2Ku

High-performance inflight connectivity

gogo®

Introduction

Revolutionary high performance technology

2Ku is a groundbreaking inflight satellite technology from Gogo expected to deliver peak speeds of 70+ Mbps, and, when spot-beam satellite technologies become available, up to 100 Mbps. The antenna's unique design offers coverage around the globe – even in commonly problematic equatorial regions – and its unprecedented speeds enable unique inflight experiences for everyone onboard.

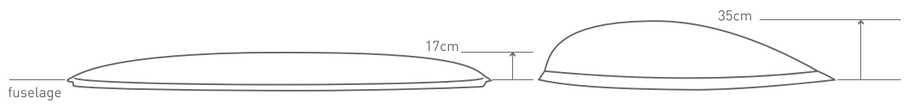
Representing Gogo's next step in technological evolution, 2Ku is a game-changer in the global aviation market and has the potential to revolutionize inflight connectivity – and even the air travel industry – from now on.

Introduction

2Ku at a glance

2x more spectrally efficient

2Ku's antenna aperture size is unprecedented in the IFC market. It's 2x more spectrally efficient than other antennas in the commercial aviation market, delivering more throughput at less cost.



Gogo 2Ku radome | Conventional aero radome

Low drag radome

The 2Ku antenna features a streamlined radome with a low profile of 17cm, which reduces drag compared to other satcom solutions.

Clean, simple design

2Ku has fewer moving parts – there are no traditional stepper motors, belts, pulleys, or gears, resulting in high reliability and lower total cost of ownership & manufacturability than conventional aero antennas.

Introduction

Technology comparison

Satellite technologies

		GOGO 2KU	CONVENTIONAL AERO ANTENNA
Customer benefits	Aircraft network capacity	●	○
	Drag / equivalent weight penalty	●	○
	Satellite redundancy	●	●
	Dedicated aero capacity	●	●
	Peak spectral efficiency	●	○
	Equatorial performance	●	●
Airline benefits	Coverage	●	●
	Peak data rates	70+ Mbps	30-50 Mbps
	IPTV	●	●
Availability	Available	Expected mid-2015	Today

● Meets all requirements ○ Meets some requirements ● Does not meet requirements

Key advantages

Lower weight for reduced drag

Using Computational Fluid Dynamics (CFD) analysis, the longer – and lower profile – 2Ku radome was modeled against a radome for a traditional gimbaled antenna on an A320 airframe. The result was 31.7 lbs. (14.4 kg) of drag for the traditional gimbaled antenna radome vs. 6 lbs (2.7 kg) for the 2Ku radome.

With a lift/drag (L/D) ratio of 16.8 – for a modern, efficient, single-aisle aircraft at cruise – the resultant equivalent aero weight penalty for 2Ku is 379 lbs. (171.9 kg) less than for a traditional gimbaled antenna radome (nearly 50% reduction).

Equivalent weight penalty[1]

	CONVENTIONAL AIRBORNE TERMINAL	2KU
Radome drag	31.7 lbs. (14.4kg)	6.0 lbs. (2.7 kg)
Lift/drag ratio	16.8	16.8
Equivalent aero weight	533 lbs. (241.7 kg)	101 lbs. (45.8 kg)
Hardware weight (single-aisle)	300 lbs. (136 kg) est.	353 lbs. (160 kg)
Total equivalent weight	833 lbs. (377.8 kg)	454 lbs. (205.9 kg)

The equivalent weight penalty for 2Ku is nearly 50% less than gimbaled radomes.

[1] For A320, under the following cruise conditions: α=2, M=0.78, a=35 kft. Radomes installed at frame C47.

Key advantages

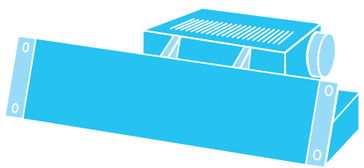
Superior equatorial performance

Conventional, rectangular aperture aero antennas suffer reduced data rates in tropical (high skew angle) regions due to adjacent satellite interference. 2Ku, however, offers extremely efficient performance in high-skew areas, exceeds the capabilities of conventional antennas at mid-latitudes (where the vast majority of global flight minutes occur), and matches conventional antenna performance down to 10 degrees elevation (equivalent to 71° N or S latitude).

