set to take advantage of the October 1, 2017, lifting of the ban on the use of portable devices on domestic flights.[295] China Eastern, China Southern, Hainan and Xiamen airlines are offering IFC on some of their international routes. Air China will have a number of its Airbus 350 aircraft equipped with IFC by December 2017.[296]

In the next decade, the largest percentage growth is expected across Latin America, where the number of connected aircraft is forecast to increase from 44 in 2015 to 1,529 by 2025.[297]

Demand for the new IFC capacity coming on stream should be significant. Historically, usage has been concentrated among business users, most of whom expense usage. Consumers have always wanted in, but at lower price points and with better quality.

Demand for connectivity is now so strong that consumers would prioritize it over most other amenities. One survey found that if respondents had to select from a range of services, 54 percent would choose Wi-Fi. This is almost three times the proportion (19 percent) that would choose a meal.[298] Another survey, conducted among IFC users, found that almost 90 percent would trade seats, additional legroom or another amenity for a faster and more consistent wireless connection.[299]

Consumers' connectivity motivations will vary. Some may want to remain productive and respond to work emails. Others may want to continue conversations (when permitted), share selfies from the sky or stream their choice of music rather than the airline's selection.

Airlines' motivations are likely to be to meet customer demand, attract and retain customers, and generate revenue. Revenue could come directly, from the sale of airtime, or indirectly, when IFC is offered free, as a way to acquire new customers or improve loyalty. If it proves a revenue generator, IFC will allow airlines to augment the already booming ancillary services market, which has increased more than 13 times between 2007 and 2016.[300]

The most popular charging model is for a certain period of connection time or for a flight (regardless of the route).[301] Some airlines may choose to offer certain, typically low-bandwidth services (such as texting) for free or offer connectivity for free for a certain period of time as a way to increase service awareness and entice further usage.[302]

Other airlines may choose to delay IFC deployment, given the capital cost of between $200,000 and $300,000 per plane[303], the revenue forgone from grounding the plane during the three-day installation[304], and the on going cost for capacity. Some of these costs may be offset by savings if IFC means that existing seatback entertainment systems can be uninstalled or not installed in the first place. Removing seatback entertainment would eliminate a major maintenance cost, remove the capex spend on new hardware or upgrades, and reduce fuel costs by reducing the plane's weight.[305]

Some of the cost savings could be put toward purchasing capacity and media content to be made available for consumption on customers' personal devices. Improvements in compression should enable content (including movies and TV programs) to be streamed at high quality with less bandwidth.[306]

288. For example, see Gogo's 2KU antenna showcased at Global Connected Aircraft summit 2015, as accessed on 31 October 2017: http://www.gcasummit.com/wp-content/uploads/sites/21/2015/08/Gogo-2Ku.jpg.

289. Wi-Fi at 35,000 feet! Honeywell demos new in-flight tech for flyers, pilots, TechRadar, 13 July 2017: http://www.techradar.com/news/wi-fi-at-35000-feet-honeywell-demos-new-in-flight-tech-for-flyers-pilots.

290. Panasonic Avionics: "jury's still out" on profitability of in-flight connectivity, SpaceNews, 15 July 2017: http://spacenews.com/panasonic-avionics-jurys-still-out-on-profitability-of-in-flight-connectivity/.

291. 2017 Wi-Fi report, Routehappy.com, as accessed on 31 October 2017: https://www.routehappy.com/insights/wi-fi/2017.

292. IAG to be launch customer of European Aviation Network, Inmarsat, 8 March 2017: https://www.inmarsat.com/news/iag-launch-customer-european-aviation-network/; for details on other airlines, see Europe's airlines set to benefit from in-flight connectivity advancements, FutureTravelExperience.com, May 2016: http://www.futuretravelexperience.com/2016/05/europes-airlines-set-benefit-flight-connectivity-advancements/.

293. European Aviation Network is airborne, T-Mobile, 28 November 2016: https://www.telekom.com/en/media/media-information/archive/ean-is-airborne-444776.

294. Virgin Australia the only Australian airline to offer inflight Wi-Fi on international flights, Virgin Australia, 10 August 2017: http://newsroom.virginaustralia.com/release/virgin-australia-only-australian-airline-offer-inflight-wi-fi-international-flights; Qantas switches on fast, free inflight Wi-Fi, Qantas, 7 April 2017: https://www.qantasnewsroom.com.au/media-releases/qantas-switches-on-fast-free-inflight-wifi/.

295. Domestic airlines to lift ban on phones, Shanghai Daily, 8 September 2017: http://www.shanghaidaily.com/nation/Domestic-airlines-to-lift-ban-on-phones/shdaily.shtml.

The bottom line

When deploying IFC, airlines have to decide whether to use satellite, ATG or both. Airlines also need to decide which spectrum to use; they must determine which solution is most suited to future as well as current demand and how well it can scale.

There is a trade-off between quality of service, the complexity of the solution and the cost of the installation process.[307] Airlines will need to gauge if the resulting customer pricing, if any, is likely to be affordable to their customers.

Airlines will also need to decide which parts of the IFC service they want to manage on their own. For example, with certain solutions, the vendor supports the costs of installing the connectivity in the planes and can manage the service; the airline receives a share of the revenue but doesn't need to do anything else. Other airlines are taking on the installation of IFC and the development and delivery of services.

