



GOGO 5G

A guide to the future of inflight internet





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What is 5G?



Generational differences

We're used to talking about generations — baby boomers, millennials, something called Generation Z — but the most important generations in our lives might in fact be digital.

5G is the fifth generation of cellular network technology, as established by worldwide standards organizations. These generations have come and gone since the 1980s and are generally marked by a change to the fundamental nature of the communication or some other notable technology advancements.

In the next several years, 5G will become the new normal, with older generations such as 4G and 4G LTE yielding to its upgraded standards and higher performance. From Gogo's perspective, 5G is the most impressive combination of immediate and future benefits we've ever seen — which is why we decided to adopt it right away.

This guide explains some of the most important ideas that informed Gogo's adoption of the technology.

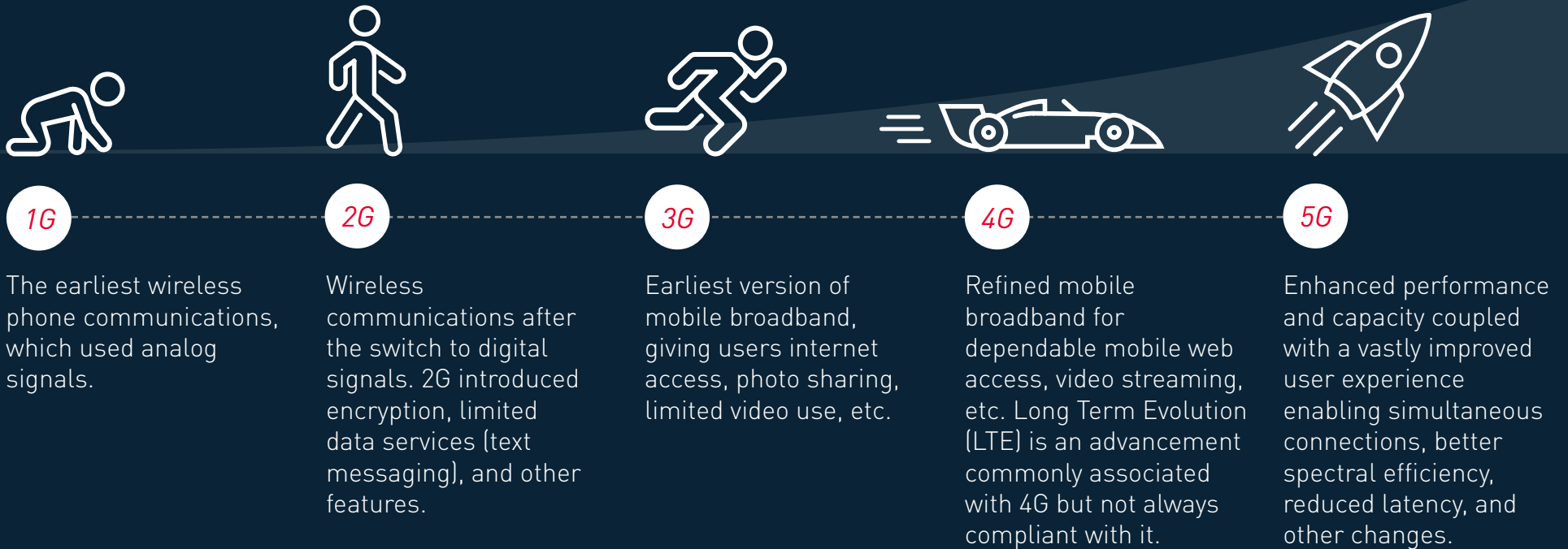
Aviation is no longer “behind”

Today, the world's leading ground carriers are starting to deploy 5G connectivity for their users. Gogo's switch to full 5G service to serve aviation is happening at the same time — so it represents the point when the aviation sector and ground sectors are advancing at the same time, for the first time.

The gap between airborne and ground connectivity will be smaller than it's ever been.

This is a fantastic moment in the history of inflight internet.

