gogo BUSINESS AVIATION

The connected Pilatus:

A guide to accelerating your business at altitude

Table of contents

01 Why we connect

A cultural and technological match

In an aviation culture where jet fighters are expected to operate from roadways in emergencies, it's no surprise that the Swiss-built Pilatus lineup embodies similar pragmatism. When the Swiss government recently took delivery of an 11-passenger Pilatus PC-24, dubbing it their "Swiss Air Force One," they made it clear that the capabilities and good sense of Pilatus aircraft are world-caliber.

So, of course, is the technology under the glossy white skin. Like many other business aircraft, Pilatus jets have proven to be ideal platforms for Gogo connectivity technology, propelling businesses across the globe to new heights of productivity.

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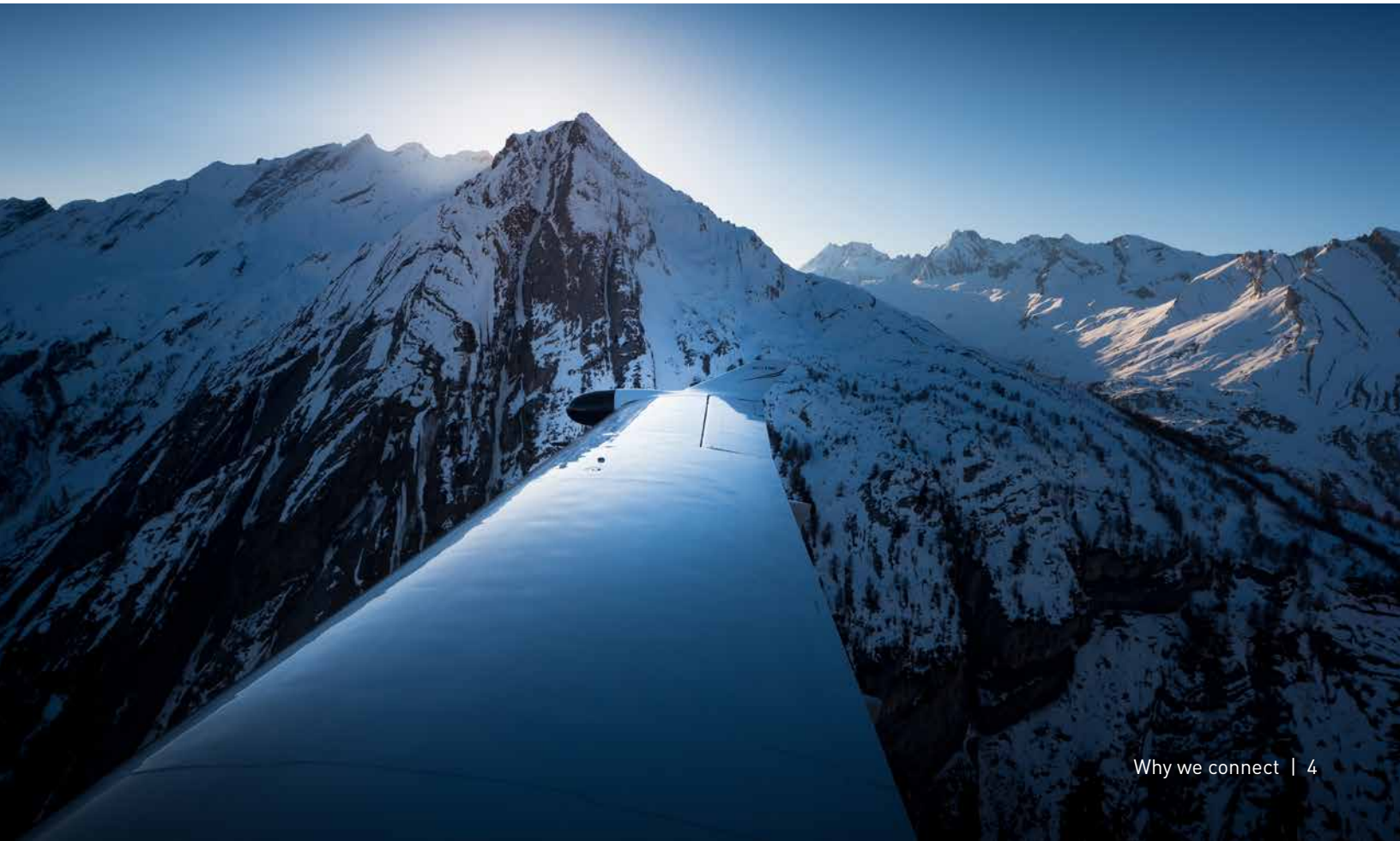


The value prop of connectivity

You know it already: Today's business travelers must connect in the air because life and work won't wait. Gazing out at the horizon isn't a luxury most of us have while flying; instead, we need to stay focused on the tasks at hand. Connectivity enables us to complete those tasks.

