

Connecting Orbiting Spacecraft and Humans: Suborbital, Low Earth Orbit, and Lunar Orbit and Surface Connectivity

Brian Barnett

Solstar Space Company, Santa Fe, New Mexico, USA

Abstract

It is more challenging to keep on-orbit assets including satellites, space stations, launch vehicles, and more connected in space than on Earth. Providing an internet connection between spacecraft and Earth-based payload managers, satellite operators, and enabling communications for crewed and uncrewed missions in sub-orbit, LEO, and cis-lunar and lunar surface operations is crucial to meeting mission goals.

Networking Everything and Everybody in Space

These important missions require space-hardened routers, WiFi access points and hotspots, and space-based satellite data relays to deliver on-orbit connectivity. As programs like NASA's Artemis and more get underway, these critical connections are becoming increasingly critical. Learn what is required to keep satellites and spacecraft connected and ensure crew, spacecraft, and Earth-based satellite operations teams connected so they can accomplish their goals for helping humans become a spacefaring species.

This connectivity is important for safety, security, and the future of space exploration.

Requirements for Connected On-Orbit Assets

Secure, persistent space-based communications are becoming increasingly crucial to a sustainable and expanding space industry. With the recent FCC order requiring end-of-life satellite assets to be de-orbited within 5 years, requirements for reliable communications are even more critical.

The required space-based networking equipment and services includes crew capsule hotspots, radiation tolerant WiFi access points, data relays for integration into cubesats, smallsats, space stations, launch vehicles and on-orbit assets, and narrowband and broadband data, voice, and video services. An example of a use case includes the HALO module of NASA's Lunar Gateway. The requirement is to provide a WiFi network for connectivity that will support astronaut communications with ground control, the lunar surface, and spacecraft, while also supporting payload integration, experiments, and more. It needs to securely connect WiFi-enabled components including computers and IoT sensors, creating a collection of space-based networked devices.

Conclusions

The future of space-based operations relies upon reliable networking and services.



WiFi Access Points: The HALO module of NASA's Lunar Gateway will require onboard connectivity.