2Ku antenna vs. conventional aero antenna

2KU

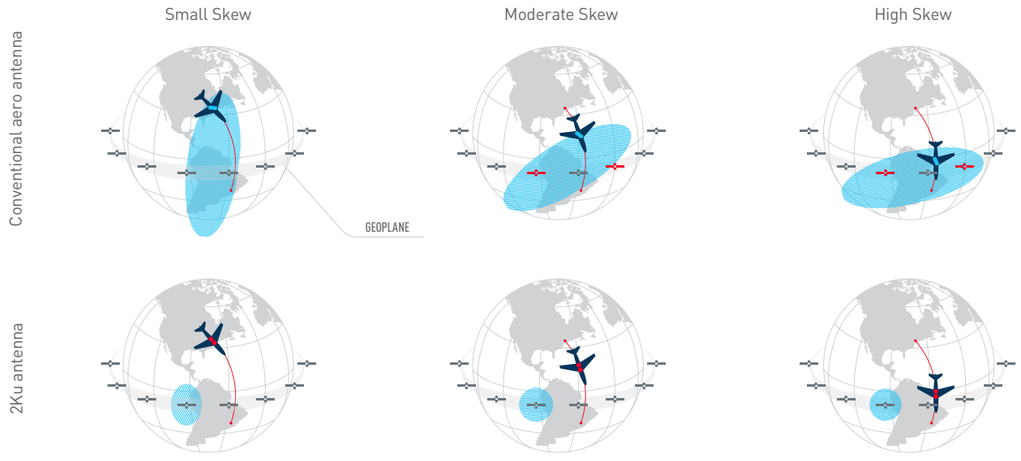
Mechanically phased array antennas, like the 2Ku antenna, represent the next generation of airborne antenna design. Rather than physically pointing toward the target satellite, these antennas create a beam in the desired direction by mechanically rotating a series of internal plates with carefully designed resonance characteristics. These antennas are symmetric in design, which results in a symmetric beam shape. Compared to gimbaled antennas, they are even lower in profile and more aerodynamic, effectively reducing the amount of drag.



CONVENTIONAL AERO ANTENNA

Gimbaled antennas, like conventional aero antennas, are asymmetric in design, which results in an asymmetric beam shape. Airborne antennas have typically adopted this design due to aerodynamic considerations. These antennas rotate on two axes to maintain orientation toward the target satellite regardless of aircraft location or altitude.

Solving the skew angle challenge

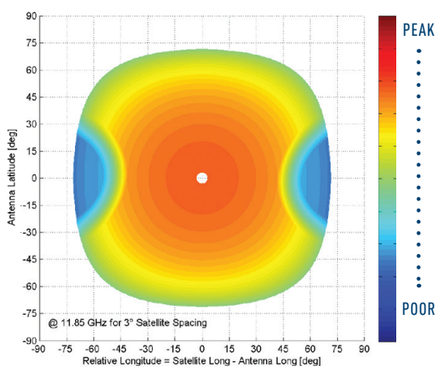


Conventional aero antennas produce oval-shaped beams, which can lead to interference that results in reduced data rates both to and from the aircraft when flying in tropical regions. As the aircraft moves toward the equator, the wider cross-section of the beam begins to align with the geoplane, causing the aircraft to receive undesired signals from adjacent satellites along with the signal from the target satellite. The degree to which the beam rotates into the geoplane – and hence, the severity of the interference – is described as the "skew angle."

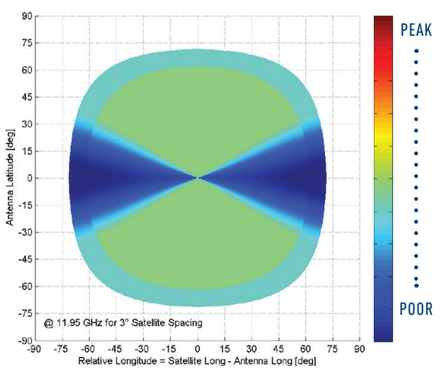
Conventional aero antennas must compensate for interference at high skew angles, which reduces data rates to the aircraft. As a result, the antennas must lower transmit power, reducing data rates from the aircraft.