1G-5G: Learning to fly



Gogo 5G at a glance

Rollout: **2022**



Dedicated network serving only aviation

Uses existing tower infrastructure of **more than 250 towers**

Significantly faster and robust for a better experience



Lower latency to more closely resemble the in-home connectivity experience

100% end-to-end true 5G as defined by 3GPP: the global consortium that sets mobile broadband standards



Using 64MHz of spectrum - 60MHz of unlicensed spectrum, which will work with the 4MHz of FCC licensed spectrum we own and operate today





Why Gogo 5G?

A new era of connectivity performance



- 01** High speed
- 02** Low latency
- 03** High bandwidth
- 04** High reliability
- 05** Nationwide coverage

5G is more than an incremental upgrade: It's a new era of mobile broadband that will affect how passengers do business and spend their time in the air. Aside from raw transfer speed, there are several other crucial benefits (covered in detail later) that will enhance productivity, streamline airborne systems, and even lessen passengers' mental workloads.

Gogo 5G will present a dramatic acceleration of connectivity performance and increased capacity to accommodate the rising demand for data onboard business aircraft.



01

High speed

Yes, speed and more speed. Make no mistake, Gogo 4G is a fast inflight internet service. But with Gogo 5G, your airborne experience has never been this similar to your home or office experience. Productivity zooms. Interactions happen in real time, like you're really there.



02 Low latency

Don't be latent. Latency, in simple terms, is a system communication delay that results from data having to travel back and forth from the aircraft to the network (such as a cellular tower or a satellite). The greater the distance, the higher the latency. When using inflight connectivity, people who experience latency often call it a “lag” or they begin to see “buffering.” Whatever you call it, it’s annoying.

Gogo 5G will have ultra-low latency, which users will love — especially compared to any satellite systems, which have much higher levels of latency and makes things like streaming and Wi-Fi calling very frustrating to do.

Gogo’s existing ATG networks already have low latency compared to satellite, and Gogo 5G will effectively deliver the end of “lag” and skyrocket executive satisfaction with the Wi-Fi experience.

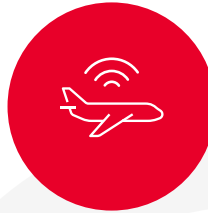
03

High bandwidth

Gogo 5G is not just about speed, it's also about giving you more bandwidth to the aircraft. Bandwidth is vitally important because it enables "lots more" -- lots more users and lots more devices accessing the network at the same time without any impact on the experience. 5G's greater bandwidth is key because users on board are using more and more data every year.

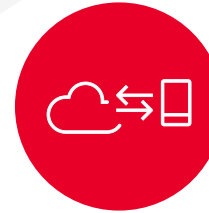
Today with AVANCE L5, multiple users can connect and do data-heavy activities such as video streaming and virtual conferencing. With 5G, however, streaming will go to a whole new level. From Zoom and Teams, to ESPN+ and Disney+, to Slack, iCloud and more – everyone on board can access it all with a seamless experience.

**People are using more data.
Be ready for it.**



**6,070,000
GIGABYTES**

of Gogo network data
consumed in just 1 year



**3X
DATA USAGE**

between 2014-2021,
growing from 100MB
to 300MB per flight



**9
DEVICES**

average per flight
- an 80% increase
since 2015



Did you know?

Gogo ensures that the ATG network uptime is over 99.7%. It takes a lot to operate and maintain a network.

04

High reliability

Gogo's mission is to deliver the most reliable connectivity in business aviation. We own and operate our networks, and we created the AVANCE platform. Our 4MHz of licensed spectrum is a critical differentiator for Gogo - it's what all our existing systems use today to connect 6,000+ ATG aircraft, and it guarantees Gogo will always have an exclusive and reliable signal.

On every Gogo AVANCE system, Gogo Multilink Balancer (GMB) software dynamically manages the total 64MHz of Gogo 5G bandwidth to deliver the best available passenger connectivity experience. If there's high usage (radio frequency noise) on the unlicensed network, the GMB adjusts to ensure you remain connected to the best available service.

In other words, our software manages the network traffic, so you can just focus on using the internet to do more important things.

