

Connectivity 101

Many Networks, Many Options

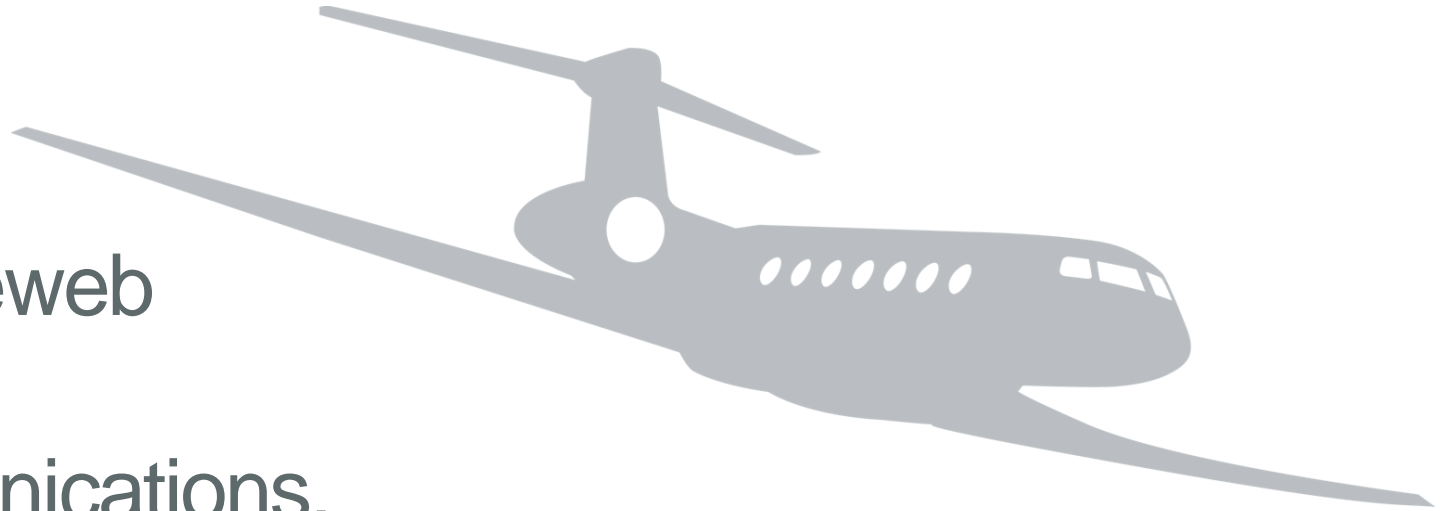
Types of Connectivity

Aircraft networking

ATG – Air to Ground

Leo Systems-Starlink- Oneweb

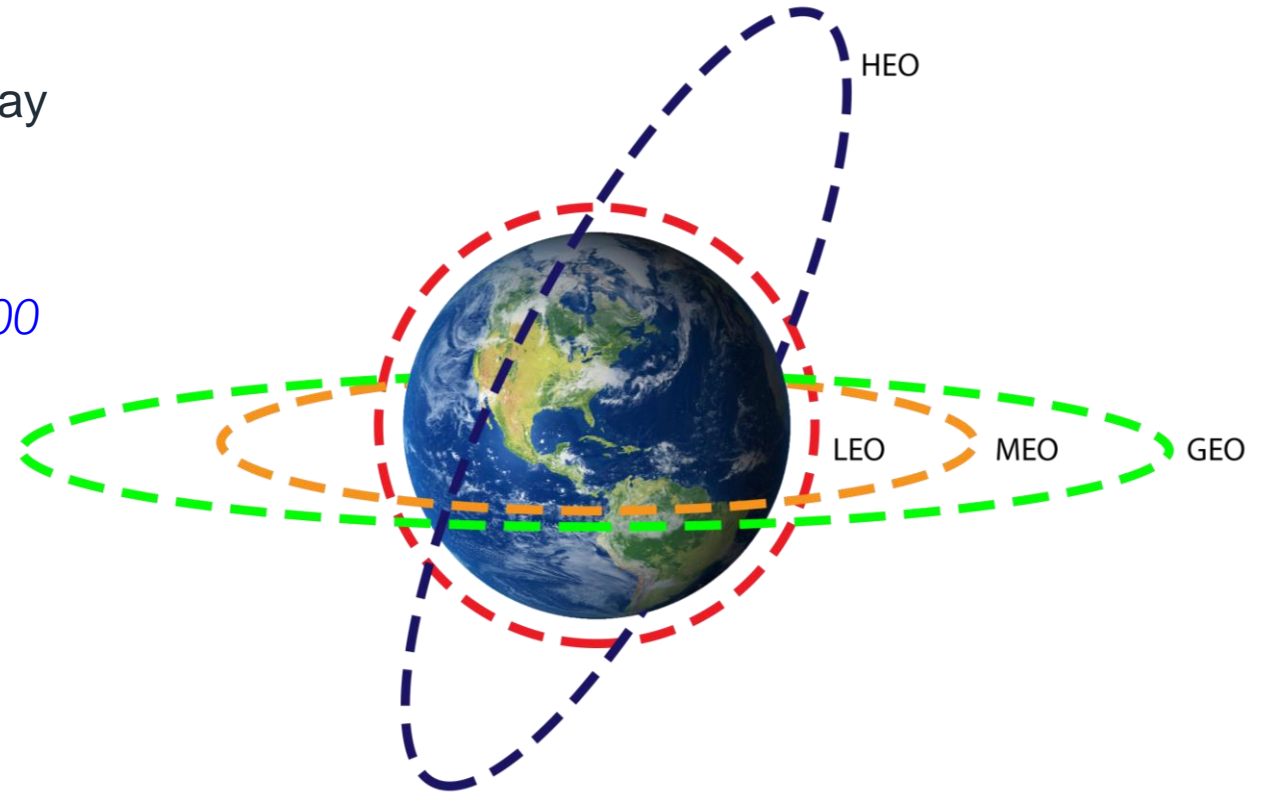
Satcom – Satellite Communications,
SBB-Viasat & Inmarsat, Satcom
Direct Direct, Collins-Ku-KA



Satellite Orbits

Depending on then installed system(s), the aircraft may use one or more satellites in [multiple orbits](#)

- *Low Earth Orbit (Iridium, Starlink, Oneweb) 250-900 Miles*
- *Medium Earth Orbit (GPS)*
- *Geostationary Orbit (Viasat & Inmarsat) 23,000 miles*
 - *SBB, Ku, Ka*
- *Highly Elliptical Orbit (Weather)*