There are plenty of ways to provide inflight connectivity, and we'll go into more detail in subsequent chapters. But from a practical standpoint, the technology must meet a few basic requirements. It must:

- Provide good download speeds.
- Accommodate the same apps and tools you use in the office.
- Be durable and dependable wherever your flight path takes you.
- Help you improve your bottom line.

For the last 25 years, advancements in technology and network management have met these needs with increasing effectiveness.

"A lot has changed since I started flying in the 1980s. Today, people expect to be connected even at 35,000 feet going 500 mph. Anymore, connectivity is almost as important as a pilot and propulsion. It's must-have technology."

TODD DUNCAN, CHAIRMAN, DUNCAN AVIATION

GOGO: TRUSTED AROUND THE GLOBE

845,951

unique devices connected

9.7 device connections per flight

653M

miles flown while connected

2/3

of passengers said they were more productive in flight than at the office

We've come a long way

Today, connectivity is meeting our evolving business needs:

Move at the speed of business.
The markets won't wait for your flight to land. Neither will your competitors.

Keep up with your team (and keep them up to date).
If you're a leader, your team relies on you to remain productive and address issues as they arise.

A HISTORY OF CONNECTION

1959
The Pilatus PC-6 Porter, a single-engine short takeoff and landing (STOL) aircraft, first flies. It has remained in production for 60 years.

1973
Twelve military officers at the Pentagon discuss the Defense Navigation Satellite System (DNSS), the synthesis from which GPS is born.

1989
Apple, Zenith Data Systems, Compaq, and IBM release their versions of the laptop.

1997
FCC authorizes Aircell's first generation analog cellular network for aviation in North America.

2001
Apple releases the iPod, a portable media player for music, eventually supporting photos, video, and more.

2002
Aircell offers Iridium satellite service, to become a multi-network global solution.

2005
Aircell Axxess, aviation's first all-digital multichannel communications system, is introduced.

Tap into the latest intelligence.

If you own and pilot your own aircraft, a connected cockpit increases efficiency and safety.

Increase the value of your assets.

Connectivity technology increases the resale value of aircraft.

Connect with family and unwind.

We all know that connectivity isn't just for business. Sometimes you need to hear from your kiddos or your partner — or keep up with your friends via social media.

2006

Aircell is granted exclusive air-to-ground broadband frequency license in a historic FCC auction.

2007

The iPhone revolutionizes smartphone capabilities and is named the invention of the year.

2008

Aircell becomes Gogo and launches the first air-to-ground connectivity network in North America. And, offers Inmarsat SwiftBroadband service for global travelers.

2010

Apple announces a 2010 release date for the iPad.

2013

Gogo Text & Talk service enables the use of personal smartphones in flight.

2015

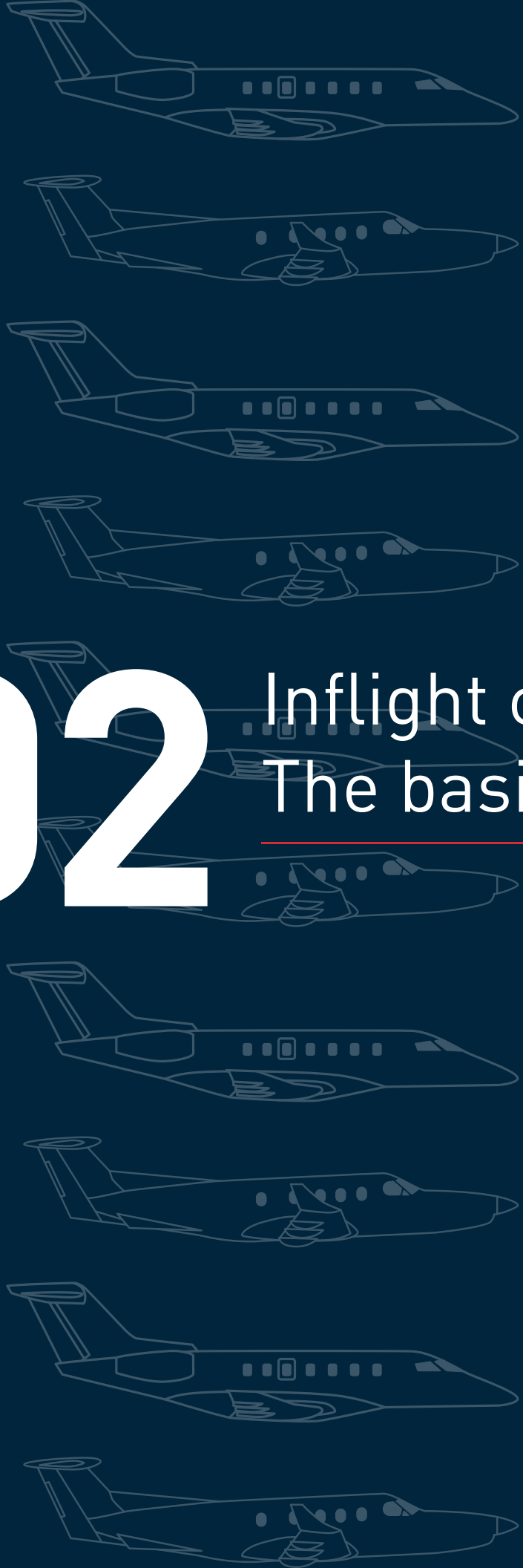
Gogo Vision introduces a new era of inflight entertainment.