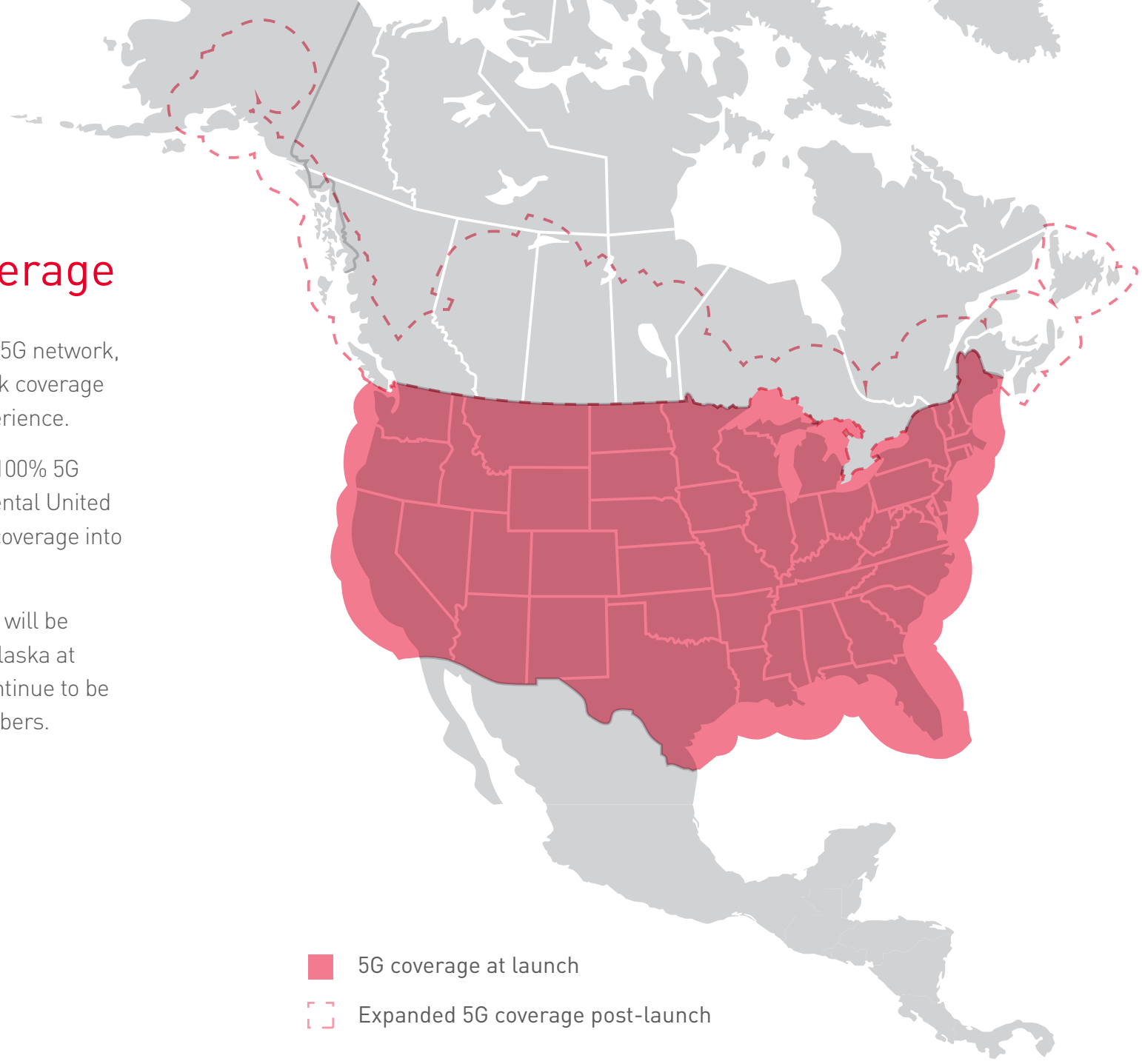
05

Nationwide coverage

Gogo is building an entirely new 5G network, but our existing licensed network coverage is a key part of the Gogo 5G experience.