A CHANGING LANDSCAPE

Viasat
10+ Ku & Ka Satellites
Geosynchronous Orbit

SES
41 Ku Satellites
Geosynchronous Orbit

inmarsat
10+ Ka Satellites
Geosynchronous
& HEO Orbit

starlink
4,000 Ku Satellites
Low Earth Orbit

OneWeb
600 Ku Satellites
Low Earth Orbit

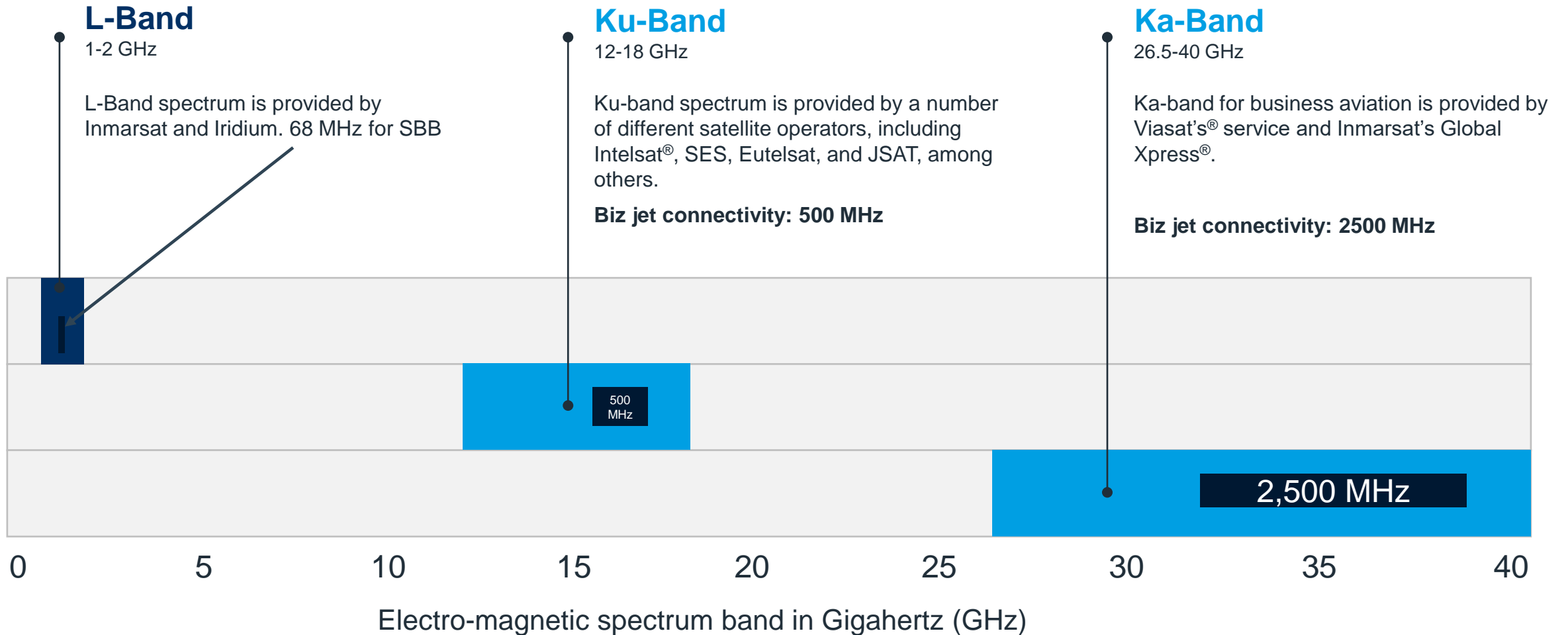
iridium
75 L-Band Satellites
Low Earth Orbit

O3B MPOWER
20 Ku Satellites
Medium Earth Orbit

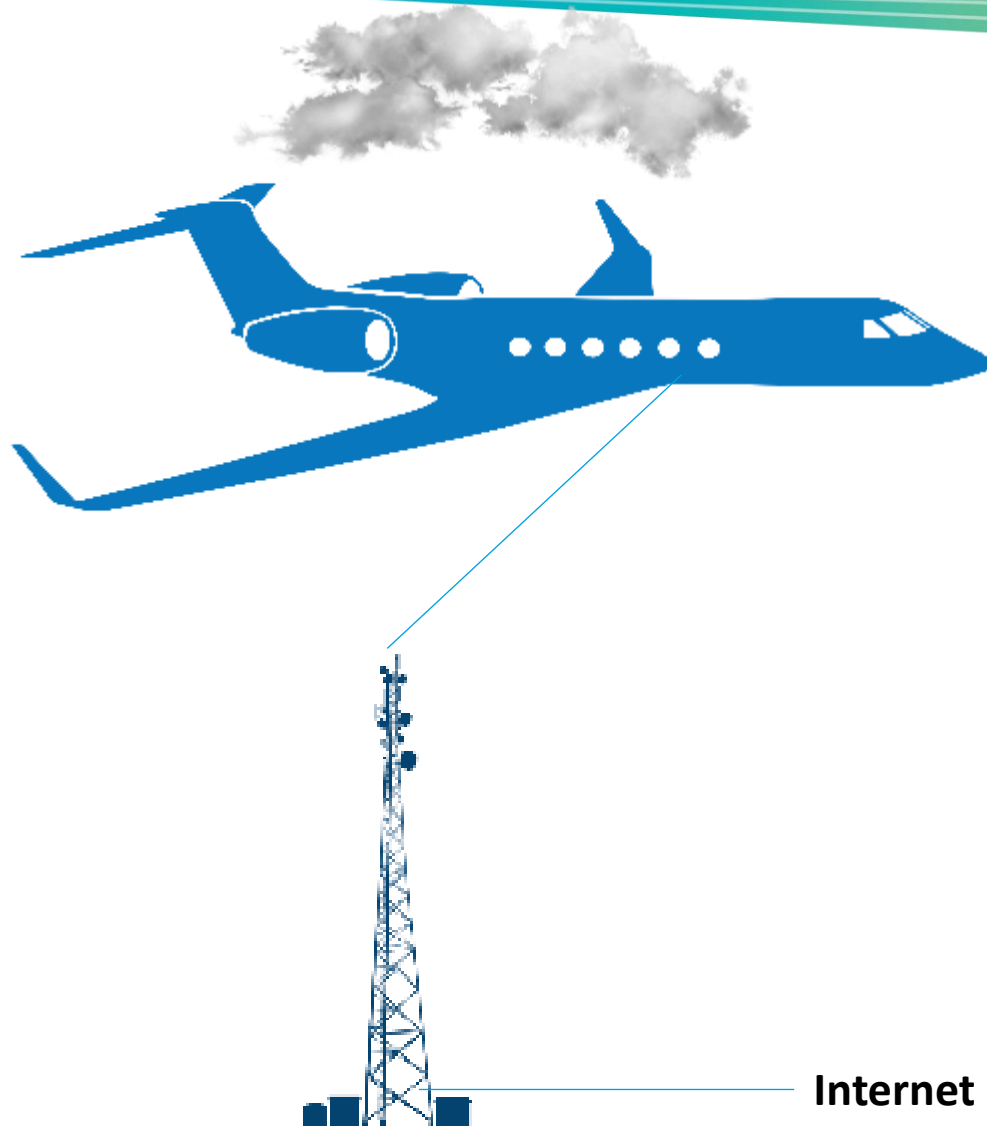
INTELSAT
13 KU Satellites
Geosynchronous Orbit