2016

Gogo and Weather Services International join forces to crowdsource turbulence data for better awareness and smoother flights.

2017 and beyond

Gogo announces high-performance services and releases the Gogo AVANCE product platform.



02 Inflight connectivity: The basics

A feat of engineering

For most Pilatus owners, operators, and passengers, inflight connectivity has become obligatory. On average, we carry around two or three connected devices at any given time, and we check them reflexively. Colleagues and business partners expect us to be accessible no matter where work takes us — often instantly. Sometimes, even a 30-second hiccup in service is enough to create anxiety.

The fact that technology has met these business needs is remarkable. Behind the scenes, inflight connectivity requires impressive feats of engineering and planning — things that go unnoticed by most business travelers simply because they work so well.

In the air, a signal has to connect with an aircraft thousands of times an hour and navigate rapid shifts in orientation, speed, and direction — all while ensuring an "always-on" experience for pilots and passengers.

Moving targets

One of the most basic differences between ground connectivity and inflight connectivity is motion. Airplanes don't stand still. Instead, they dart through airspace at hundreds of miles per hour, requiring the data link to adjust quickly in real time. At home, your coax cable doesn't have to go anywhere; even if you're texting in the car, the speeds and distances involved are modest compared to those in the sky.

But in the air, a signal has to connect with an aircraft thousands of times an hour and navigate rapid shifts in orientation, speed, and direction — all while ensuring an "always-on" experience for pilots and passengers.

Distance and latency are two of the factors that impact these connections the most. The vast distances involved in air travel can weaken connections and demand switching between many ground stations; latency, often caused by making such a switch, can cause service gaps.

Fortunately, today's inflight systems are extraordinarily efficient and make all of this nearly invisible to end users.

Air-to-ground and satellite technologies

How have Gogo and other companies succeeded at connecting business travelers in the air? They've used available resources exceptionally well. Two of the most important of these resources are air-to-ground (ATG) and satellite technologies.

In principle, ATG, which equips most domestic U.S. Pilatus aircraft, isn't much different than your cellular connection.

An aircraft communicates with a ground station, ideally within a target range and line-of-sight bearing. With ATG, the ground station antennas serve aircraft that pass through their airspace, similar to the way your cell phone connects while you're in a moving car.

Satellites are different, and there are additional steps involved in getting, say, an email to outer space and back.

With either technology, key factors that are important to aviation are the available network capacity (today and in the future), the number of available towers and/or satellites covering flight routes, and connectivity redundancy.

A note on efficiency and optimization

One of the easiest ways to compromise your connection is to leave a bunch of your devices on while you're working on something else. Even though those devices might not appear active, they're still sending and receiving information without your input. And that uses up both your inbound and outbound data capacity. Protect those pipes.

More information about efficiency and optimizing your system appears in chapter 3.

Speed vs. capacity: A metaphor

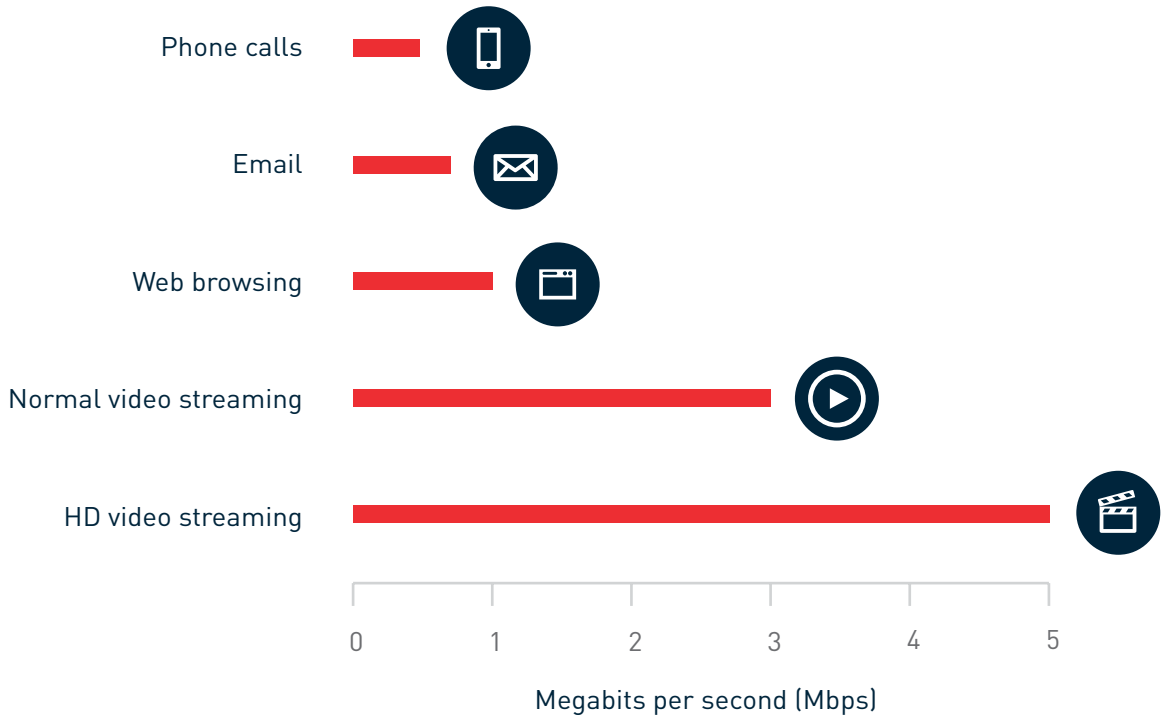
Speed is an intuitive measure of a connection's quality — but it's not the whole story. The better measure is capacity. Consider this in plumbing terms: A small pipe and a big one can have the same throughput speed, but the larger pipe is going to transmit more material (or data). "Bandwidth" describes capacity, and a larger bandwidth means you can send more information at a given transfer speed.