At launch, Gogo 5G will provide 100% 5G coverage throughout the continental United States. We will then expand 5G coverage into Canada and Alaska.

But that does not mean that you will be without service in Canada and Alaska at launch. Gogo Biz service will continue to be available for all Gogo 5G subscribers.

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- The map displays the continental United States, Canada, and Alaska. The continental United States is shaded in a solid red color, indicating 5G coverage at launch. A dashed red line outlines the entire continent of North America, including Canada and Alaska, indicating expanded 5G coverage post-launch.
- 5G coverage at launch
 - ▭ Expanded 5G coverage post-launch

Bringing 5G to the skies



Gogo is building aviation's first and only true 5G network

Gogo has a team of professionals who know how to build, deploy, and operate an air-to-ground network. In fact, many of the people who built Gogo's original network are still with the company today. They know the systems, they know the geography, and they've done similar planning. They're the expert team that will make our 5G network fly, and they are on track for launch.

For us, 5G is an evolution rather than a reinvention, and with our experience in the industry we can deploy it smoothly and cost-effectively.

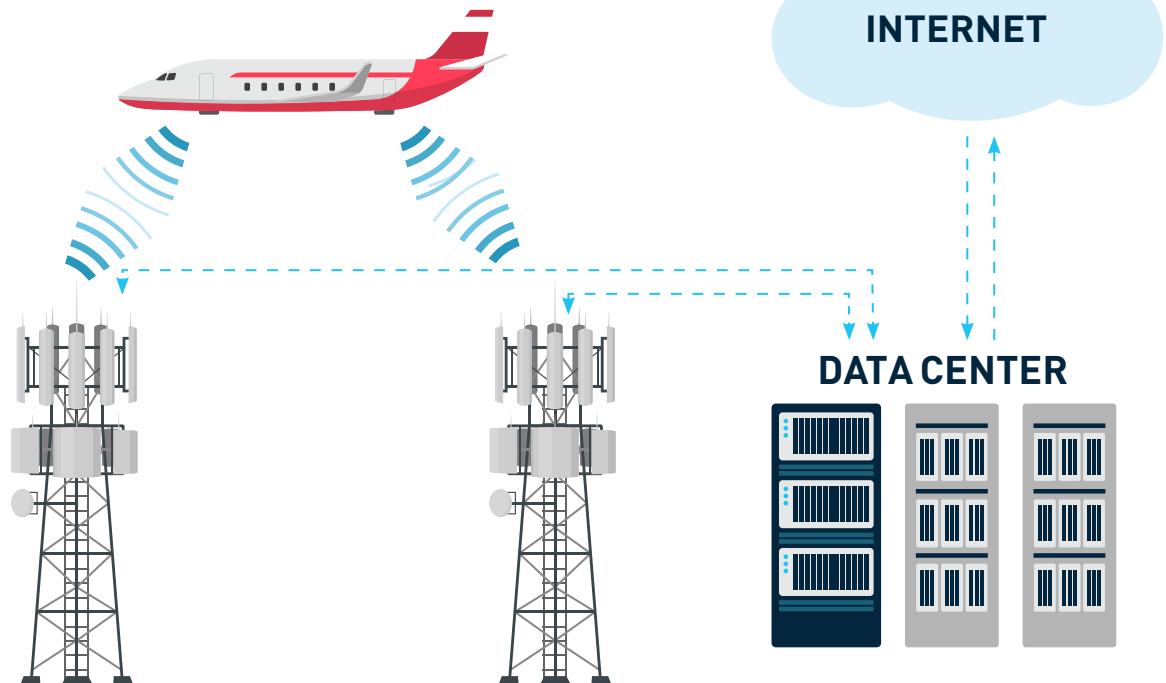




The Gogo 5G Network is 100% end-to-end 5G



- › Meets or exceeds 3GPP standards
- › Airborne equipment has 5G chipset
- › Ground base radios at each base station are 5G
- › Data center servers are all 5G core servers












The assurance of vertical integration

One of Gogo's biggest differentiators is that we directly manage almost all of our network infrastructure. We also design and build most of our onboard systems. This level of ownership and coordination is unique to Gogo, and it allows us to maintain unmatched levels of dependability and service — even through technological change.

