
How Satellite Brings You a Better Flight

Satellite technology is getting ready to make your next airplane flight a whole lot better.

Once a luxury experience for the well-heeled, airplane travel has become a regular part of life for most of us, at least in the affluent parts of the world. In 2015, people took 3.4 billion airplane trips, up 700% from only 432 million in 1975. People in high-income countries accounted for two out of every three trips.

Affordable air travel is good. Not so good are long, boring flights packed too tight with too little to do. Infuriating delays that ripple through the overburdened system like a bad case of the flu. And occasionally, the terrifying moment when a flight disappears, never to be seen again.

The world's airlines and air traffic managers have a solution to all these problems – and the solution is satellite.



Staving Off Boredom – and Saving Billions

For better or worse, being connected is central to modern life. The screen rules, whether it is the phone in your pocket or purse, the tablet in your hand or the laptop in your bag.

Not so long ago, however, the screen's domain ended at the aircraft door. Phones and laptops were switched off for take-off and landing, and once airborne, there wasn't much to do with them but play games or catch up on work. But starting in 2009, airlines began installing Wi-Fi aboard their aircraft. Suddenly, the device in your hand or lap was in touch with the world. The experience, however, left most users frustrated. The systems on board each aircraft communicated with antennas on the ground. That meant they only worked on flights over land. Spotty coverage and slow speeds made it feel like surfing the web on a 10-year-old mobile phone.

Then satellite got into the game, and things changed fast. A new generation of satellites designed specifically for broadband went into service aboard airlines beginning in 2016. They brought multi-megabit speeds into the cabin for everything from email and social media to online shopping. A recent survey by Honeywell Aerospace concluded that two-thirds of airlines passengers are choosing flights that have Wi-Fi on board and are willing to put up with additional hassle, such as early check-in, to get a flight with fast digital speeds.

At first, airlines were concerned about the expense of adding yet another amenity to the flight experience, but they soon fell in love with the idea of delivering content to passengers' own devices. Inflight entertainment systems, installed in the back of the seat, can cost nearly \$8 million per airplane. Wi-Fi delivery was a much

better value: when a French airline decided to distribute iPads to passengers, it saved \$2.75 million on each plane. Cheaper installation is encouraging airlines around the world to add Wi-Fi to their planes. A 2016 research report projects that providing connectivity to passengers will earn communications companies nearly \$5.4 billion in 2025, up from \$700 million in 2015.



Lost in Space

Satellites do much more for airline passengers than make the hours pass. When airlines fly over land, air traffic controllers track them using ground-based radar. But two-thirds of our planet is covered with water, and once aircraft head out over the deep blue sea, they pass out of radar range.

If you're a nervous flyer, you may be troubled by the idea that your airplane, once over the ocean, is literally out of sight. It is not, however, out of mind. Air-traffic controllers substitute good planning for lack of knowledge. They assign aircraft specific routes, speeds and altitudes, and a specific time to enter their route, so that planes maintain a safe distance from each other. The importance of that timing accounts for why transoceanic flights

leave on time more often than flights over land.

It is not quite true that nobody knows where your airplane is. The flight crew knows, because they have access to the same GPS satellite navigation data that powers the maps on your mobile phone. Regulations require them to radio their location to air traffic control centers they pass. It all works extremely well most of the time – but flights do sometimes vanish. The most recent and infamous case was Malaysia Airlines flight 370, which disappeared in 2014 while carrying 239 passengers over the Indian Ocean.

Flight 370 was equipped with a satellite tracking technology called ADS-B, which reports position, altitude and speed to a satellite every 6-12 seconds. Most commercial aircraft carry ADS-B gear today, but for unknown reasons, Flight 370's system was switched off. At normal flight speeds, such frequent reports let authorities narrow the search area to a little over 100 square miles (260 km²) instead of the 4,600 square mile (120,000 km²) area that was searched for traces of flight 370. Better data has the potential to save lives when aircraft make a water landing.

The More We Know, the More We Can Do

ADS-B is the beginning of a satellite technology revolution in air-traffic control that will bring amazing improvements to air travel over the next decade. ADS-B not only communicates with ground controllers, it also connects to any ADS-B equipped aircraft in range. That means aircraft can begin telling each other and air-traffic control where they are with extreme accuracy, even when they are on

the ground and invisible to radar. With better data, aircraft can begin flying closer together and squeezing more landings and take-offs into the same runways. It is the foundation of a system called NextGen being developed by the US Federal Aviation Administration and similar systems underway in Europe. NextGen turns the air transportation system into a gigantic network, in which each aircraft automatically shares the job of air-traffic control with the controllers on the ground. Information sharing will let airplanes fly more direct routes, lower fuel consumption and reduce delays.

Every flight begins with a briefing about the things keeping you safe, from seat belts and life preservers to inflatable rafts. Today, more and more of those things are digital services delivered by satellite, and you can thank those orbiting assets for protecting you, entertaining and informing you on the way to your destination.

“Air Transport, Passengers Carried,” World Bank 2017. “Will Wi-Fi Change How Airlines Keep Us Entertained Above the Clouds” by Katie Moskvitch, BBC, July 2, 2015. “Five Billion Reasons to Bet on In-Flight Connectivity,” by Jordan Yerman, *Airline Passenger Experience*, February 12, 2016. “How ATC Tracks Planes Flying Over the Ocean,” by Vic Vector, *ThePointsGuy.com*, 2015. “Satellite Tracking to Keep tabs on Airliners Over Oceans,” by Joan Lowy, *Phys.org*, January 19, 2017. “New Air Traffic Surveillance Technology,” by William Richards, Kathleen O’Brien and Dean Miler, *Aeromagazine*, 2nd quarter, 2010. “Delivering NextGen,” Federal Aviation Administration.

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