Except there are two pipes

There are actually two "pipes" at work on your aircraft — one for the incoming data stream and one for the exiting stream. Inflight connectivity systems keep these data streams separate to ensure that both can function regardless of the other's load. Outbound streams are usually smaller, since people are impacted more by how fast they receive data than how fast it gets sent away.

Not all streaming is equal

The files we stream vary widely in size. One way to express this is by the minimum connection speed required to stream each type. For example, the connection speed needed for a phone call over VoIP is less than 0.5 Mbps; an HD video requires 5.0 Mbps. Users can unknowingly exceed their data limits by treating each file type as if it uses the same system resources. By remembering what kind of data you're asking your system to handle — and the scale of its consumption — you can avoid such surprises.



The hardware

Fortunately, the hardware involved in inflight connectivity is minimal — you might even say elegantly so. Aside from the obligatory box (which resembles the modem/router boxes you have at home), IFC solutions will include aerodynamic antennas or radomes that attach to the fuselage.

Pictured here is the Gogo AVANCE L3, one member of the industry's best ATG lineup for Pilatus aircraft. It allows for streaming of video and audio, email, text and talk, and high-speed Internet.

Gogo AVANCE represents a shift in how new functionality is delivered. It's a core platform that allows for easy upgrades to service plans, features, and capabilities as time goes on.

Gogo AVANCE L3

Type: Air-to-ground for domestic networks

Dimensions: 4.18" W x 8.38" H x 16.24" D

LRU weight: 15 lbs.

Antennas: 2

THE CONNECTED ECOSYSTEM

Regardless of your plane's purpose and specifications, today's connectivity products are durable and serve the whole plane. By allocating available resources well:

1. **Pilots can get up-to-date intelligence pushed to the cockpit via their favorite flight apps.**
2. **You get your email and attachments at your workstation.**
3. **Your other passengers or family get the connectivity they need.**

For more information, visit business.gogoair.com/solutions.

03 Aboard the Pilatus: Connectivity in practice

When the stakes are sky-high

As consumers of inflight connectivity, business travelers are primarily concerned with one thing: productivity. Million-dollar contracts are routinely sent, received, and signed at 35,000 feet — often, business simply won't adjust to your flight plan.

As a result, the connection you have on your Pilatus had better perform regardless of where you fly. No executive or manager wants to experience four hours of dead air, only to find that a competitor made a move while they were airborne. Here's how to optimize your system and control your life in the air.

"One thing that I like as a pilot is to have redundant systems when I fly. With inflight connectivity, I have access to flight and weather information through my flight apps — in addition to my onboard radar and other cockpit tools. Inflight Wi-Fi is a valuable asset for routine, as well as extraordinary, missions."

MARC DULUDE, PILOT/AIRCRAFT OWNER

How to maximize bandwidth

Limit the number of devices that are active at any given time. Remember that even "inactive" devices consume small amounts of bandwidth. Power them down when you can, and disable automatic updates while you're in the air.

Suspend cloud services (iCloud, Google Drive, etc.). Sync them once you've landed.

Be aware of your file types and sizes. That sprawling PowerPoint presentation from the sales department will consume a much larger volume of bandwidth than downloading an email. And content within apps — like that autoplaying Facebook video — can stealthily rob you of bandwidth.

Becoming a good user

A few key ideas can help users get the most from their connection. For example, as we discussed in an earlier section, understanding bandwidth is a little trickier — and more consequential — than it might seem.

Solving video

The most affordable and dependable way to enjoy video in flight is to download what you want to watch while you're on the ground and store it on a server on the plane. Gogo Vision, Gogo's inflight entertainment and information solution, provides offline access to movies, TV episodes, news, weather, and flight information when you fly. Catching up on the news or watching the latest Hollywood release won't require an internet connection.

