



SES White Paper March 2019

BROADBAND AT 30,000 FEET

Accelerating inflight connectivity with SES Networks

The inflight connectivity (IFC) market has exploded over the last few years, with a growing number of commercial aircraft providing airline passengers with access to the applications, services, and entertainment they're able to enjoy on the ground. This trend will continue to intensify over the next decade, with 68% of aircraft expected to be connected by 2026.¹ Passengers want to be able to access high-speed Wi-Fi, stream video entertainment, and catch up on email and social media while on board, with 78% of global travellers stating they want inflight internet, and 30% specifically looking for that feature when booking their flight.²

As much as IFC is changing the experience for passengers, it is also benefitting airlines by enabling them to optimise their processes. Electronic Flight Bags (EFBs) have replaced stacks of flightpath reports stuffed into pilots' briefcases, with tablets offering access to real-time weather, turbulence, and operations

updates. When pilots, and flight and ground crews have real-time operational data at their fingertips, they can make better, more informed decisions that have an impact on the airline's bottom line. Savings can be significant, including over US\$311 million in fuel costs from improved route management, nearly US\$17 billion from leveraging condition-based monitoring of aircraft to reduce flight delays, and US\$33 million from preventing medical-related diversions with IFC-enabled telemedicine.³

More bandwidth to the plane also means airlines can more effectively manage, transmit, and store each passenger's inflight preferences and selections, ultimately providing a far more personalised travel experience. Flight crews today can easily access electronic passenger profiles on their connected tablets to provide up-to-the-minute connecting flight information, real-time credit card processing, and even inflight meal choices and suggestions.

¹ *'The Future of In-flight Connectivity'*, Valour Consultancy, 2018.

² *'The 2018 Global Traveler Research Study'*, Gogo, 2018.

³ *'The Future of In-flight Connectivity'*, Valour Consultancy, 2018.