Gogo solely manages the following functions:

-  Cellular towers
-  Onboard hardware and software (servers, routers, antennas)
-  On- or off-site repair, troubleshooting, installs, and upgrades
-  Data centers and backhaul
-  Customer service
-  Security protocols and systems
-  Industry-leading cybersecurity

New capabilities. The most trusted, proven infrastructure.

With 5G, Gogo is able to make significant performance advancements while relying on a proven, time-tested network infrastructure (towers, backhaul, hardware, software, customer service, etc). This provides several crucial benefits to users:



Benefits of Gogo 5G in the air

- **Productivity:** More bandwidth to the plane maximizes your ability to get more done while in flight.
- **User experience:** Your airborne experience and your office experience on the ground have never been this similar.



Benefits of proven Gogo infrastructure on the ground

- **Peace of mind:** Your experience is as dependable as it's always been, even as the technology advances.
- **Seamlessness:** Gogo can roll out these and future changes in short order, without customer disruption.



Gogo's technology partners



World-class experts creating a world-class network

To deliver true 5G technology, Gogo is collaborating with several of the wireless industry's leading innovative and trusted companies.

Each one is helping us develop select components that are critical to bringing the world-class Gogo 5G network to life.

At a glance: How Gogo is making 5G a business aviation reality



**System software,
management, and service**

The tried-and-true ecosystem
and partnership you trust



Aircraft antenna technology

Advanced US military transmission techniques



Data center technology

Seamless, simplified integration of various network components



Base station technology

Carrier-grade transmission quality no matter your speed, altitude, or situation

The Gogo 5G aircraft antenna



The Gogo 5G antenna is a multi-function, belly-mounted blade antenna. The compact design accommodates complex multiband apertures, advanced beamforming technology, phased arrays, and other important features. It also integrates legacy and future network technologies, which is crucial for overall 5G network performance.

Novel beamforming techniques enable the Gogo 5G antenna to achieve outstanding gain from such a compact device, which increases system throughput to more reliably meet the demands of the Gogo 5G network. It also features a highly aerodynamic blade shape to minimize drag.

The Gogo 5G antenna in detail



Type	13-inch, blade-style, multiband phased array antenna
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Standard RF/coaxial interfaces that align with existing Gogo dual directional antenna interfaces

Approximate dimensions	13" L x 8" H x 4" W
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Antennas per aircraft	2
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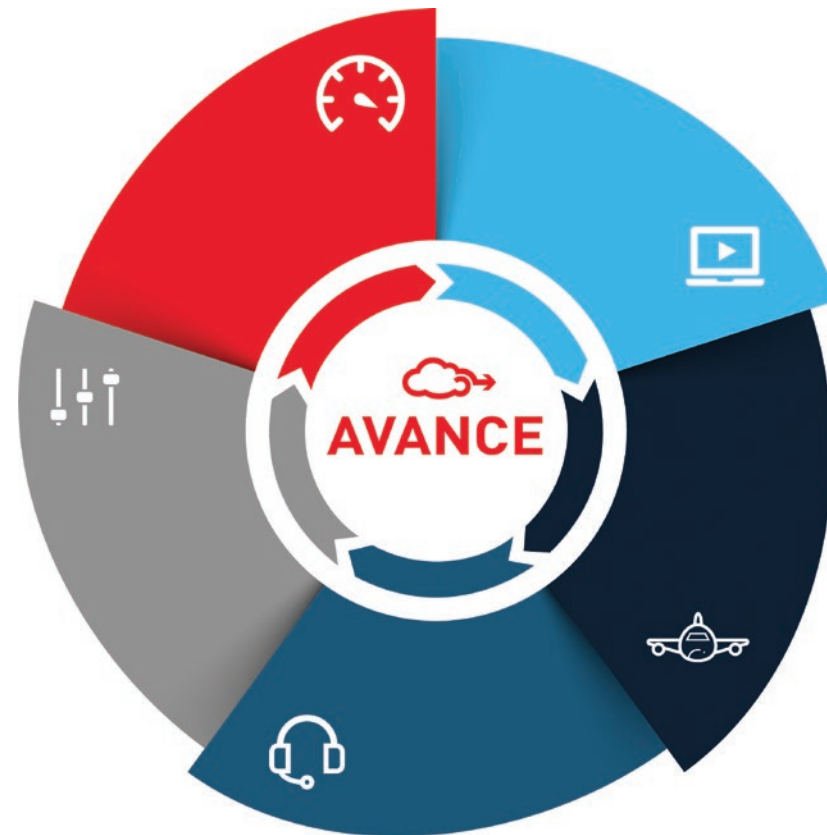
AVANCE makes Gogo 5G possible