This is both practical and financially smart. Even when streaming video midair is technically feasible, the cost can sneak up on you because video files are so huge.

To learn more, visit **business.gogoair.com/technology/inflight-entertainment/gogo-vision/**.

Long-term investments

Adding a connectivity solution to any Pilatus is an important decision with long-term impact. Here's how Gogo is planning for the future:

We've introduced Gogo AVANCE, which currently leverages our existing North American ATG network. This platform has been designed as an easy upgrade for existing customers, and a future-proof solution for new ones.

An upgrade to Gogo AVANCE puts you on a path of natural progression to even better, faster technology — the platform can grow as new technology becomes available.

We have two decades of experience with network management and support services to draw from, and we're constantly looking ahead. While technologies can evolve by leaps and bounds, our newest solutions are all supported by our proven network and support services, which are continually optimized. Customers routinely tell us how important stable infrastructure and personal, responsive support are to them.

From the pilot's seat: Connectivity in the cockpit

To a typical pilot, whether they own the plane or not, money management is always a priority. These are the users who understand the value of connectivity but must fit it within a more constrained budget environment if they want to stay in the air. Pilots also bring different needs, including real-time cockpit intelligence.

To them, connectivity isn't necessarily about pleasure or even conducting business — it's about improved situational awareness and redundancy. Fortunately, there is a menu of aviation apps supported by Gogo, and these can provide supplemental information for navigation, logging, briefings, and flight-plan filing. Providers include Garmin, ForeFlight, FlightAware, Honeywell, and other industry leaders that improve the flight experience with every software update.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RADIO
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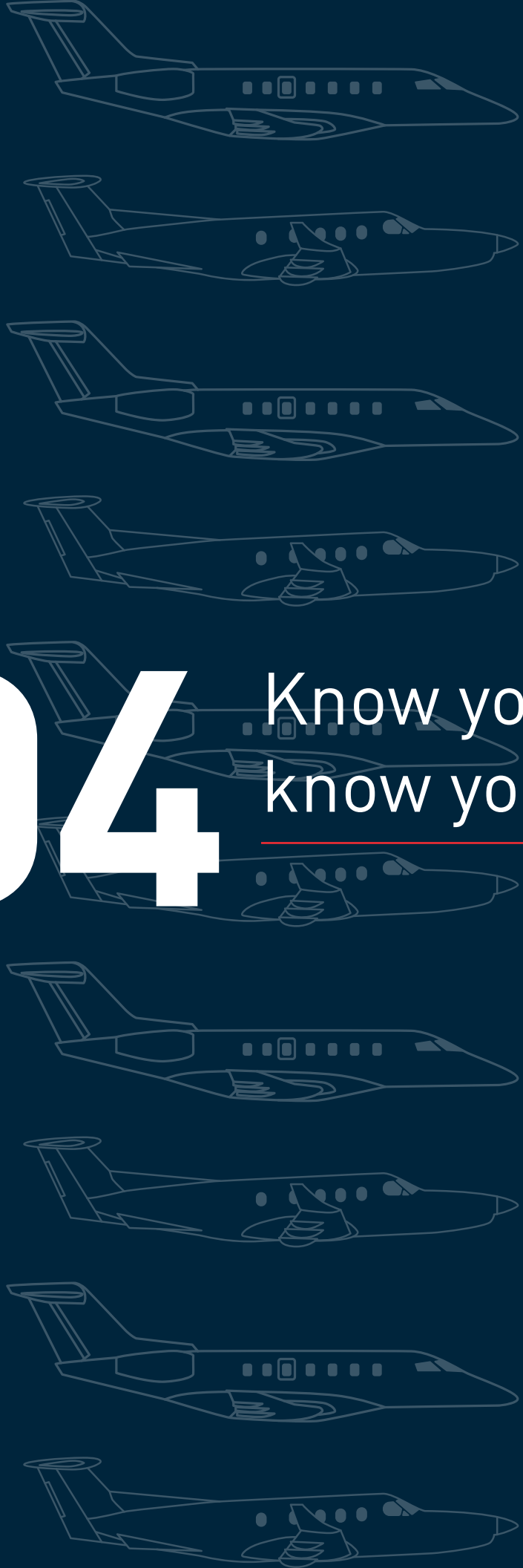
122.900
121.900
110.35
110.35
116.90
335.0
PILATUS



04 Know your Pilatus, know your solution

Tailored to your Pilatus model

Gogo can equip any Pilatus, but different models have different ideal setups. Flying, after all, is a complicated contest of physics, where adding equipment and antennas forces us to address aerodynamics and gravity. Equipment and installation costs, and the expense of monthly plans, are also concerns. That's why we market diverse solutions. We also provide the advice and background buyers need to help them make the best decisions.