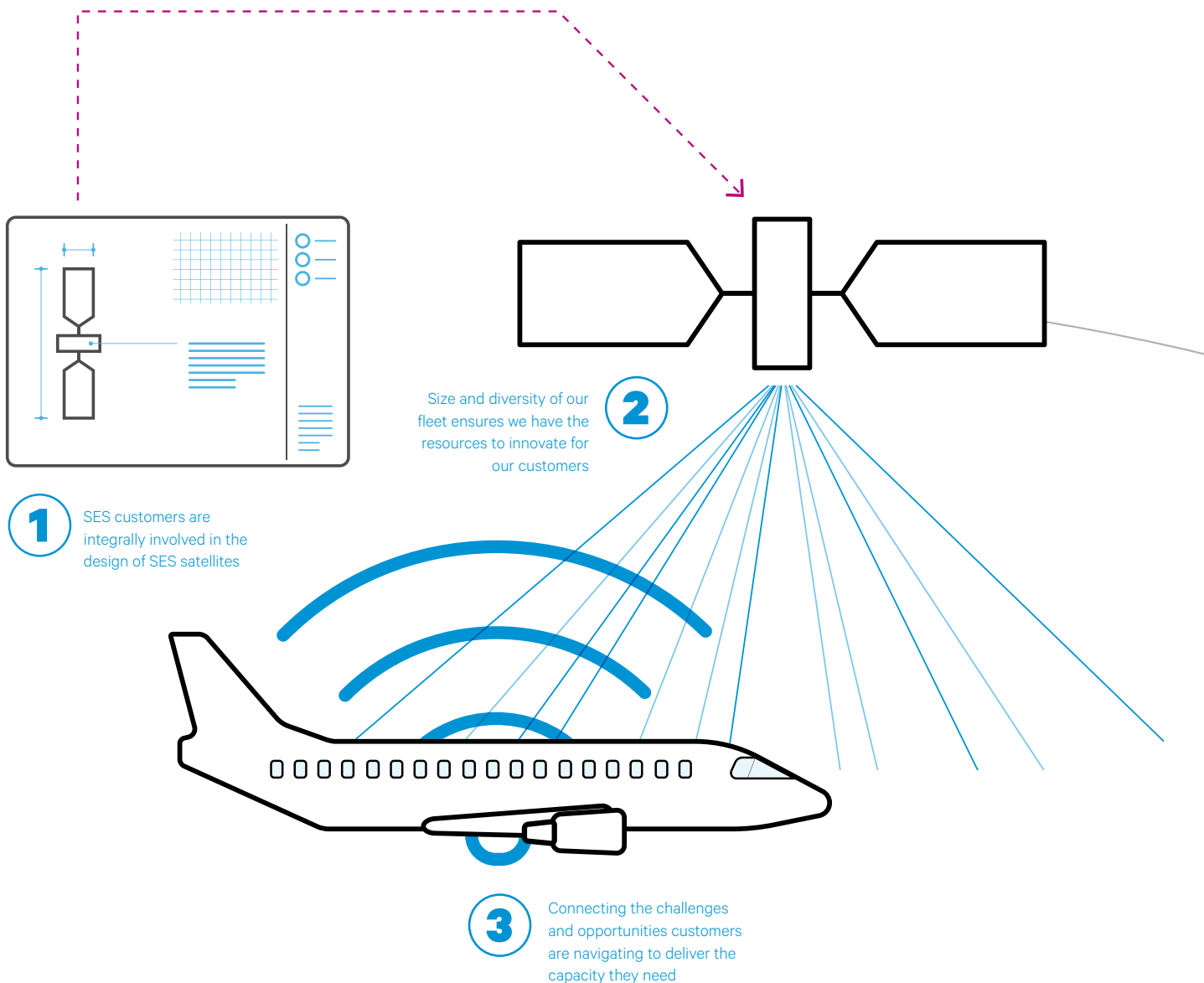
SES AND THE IFC OPPORTUNITY

SES Networks is at the forefront of the shifting IFC market, working with the industry's leading aviation service providers (ASPs) to ensure both commercial airlines and private jets are able to meet their passengers' increasing demands for data. Our Signature Aero Solutions are underpinned by our multi-band satellite constellation and Skala Global Platform, a next-generation ground system optimised for the delivery of high-quality broadband services for the aviation market. This market-leading aero offering is used by the leading ASPs, including Global Eagle Entertainment, Gogo, Panasonic, and Thales.

SES Networks Signature Aero Solutions are based on five core principles developed to address the IFC requirements of our aviation customers and end users—now, and in the future.

1 COLLABORATIVE PROCESSES

Our customers are integrally involved in the design of our satellites, which ensures that every aspect of their requirements can be taken into account from the start. In the case of SES-17, SES worked closely with Thales to develop this Ka-band high-throughput satellite (HTS) specifically designed to support aero mobility throughout the Americas. SES-17 is set to launch and begin delivering Thales' FlytLIVE IFC and streaming services to airline customers in 2020. In the interim, SES has developed a forward-compatible solution that has enabled Thales to start offering IFC services in North America in 2018.



2 TAILORED COVERAGE

The combination of our next-generation HTS and Skala Global Platform enables our aero customers to more efficiently provide IFC services at a lower cost per bit. ASPs are able to seamlessly deliver bandwidth across a network that

spans multiple beams, aircraft, and end users, as well as the ability to carve out service areas, and support data-intensive applications with exponentially higher throughput as compared to widebeam satellites.

3 CUSTOMISED SERVICE

Our collaborative relationship with our customers doesn't end when the service is launched. Our ASP customers need flexibility to meet the needs of the dynamic IFC market, and we ensure they have the services they require to meet their challenges. When Gogo launched its new 2Ku IFC service aboard flights across North

America and the Atlantic Ocean, it called on SES to provide a tailored coverage area across multiple satellites in this region. This successful engagement led to further collaboration, with Gogo further capitalizing on our HTS capabilities to enable its success in the global IFC market.