IFC can also be used to run parts of the aircraft's operation. American Airlines, the first airline to do this, equipped all its flight attendants with internet-enabled tablets as early as 2012.[308] This enables them to carry out mileage upgrades, read and respond to corporate emails, get real-time access to passenger seat assignments, file reports, and do remote maintenance.

Airlines will need to determine the role that IFC plays in their entertainment program. Some airlines may choose to allow customers to use their own devices to stream content from an onboard library, even at no additional cost. Others may choose to continue to provide seatback entertainment, but mostly on long-haul routes. Airlines will also have to consider whether to give customers full control over which services can be used. Various airlines are forbidding calls on their planes, mostly in response to flyers' feedback.[309]

Mobile operators will need to consider whether they should extend their reach into the sky. One operator has sponsored free access to messaging and one hour's in-flight internet access.[310]

Connectivity can be sponsored by other companies in exchange for customer data; this is currently the model used in many airports that offer free internet.

Regulators will need to ensure that there is sufficient spectrum to meet current and future demand.

For three-quarters of air travelers at present, being on a plane means disconnection from the world, whether or not they want that. In coming years, it may not be an option. As connectivity improves and becomes cheaper, IFC is likely to become standard. The plane, too, will be connected – and the majority of passengers will be delighted by this and will express their happiness on social networks from 35,000 feet up.

296. Panasonic Avionics brings inflight connectivity to Air China, Get Connected, 26 July 2017: http://www.getconnected.aero/2017/07/panasonic-avionics-inflight-connectivity-air-china/.

297. Sky High Connectivity, SES, September 2016: https://www.ses.com/sites/default/files/2016-10/Sky%20High%20Connectivity.pdf.

298. Global Inflight Survey, Inmarsat, May 2016: http://www.inmarsat.com/wp-content/uploads/2016/05/Inmarsat-Global-In-Flight-Survey-WHITE-PAPER.pdf.

299. Honeywell survey confirms growing demand for in-flight connectivity, Inmarsat, as accessed on 31 October 2017: https://www.inmarsat.com/news/honeywell-survey-confirms-growing-demand-for-in-flight-connectivity/.

300. For a view on growth in ancillary revenues, see the top 10 airlines, ranked by total ancillary revenue, which generated $2.1 billion in 2007. In 2016, this had grown to more than $28 billion. Airlines look to take flight with lucrative extras, 18 September 2017: https://www.ft.com/content/9ff6e4b4-9c40-11e7-9a86-4d5a475ba4c5.

301. For example, Turkish airlines charge $9.99 per hour or $14.99 for 24 hours; Air Canada charges $9.95 per flight for a laptop, $7.95 per flight for a handheld device. Review: Turkish airlines economy aboard a transatlantic 777 flight, airlinereporter.com, 27 June 2016: http://www.airlinereporter.com/2016/06/review-turkish-airlines-economy-aboard-transatlantic-777-flight/.

302. Free messaging takes flight, Delta Air Lines, as accessed on 31 October 2017: https://www.delta.com/content/www/en_US/traveling-with-us/onboard-services/delta-studio/in-flight-wi-fi.html.

303. What's the cost of equipping a plane with wifi? Tnooz.com, 30 September 2013: https://www.tnooz.com/article/whats-cost-equipping-plane-wifi-inflight-musings/.

304. Gogo Has More In-Flight Internet Bandwidth Than It Knows What to Do With (Sometimes), Skift, 27 February 2017: https://skift.com/2017/02/27/gogo-says-it-has-a-bandwidth-abundance-on-some-planes/.

305. It is estimated that for a plane with 260 seats, seatback screens cost $3 million per plane, while the weight of cabling required for the system costs $90,000 in extra fuel per year per aircraft. For more information, see Airlines Entertain Tablet Ideas, The Wall Street Journal, 27 September 2012: https://www.wsj.com/articles/SB10000872396390443916104578020601759253578.

306. For example, in 2018, Netflix will start offering a compression technology that will allow passengers to watch Netflix at high quality, while airlines can decrease their bandwidth costs by 75 percent. See Netflix takes to skies, pitching airlines on in-flight streaming tech, Variety, 25 September 2017: http://variety.com/2017/digital/news/netflix-airlines-in-flight-streaming-technology-free-wifi-1202569965/.

307. For a view on this for JetBlue, see The connected aircraft: four airlines, four views – from our archives, Via Satellite, 1 June 2017: http://www.satellitetoday.com/telecom/2017/06/01/connected-aircraft-four-airlines-four-views-throwback.

308. Tech enabled flight attendants upgrade customer service, Fortune, 21 December 2015: http://fortune.com/2015/12/21/flight-attendants-tech-devices/.

309. Calls Aren't Allowed on Planes, but Regulators Consider a Warning Anyway, The New York Times, 9 December 2016: https://www.nytimes.com/2016/12/09/business/airplane-phone-calls.html?mcubz=1&_r=0.

310. Free Wi-Fi on the fly, T-Mobile, as accessed on 31 October 2017: https://www.t-mobile.com/offer/free-in-flight-wifi-texting-uncarrier.html.

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