"Even for lighter aircraft, inflight connectivity provides a value you may not realize. Consider the cost of your time along with having access to external data to support your flight and flight operations. The value of staying connected to your teams, your family, your business may become obvious. With inflight Wi-Fi, you can stay accountable and responsible, even when you fly."

TRACY FORREST, PILOT/AIRCRAFT OWNER

The big four

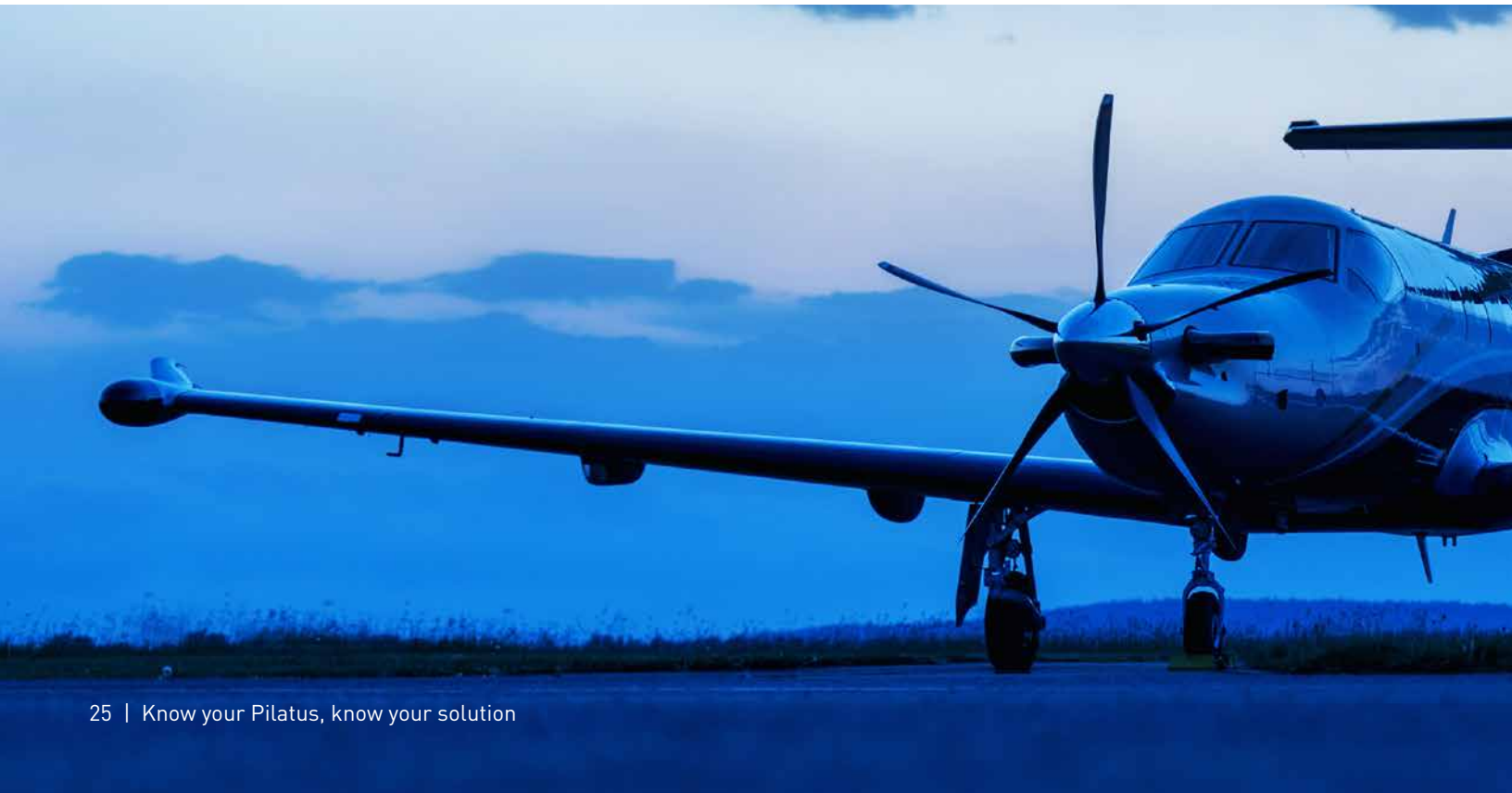
Four factors commonly affect connectivity choices across Pilatus models:

1. Physical/structural considerations
2. Device count
3. Service options
4. Mission type

Keep these in mind when you're considering connectivity options, and you'll be more likely to find the right combination of functionality and cost effectiveness.

1. Physical/structural considerations

Particularly among smaller aircraft, internal fuselage space can be at a premium, which means the connectivity solutions for these planes are likely to resemble the cable equipment you might have at home: a smallish box coupled to one or two externally mounted antennas. This equipment provides more than enough functionality for many cases, particularly for light to mid-size jets.



2. Device count

Service plans commonly scale up in proportion to the number of allowed device connections. That's because, unsurprisingly, increasing the number of devices raises the cost of administering them. With this in mind, it makes little sense to buy a plan that allows for 24 connections if your aircraft only has eight passenger seats.