We're building Gogo 5G to run on, and fully leverage, the power of the Gogo AVANCE platform.

Gogo AVANCE is inflight connectivity and entertainment's (IFEC) smartest platform and the fastest, most personal way to enable passengers, crew and operators with the full power of connectivity.

AVANCE delivers Gogo's promise to help business aviators move away from generic Internet pipes and unsustainable hardware to a new era of digital platform solutions that enable truly smart airplanes. And we're doing it so you can create connections in ways never before possible: in the cabin, in the cockpit, in your flight operations and in your business.



And transforms your entire IFEC experience



Gogo AVANCE systems are fully integrated platform solutions that give you the power to transform your entire inflight experience and leverage every digital opportunity possible: in the cabin, cockpit, and your operations.

PERFORMANCE

Connect to the fastest, most reliable, future-ready networks – 3G/4G/5G.

PRODUCTIVITY & ENTERTAINMENT

Empower business tools and personal tasks for passengers. Instantly offer incredible, on-demand entertainment experiences.

EFFICIENCY

Improve operational efficiency by unlocking pilot information and aircraft data.

CONFIDENCE

Ensure maximum uptime with proactive, remote, cloud-based support.

CONTROL

Leverage innovative tools to control, customize and brand your IFEC experience.

4G now and 5G ready: AVANCE L5



Gogo AVANCE L5 not only connects you to the full power of the Gogo platform and today's incredible Gogo Biz 4G inflight experience, it's also the system that provisions you for Gogo 5G.

So, you get the best of now and the best of what's next, via a single install that eliminates the need for full system swaps in the future.

See for yourself why AVANCE L5 is the fastest-adopted connectivity system in business aviation history.

business.gogoair.com/avance/l5





“ At Gogo, we never stop innovating. We build systems and networks that are designed to provide the best user experience today and well into the future.”

– SERGIO AGUIRRE, PRESIDENT,
GOGO BUSINESS AVIATION

How will my experience change?

To gauge the practical performance differences between 4G and 5G, try these scenarios on for size.

4G

Streaming video is certainly doable, but there may be limitations depending on the service you're using and the amount of bandwidth being used by others in the cabin.

You can connect multiple devices to your inflight network, but those added devices start to gobble up bandwidth, which may impact your experience.

Get your flight apps and related avionics tools updated and ready before you take off, and reap their rewards in flight.

Your aircraft is incredibly productive. You can stay in touch with everyone and everything on the ground.



GOGO 5G



Just stream it.