4 FLEXIBLE FLEET OPTIONS

When capacity is needed within a specific timeframe in the fast-moving IFC market, outside-the-box solutions must be found. The size and diversity of our fleet ensures we have the resources to innovate for our customers. For example, satellites in inclined orbits are not aligned perfectly with the equatorial plane, and are often thought to be past their prime, yet they provide a quick way to add capacity. Global Eagle Entertainment leveraged a fully-functional SES satellite in an inclined orbit to quickly increase inflight capacity for airlines serving North America, the Gulf of Mexico, and the Caribbean, allowing it to scale throughput more efficiently in one of the world's leading IFC markets.

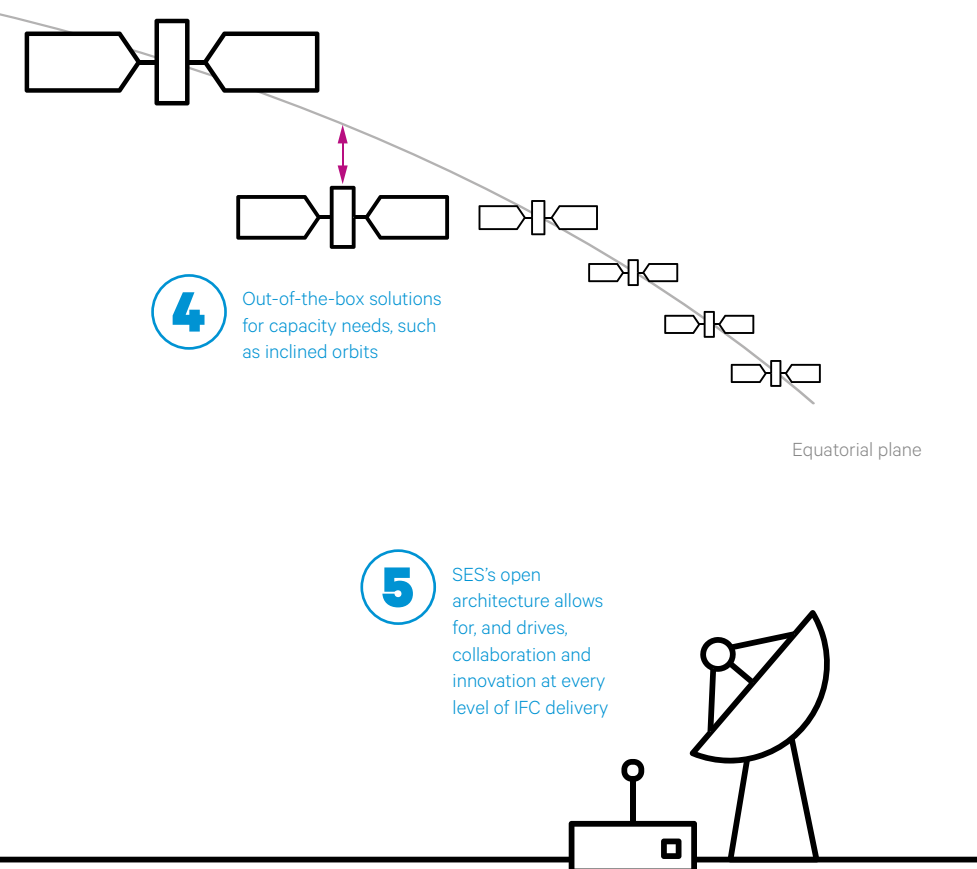
Our Signature Aero Solutions are underpinned by our multi-band satellite constellation and Skala Global Platform

5 OPEN ARCHITECTURE

The SES network is based on the principle of technological inclusiveness. Our open architecture drives collaboration and innovation at every level of IFC delivery—from advancements in ground infrastructure and satellite design to next-generation aircraft antenna and modem development. By working closely with IFC technology providers, we are able to constantly push for a better connected passenger experience.