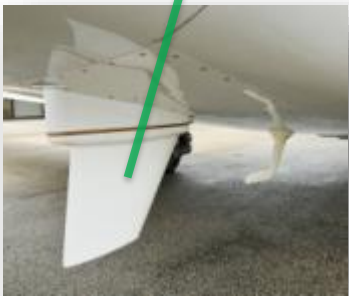
What Does Ku- and Ka-band Mean?



Air to Ground (ATG) Aircraft networking

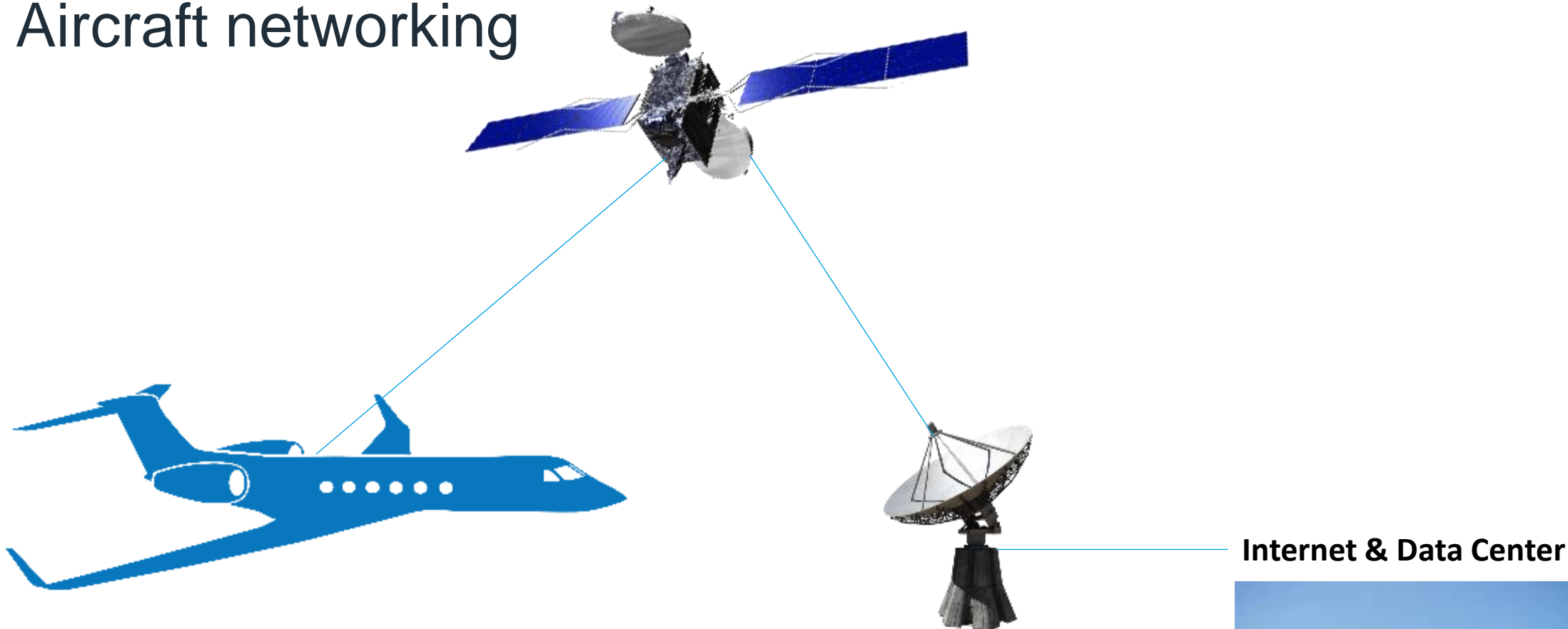


Air to Ground (ATG)
Aircraft networking



Satellite Networks

Aircraft networking



Internet & Data Center



Aircraft Hardware for Ku & Ka Satellite Connectivity



Swift-broadband

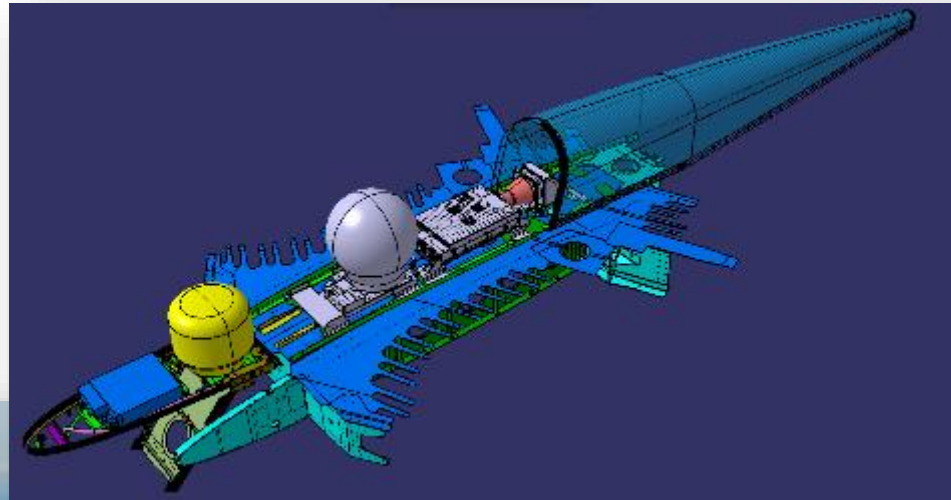
Aviator 200



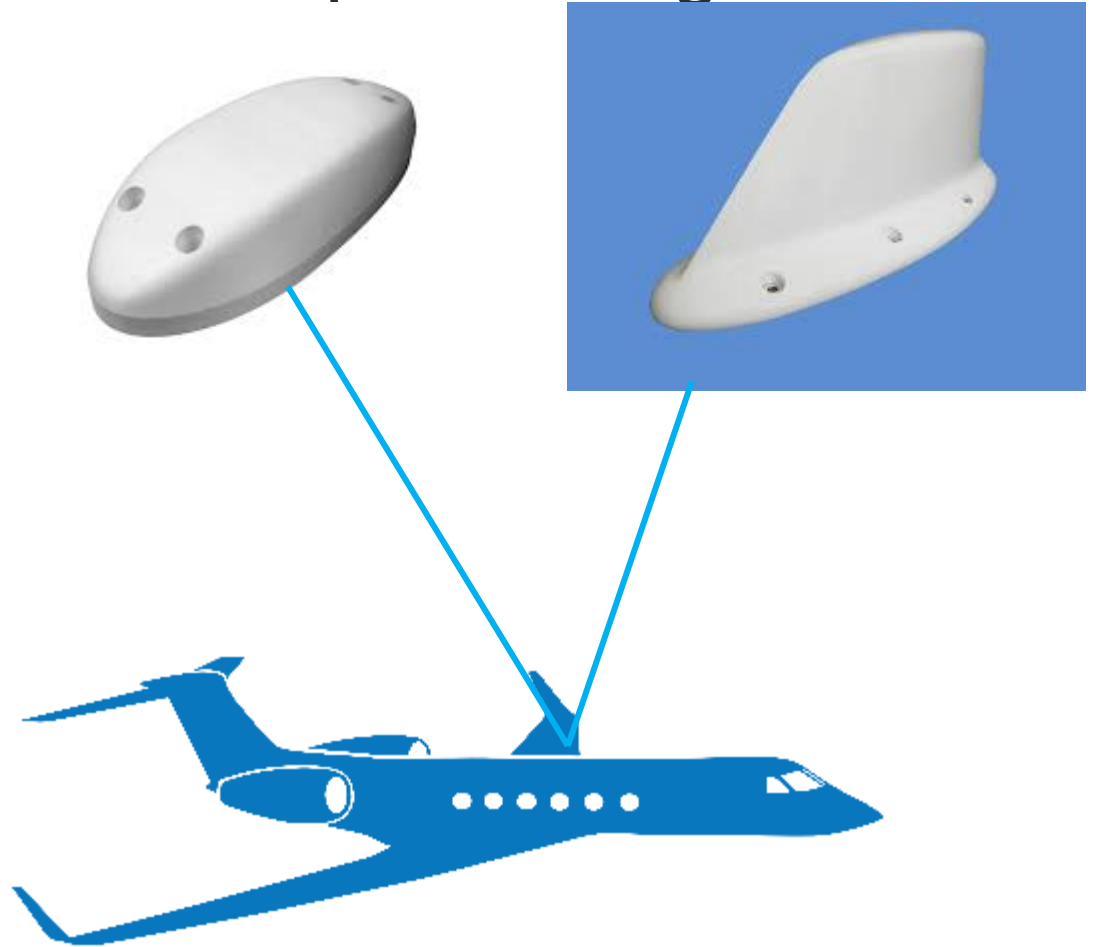
Aviator 300



Radomes that can work with High Gain Antennas



Iridium Next, Hardware and up to 1.2Mbps-coming 2023

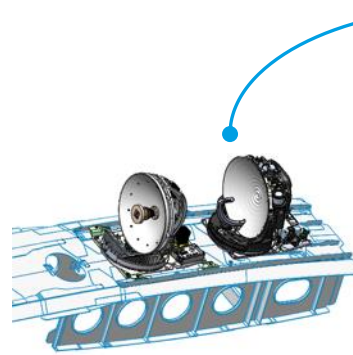


Viasat KU & KA Satellite Connectivity

- 2004 Viasat Introduces Ku service with Gulfstream called BBML



- Viasat Ka System



- > 2016 New KA Starts almost 2000 systems Inservice

Honeywell Jetwave Jx- Ka Connectivity



Tail Mount Antenna
Mid Size Business Jet



Or Fuselage Mount Antenna
Large Size Aircraft



KRFU
Up and down converters
and high-power amplifier



KANDU
Controls antenna (TMA or
FMA) and Ka-band radio
frequency unit (KRFU)