However, 2Ku can avoid these interference issues in most operational scenarios by projecting narrow beams toward the geoplane – even at high skew angles – to deliver excellent performance on flights that cross the equator.

2KU ANTENNA PERFORMANCE



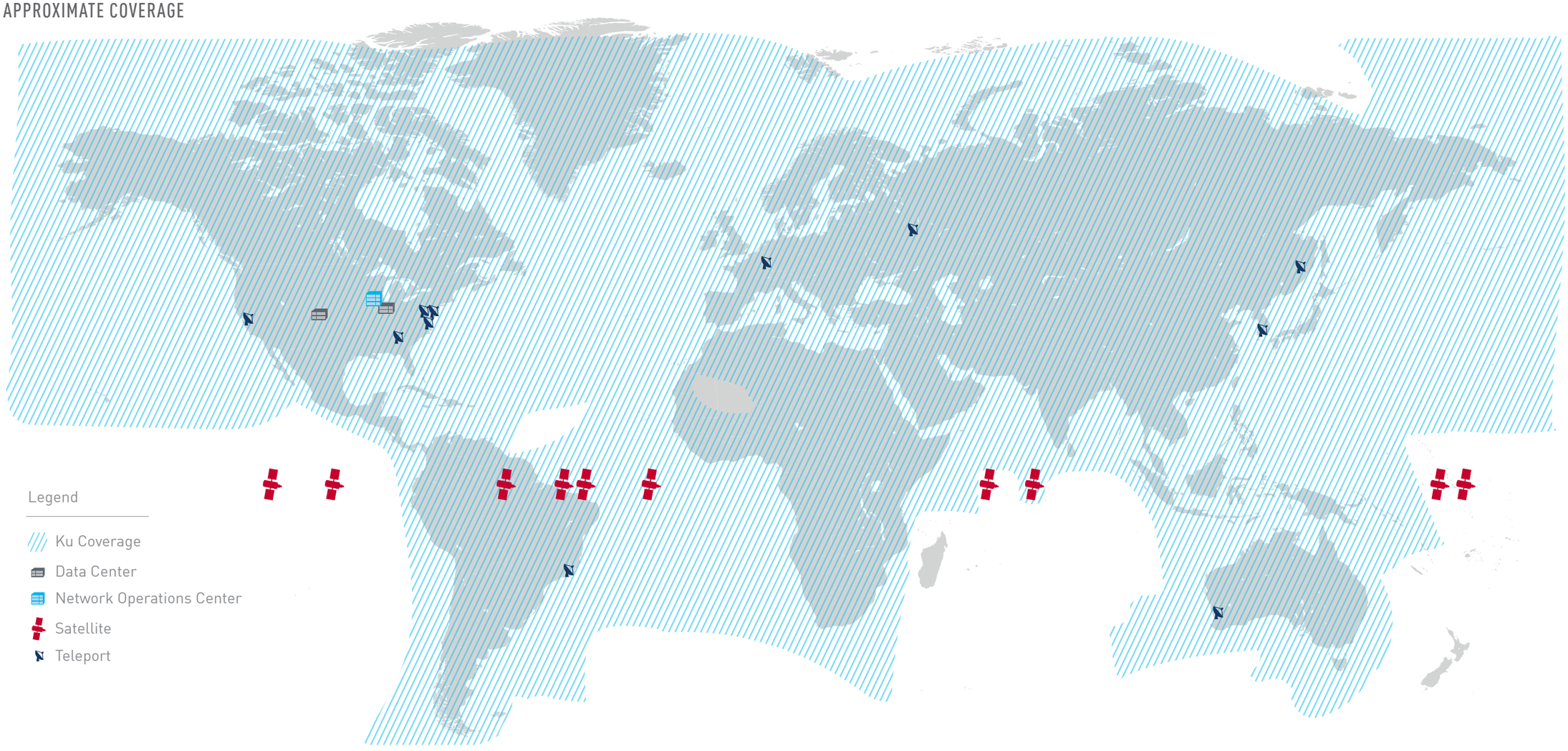
CONVENTIONAL ANTENNA PERFORMANCE



Key advantages

Global coverage

2KU'S APPROXIMATE COVERAGE



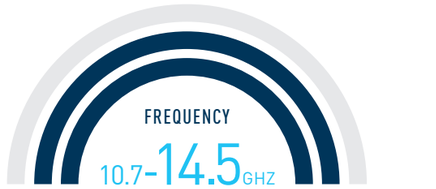
GOGO'S EXISTING GLOBAL KU NETWORK FEATURES:

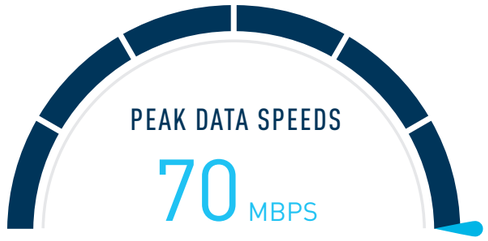
- Consistent satellite hand-offs
- 19 beams across 11 satellites and 11 teleports
- Regulatory approvals obtained for over 200 countries

Since 2Ku is compatible with many Ku satellites, it avoids the single point of failure that comes with reliance on a single satellite for connectivity in a given region – delivering the reliable global coverage that your airline desires.

Key advantages

Unprecedented speeds





2Ku's antenna is expected to deliver peak speeds of 70 Mbps, outperforming other global connectivity solutions in the market. When next-generation spot-beam satellites become available, such as Intelsat's EpicNG™ and Telesat's Telestar 12 VANTAGE, 2Ku will have the capacity to perform at peak data speeds of up to 100 Mbps.

This unprecedented speed supports all of Gogo's existing services – connectivity, inflight entertainment, Text & Talk – and delivers an improved experience for more passengers.

With higher bandwidth available, passengers can perform more bandwidth intensive activities, like IPTV. The high spectral efficiency associated with 2Ku will be optimal for IPTV due to reduced cost of data.

Furthermore, this additional bandwidth can be dedicated to the cockpit and crew, enabling operational applications that improve efficiency and help reduce operating expenses.