4 Out-of-the-box solutions for capacity needs, such as inclined orbits

5 SES's open architecture allows for, and drives, collaboration and innovation at every level of IFC delivery



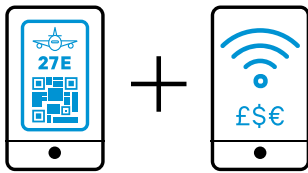
POSITIONING FOR THE FUTURE OF IFC

SES Networks holds a dominant position in IFC, with our ASP customers serving 80% of all connected aircraft, and our roadmap ensures we will continue in this role by meeting the evolving requirements of the market. We are growing our HTS fleet, which will allow us to provide even more scalable and flexible services for the IFC market, and we're building a complementary ground infrastructure, including multiple new gateways, teleports, and hub assets around the world that are interconnected by Multiprotocol Label Switching (MPLS) and fibre.

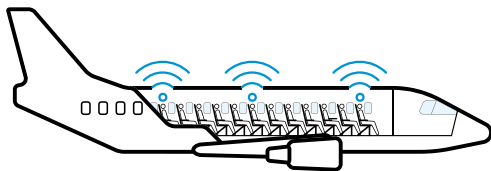
We are also working with our technology partners to co-develop next-generation antennas that will ultimately

bring the game-changing flexibility provided by our O3b MEO satellites to the aero market. High-throughput MEO capacity can be divided and allocated as needed, which has the potential to transform connectivity in the air, while our combination of MEO and GEO assets ensures seamless coverage regardless of where an aircraft flies. Our existing O3b MEO service will be augmented in 2021 by our next-generation O3b mPOWER constellation, which will deliver intelligent multi-orbit resilience to the aero market. Software-defined networking (SDN) will route applications and services over the connection best suited to their requirements, ensuring a high quality of service and the most efficient use of network resources.

TODAY



IFC cost is additional to cost of flight ticket



0.5 Mbps per seat | 150 Mbits/18 Mbits modem speed

Only a share of passengers are connected

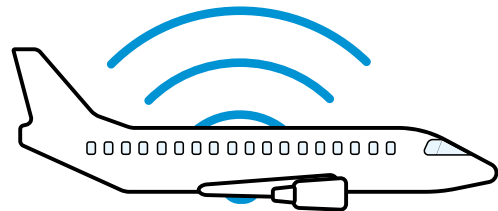


email, browsing, social media, video streaming

TOMORROW

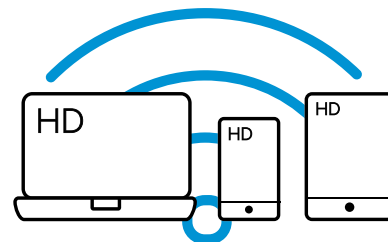


Mobile users able to roam automatically and seamlessly while in flight.