ModMan
Aircraft and connectivity
interfaces



Gogo Air To Ground Systems



Gogo AVANCE systems



AVANCE SCS
Advanced router and
robust media server



AVANCE L3
Flexible, affordable connectivity
for aircraft of all types and sizes

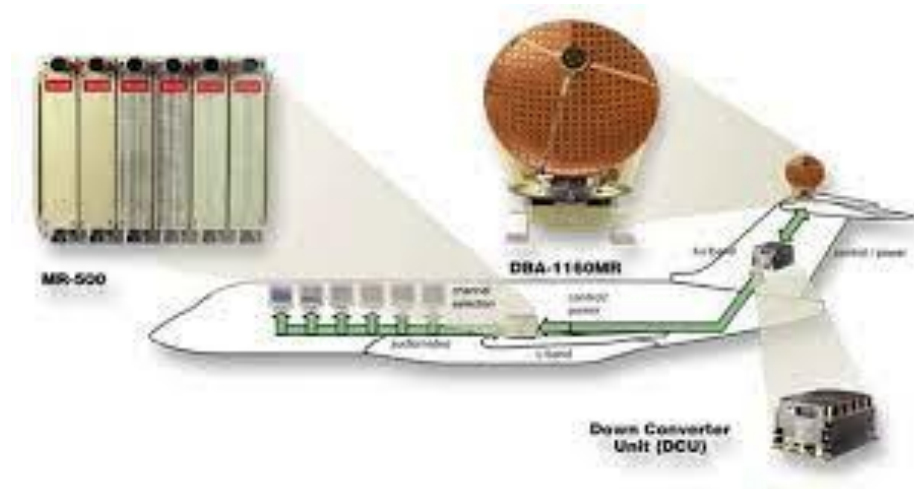


AVANCE L5
4G connectivity powerhouse
that supports streaming

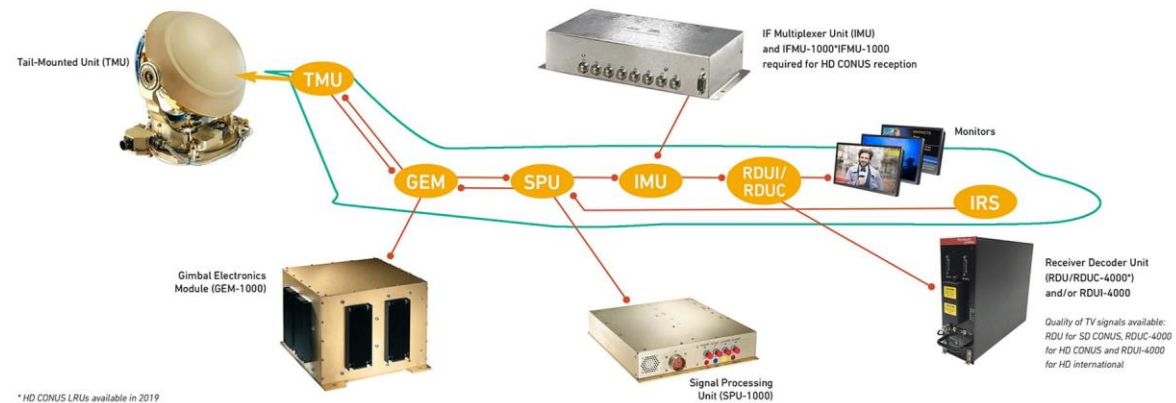


DIRECTV Systems

> Honeywell AIS 2000



> Collins Tailwind 200 & 500



* HD CONUS LRUs available in 2019

What type of options will you see based on aircraft type

- > **Small Cabin** : Air To Ground (Gogo ATG) ATG-4000, ATG 5000, L3 & L5, SBB
- > **Mid-Cabin** : (Gogo ATG) ATG-4000, ATG 5000, L3 & L5, SBB
- > **Super-Mid** : (Gogo ATG) ATG-4000, ATG 5000, L3 & L5, SBB, Viasat Ka
- > **Large Cabin**: (Gogo ATG) ATG-4000, ATG 5000, L3 & L5, SBB,
 - Viasat Ku & Ka.
 - Honeywell Jx (Inmarsat Ka)
 - Collins Ku
 - Satcom Direct Ku

What to look out for :

- > BBML Server: Common mistake in believing the aircraft has a Ku system (Gulfstream Specific) \$500k miss
- > ATG 4000-ATG5000 being replaced daily-slow service
- > Iridium Phone service : many old systems (Aircell, ICG, Honeywell) new options replacing with WiFi calling
- > Cabin CMS systems
- > Direct TV Old Collins AIS 2000, Tailwind 200 & 500 (Standard Def. going away) HD available with Collins \$500K plus upgrade and install
- > Satcom Systems, with old antennas (Sat. 906, MSC 3000-6000)
- > Older Viasat Ku Systems

2020 New Providers come into the market

- Collins Introduces LuxStream : Ku service using other Satellites for service and network
- Satcom Direct Introduces new Antenna and launches Ku service, looking to add Ka (using other Satellite Providers for service and network)
- Starlink & Oneweb LEO satellites and they are saying they will provide new service for the business aviation market. Many challenges to overcome and stay tuned
- What's next : **Ludicrous Speed**
 - <https://www.youtube.com/watch?v=ygE01sOhzz0>