*Let them connect.
Your bandwidth doesn't care.*



*Go ahead and update them
while in flight.*



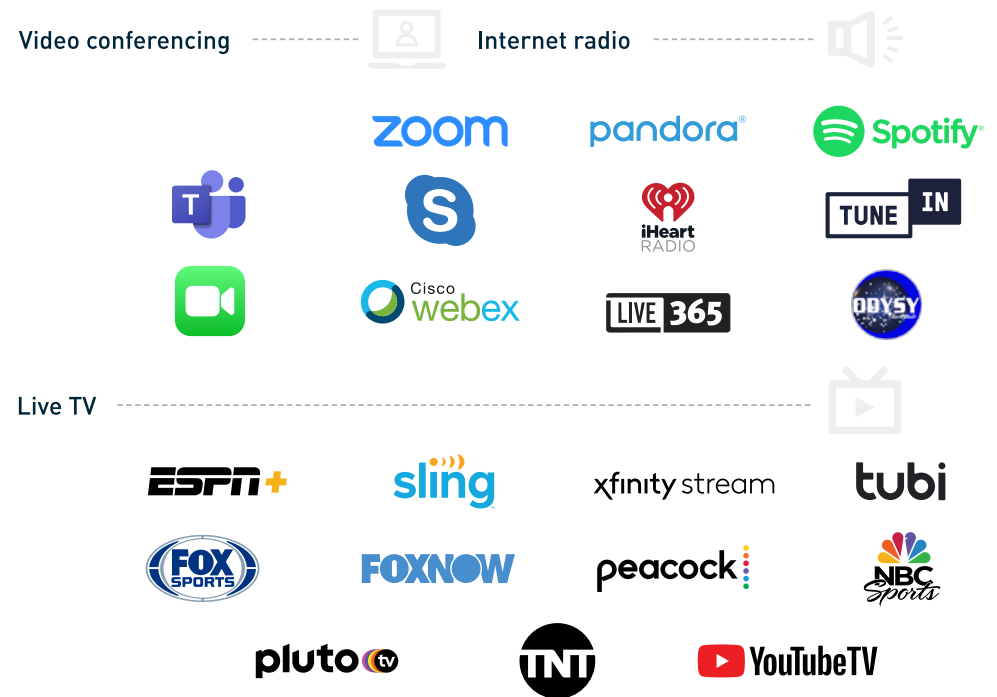
*Online interactions now happen
so fast that you forget you ever left
the ground.*

Streaming: Gogo lets you use today's most popular tools



Streaming is what passengers want during flight. AVANCE L5 + Gogo 5G gives you everything you need from your inflight connectivity — now and in the future.

Live video is harder to stream than movies or TV shows because live video doesn't allow for sending packets of data ahead of time. These packets allow your video player to stay a step ahead of your viewing, protecting quality. With AVANCE L5 you can already stream live video, but when Gogo 5G launches, live streaming will go to a whole new level of quality and capacity.



trust



NOC

Customer support



The value of independence and integration Customer support can be just as important as the technology on your aircraft, and Gogo is consistently rated best-in class. Our AVANCE platform enhances our existing support because of its automated “phone home” capability, which feeds data from the aircraft to our service centers for better troubleshooting and resolution.

Notably, Gogo’s vertical integration, from our ground network to the onboard systems to billing, means that with a single phone call you can get all the answers, and access all the experts, you need. No need to call multiple customer-care teams or wait for different firms to do their job.

“Connectivity from the sky is not just about technology. You also need reliability, coast-to-coast coverage, and service and responsiveness from your provider. It’s not just a question of functionality, but also dependability, support, and relationships.”

– TODD DUNCAN, CHAIRMAN,
DUNCAN AVIATION

Nobody does it better

We’re always thrilled to be recognized by customers and our peers for the innovation and dependability of Gogo systems. Here are some of the accolades and achievements we’re especially proud of right now.

#1 AIN Magazine ranking for customer service



in nine of the last eleven years

Business & Commercial Aviation Magazine Readership Award for



Best Business Aviation Cabin Connectivity

A factory option at every major business aircraft manufacturer



600,000+

flights connected with AVANCE systems



30 YEARS OF INNOVATION

18,600+
business
aviation systems
shipped worldwide

A factory option at **every major**
business aircraft manufacturer



Solutions installed on the
world's largest fractional fleets

With more than 30 years of innovation, Gogo Business Aviation's unparalleled experience makes us the world's most trusted provider of inflight connectivity and entertainment solutions.

We are relentlessly innovative, quality obsessed, customer focused, and globally reliable. And that is why Gogo is the brand of choice for business aviators who want to connect with confidence.