Home user speeds

Total passenger immersion



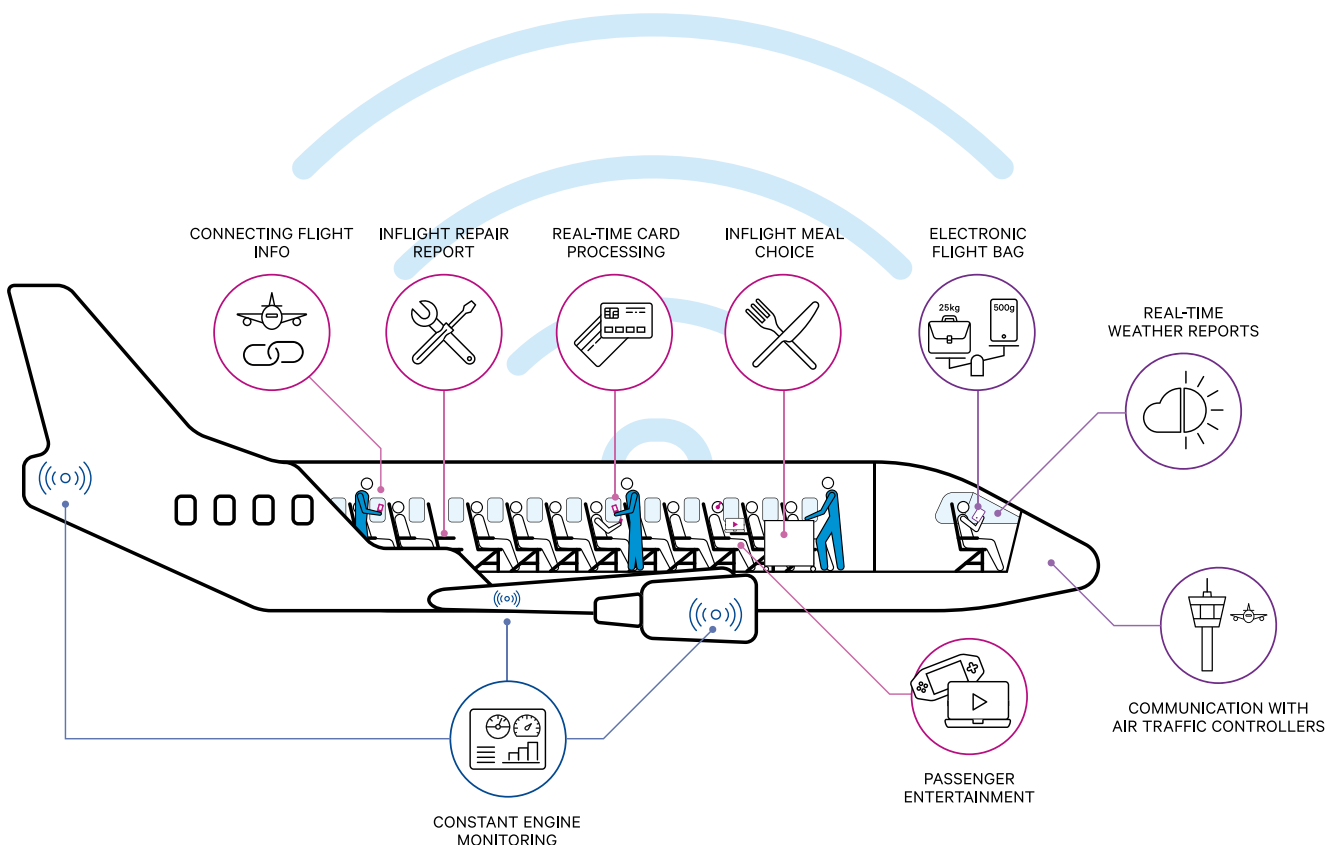
At home experience including HD video and Virtual Reality

OUR VISION OF UBIQUITOUS COVERAGE

Our vision is a market in which service providers and airlines can focus on delivering inflight services without a thought about Ku-band, Ka-band or HTS. The passenger will be seamlessly connected to the same secure entertainment and communications services in the air as they use on the ground. The cockpit will be linked to the latest flightpath weather reports, airport updates, and airline communiques. And the airline will be able to create its own differentiated brand of IFC to serve its passengers, crew, and operations teams across the globe.

To meet the soaring demand for more bandwidth per plane, we are intensely involved in the development of new technologies. In orbit, we support the development of a new breed of electric, software-defined satellites that can be built in far less time and deliver far more programmable flexibility in space to meet unforeseen IFC demands for decades to come. On the ground, we work with developers to create aero terminal systems that leverage our multi-layered fleet, and allow airlines to move beyond discussions of which frequency band is right for them.

Our next-generation software-driven satellite systems, built on collaborative work and innovative platforms, are accelerating the future of IFC across the globe.



Shaping the inflight connectivity market

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