Key milestones

In-market timeline

2015

January
Gogo receives FCC approval for 2Ku technology

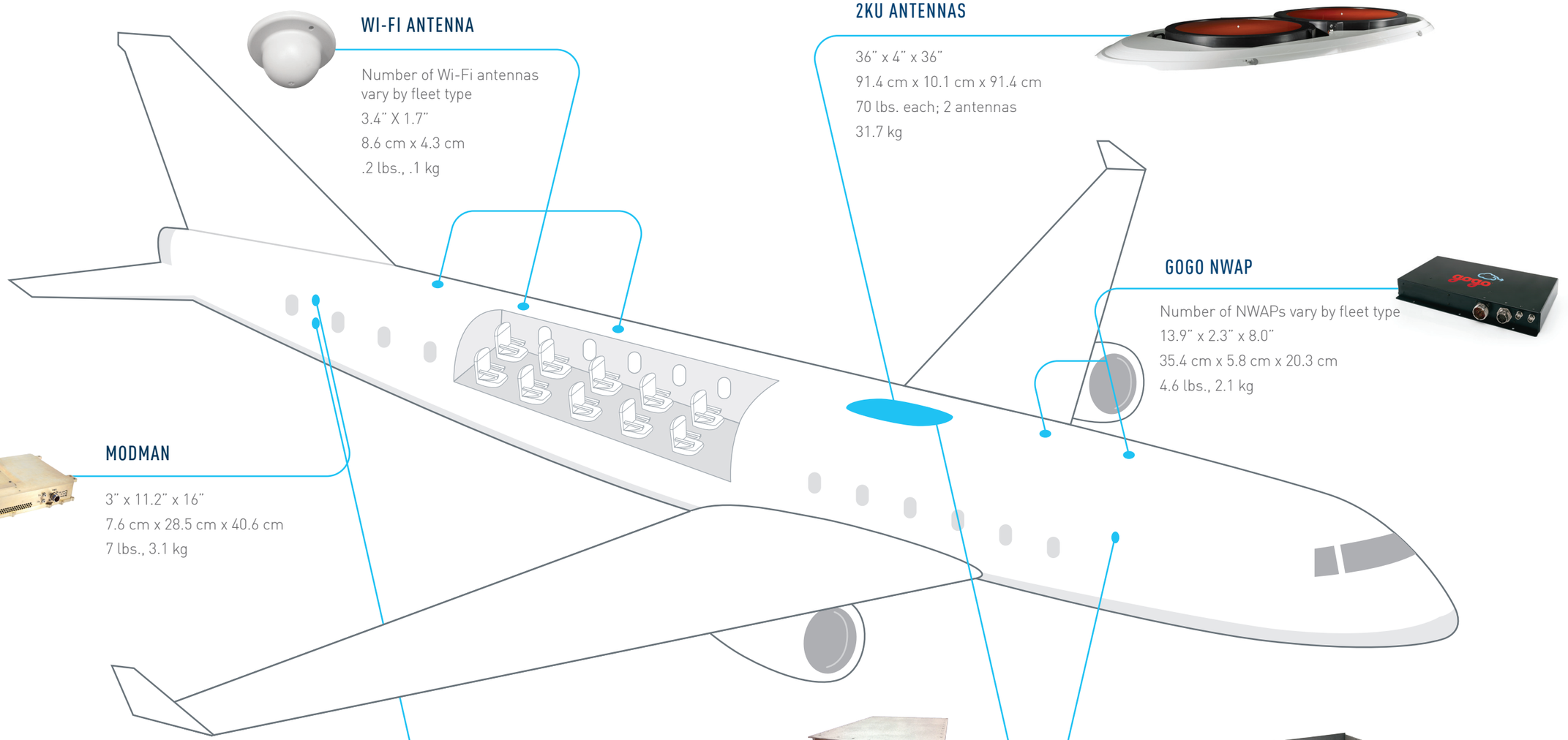
February
2Ku passes the bird-strike test

May
2Ku scheduled to install on Gogo's B737

June
Gogo scheduled to receive STC for B737

Early Q4
AeroMexico scheduled to launch 2Ku connectivity on B737 aircraft

Key equipment



WI-FI ANTENNA

Number of Wi-Fi antennas vary by fleet type
3.4" X 1.7"
8.6 cm x 4.3 cm
.2 lbs., .1 kg

2KU ANTENNAS

36" x 4" x 36"
91.4 cm x 10.1 cm x 91.4 cm
70 lbs. each; 2 antennas
31.7 kg

GOGO NWAP

Number of NWAPs vary by fleet type
13.9" x 2.3" x 8.0"
35.4 cm x 5.8 cm x 20.3 cm
4.6 lbs., 2.1 kg