Rightsizing your device count is also a way to self-throttle your data usage and avoid unforeseen costs.

For example, Gogo AVANCE L3 provides a service option that allows for up to five devices to connect simultaneously — more than enough for many Pilatus flight plans.

3. Service options

More connections and functionality equate to higher costs. For example, provisioning multinetwork management, as the Gogo AVANCE L5 allows, is desirable to some customers but unnecessary for others. Internet that's equivalent to what you get at a coffee shop? That could be either obligatory or non-critical, depending on your situation. We've found that most customers keep the same general use habits in the air that they have on the ground.

4. Mission type

Does your Pilatus fly outside North America, or are its routes domestic? How long does it fly, and how far? What types of passengers are on the flights (corporate executives, family members, engineers and technical staff)? How much do these factors vary flight to flight? Your mission type tells you and your connectivity provider how a plane is used and what its typical needs are. Fortunately, this usually isn't difficult to assess.

What about aviation regulations?

Anyone in business aviation will know that it's a complicated regulatory environment, and manufacturing and installing connectivity equipment are not exceptions.

Matching your equipment to your plane type and service needs is the key to success. To do this, study up using resources like this one, and then enlist a partner you can trust. Not just someone who'll sell you a service, but someone with a proven track record who can ensure the service you choose won't cause compliance problems.

"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

GET A DEPENDABLE PARTNER

Inflight connectivity solutions are only as complex as the use cases they serve. The right partner can demystify connectivity with:

- Industry know-how
- The perspective to see changes coming
- A willingness to listen to your needs

At that point, life won't have to stop between takeoff and landing — regardless of the plane you fly.

05 Understanding and controlling cost

Creating a sustainable plan

The primary considerations for inflight connectivity aren't just technical — any procurement must also be financially sustainable. Fortunately, there are several connectivity options to meet virtually any budget. And while there are many options available, the choice doesn't have to be daunting.

The following practices and guidelines will help you navigate the inflight connectivity acquisition process and fly away with a solution that is both useful and financially sensible. The following pages might even shed light on whether your current solution is the best available to you.

Inflight connectivity customers have a menu of choices based on plane type, mission, domestic/international flight profiles, and budget.

It’s about balance

Inflight connectivity customers have a menu of choices based on plane type, mission, domestic/international flight profiles, and budget. Any purchase decision involves judgment calls — balancing affordability and functionality, thinking ahead to future business needs, and signing on to a sustainable monthly plan. There are two main cost-generating categories with inflight connectivity:

1. **Hardware and initial setup**
2. **Ongoing monthly plans**

Each has been the savior — or downfall — of customers in this industry, so let’s demystify them.

1. HARDWARE AND INITIAL SETUP

The range of hardware choices highlights the scalability of inflight connectivity solutions. On any plane, customers have choices when it comes to hardware and the scope of an install.

Among the systems that are fit for a given plane's weight, space, and technical profile, the most affordable are also typically the most limited. Similarly, basic setups often entail fewer installation hours, cutting labor costs substantially. When evaluating your choices for inflight connectivity, it helps to consider installation costs and consult an experienced installation facility.

2. ONGOING MONTHLY PLANS

Much like a cell phone service plan, service plans for inflight connectivity are flexible according to customers' usage and need for month-to-month predictability. Each has its advantages, but users eventually find that they're best suited to one or another.

Pay as you go

On the more affordable end of the spectrum are pay-as-you-go plans, which entail no fixed costs and appeal to customers who like to "pay for what they actually use." However, these plans can be less predictable than others, and their per-MB rates often are higher than intermediate plans.

Unlimited

These plans appeal to customers who either consume masses of data each month or have the financial resources to pay higher monthly fees to ensure that their passenger and crew requirements are met. Note that some satellite services, by their technical nature, can't support unlimited data — so check with your connectivity partner.

Intermediate plans

These plans are desirable to many customers because they can be tailored: A user can opt for a base data allowance that matches their typical needs — say 2,500 MB — and then pay overage charges beyond it. These overage charges are cheaper than a pay-as-you-go rate, and they typically decrease as the size of the base allowance increases. Alongside these data plans are voice rates, inflight entertainment options, and other cost categories, depending on your system capabilities.

Understand. Monitor. Adjust.

Connectivity companies will provide a dashboard or other reporting tools for you to manage and monitor your data use — and just like your cell phone bill, they can provide alerts at certain usage thresholds. People usually have roughly the same device behavior in the air as they do on the ground, assuming they have connectivity equipment to support it.

But sometimes you need to adjust. At Gogo, we're happy to move you to a different plan if that's what's best — we're not going to hold you hostage until your existing plan term expires. That's just bad customer service and bad connectivity practice.