MODMAN

3" x 11.2" x 16"
7.6 cm x 28.5 cm x 40.6 cm
7 lbs., 3.1 kg

KANDU

3" x 15.2" x 16"
7.6 cm x 38.7 cm x 40.6 cm
17 lbs., 7.7 kg

KRFU

17" x 14" x 3"
43.1 cm x 35.5 cm x 7.6 cm

GOGO ACPU-2

7.8" x 7.6" x 16.8"
19.8 cm x 19.3 cm x 42.6 cm
16.8 lbs., 7.6 kg

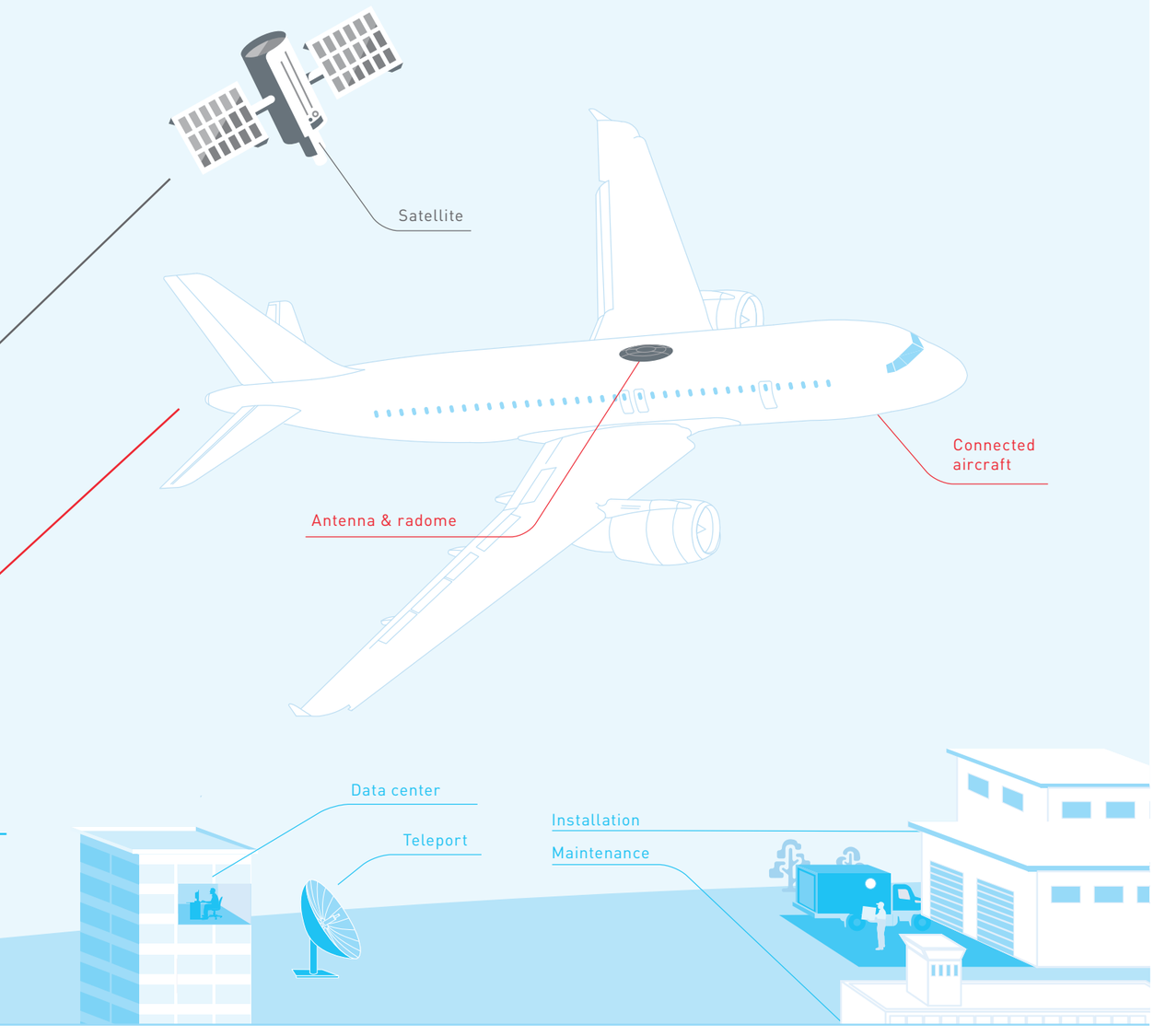
Components of the 2Ku solution

The 2Ku satellite solution is comprised of three segments:

1 **Ku-BAND SPACE**
Features satellite reliability and redundancy, technological evolution, and longevity.

2 **AIRBORNE**
Features revolutionary advancement in a highly efficient aeronautical antenna.

3 **GROUND**
Includes mature, scalable, and geographically redundant Gogo data centers.



About Gogo

As the leading provider of inflight internet, Gogo delivers connectivity and entertainment services to 2,100+ commercial aircraft worldwide. With more than 7 years of experience, Gogo has the reliability, flexibility, and innovation to empower your airline to create new opportunities in every area of the aviation business.

Find out what you can do with Gogo.

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2Ku partners

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