To repeat ourselves

If you've read our earlier discussions of bandwidth and speed, you'll know what's coming:

To keep the price right, it's important not just to pick the right system, but to also learn how to use it well. In other words, turn off idle devices, since they suck away bandwidth (and incur more usage costs, depending on your plan) even when you think they're inactive. And avoid downloading or streaming gobs of data in flight if you're equipped with something like Gogo Vision inflight entertainment. This service allows you to view movies, TV, news, and weather content from your airborne server, without incurring streaming charges.

Every connectivity plan will present opportunities for optimization and smart usage, so it's best to get trained on them.

NO CHAMPAGNE, PLEASE

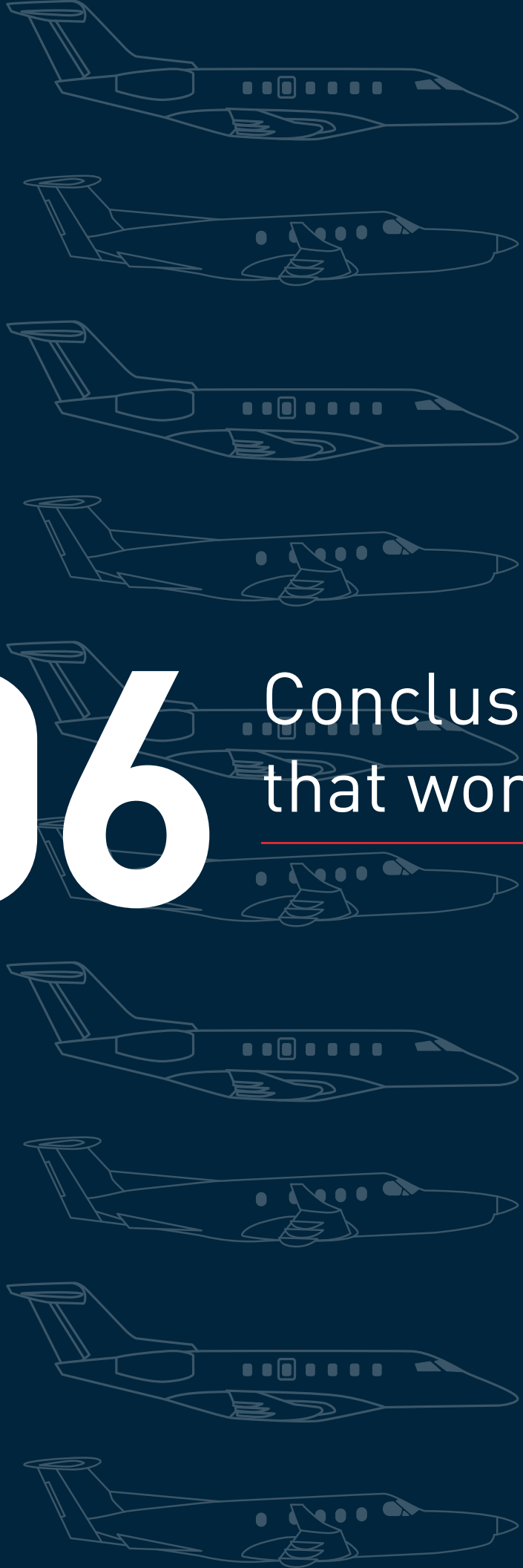
Inflight connectivity has become so prized in the business market that travelers' tastes are changing. Not long ago, business travelers, particularly executives, placed a premium on relaxing and enjoying the finest flight experience possible. Today, however, their priorities are much more tactical:

Stay plugged into the business.

Stay engaged with staff on the ground.

Don't miss a single wobble of a stock market.

This is good news for Gogo and other connectivity companies, of course. But the real benefits are to the businesses these travelers help to succeed.



06 Conclusion: Things that won't change

Inflight connectivity, like the long-celebrated Pilatus family, continues to evolve. But there are a few principles and practices that will stay steady, no matter the disruption in the market.

The effectiveness of your system is only partly dependent on technology.

Customer support, trustworthy provider relationships, industry experts at your disposal, and dependable network infrastructure are at least as consequential as whiz-bang equipment and lofty promises.

You deserve a good fit.

Inflight connectivity is a sea of choices — equipment types, service plans, budgets, etc. — so continue to be assertive in finding a setup that works for you.

Scalability is king.

Given the rate of change in inflight technology, any sustainable solution will be scalable and adaptable. Seek platforms that can accept "bolt-on" upgrades and grow over time — without a complete (costly) replacement.

Inflight connectivity enriches your life.

The business functions are only part of it. Your connectivity solution should help you connect with what matters — your work, loved ones, and cherished pursuits.

Connected wherever you are

The most fundamental purpose of connectivity solutions is keeping you engaged with what really matters — all the time. The systems and mission profiles will vary, and the pressing business and personal needs to keep in touch will only continue to increase.

Gogo's approach, now and in the future, is to blend dependable infrastructure, leading-edge technologies, and partnerships built on trust. Our products will continue to evolve, of course, but our central commitment will not.

Happy connecting.

gogo BUSINESS AVIATION | FLY SMARTER℠

Visit business.gogoair.com/inflight-wifi-for-pilatus-aircraft