AVEALTO

YOUR EYE ON COMMERCIAL SATELLITE SERVICES
MARKET, TRENDS AND INNOVATION

INSIGHTS

Issue ONE

Welcome to Avealto INSIGHTS

Avealto is excited to introduce INSIGHTS, a regular exploration combining our decades of experience as space pioneers with the history, trends and potential of the Avealto to provide a positive disruption of the commercial satellite market.

Since 1988 Avealto's leadership has been steadfast in their commitment, across a number ventures and organizations to the opening the door for commercial development and democratization of space initiatives. (#newspace)

Avealto founder Walt Anderson parlayed his success across multiple competitive telecom ventures (founder of Esprit Telecom plc, the first pan-European telecommunications operator, which IPO'd and was acquired for ~€1B, as founder of the Telco Communications Group, Inc., which also IPO'd and had a US $1B+ exit) to co-found the International Space University. Mr. Anderson then went on to commercially operate the Mir Space Station and put the first civilian in space, Dennis Tito.

NewScientist Magazine designated Mr. Anderson as one of the "Top 10 Influential Space Thinkers". He was featured in the acclaimed documentary, *Orphans of Apollo*, which tells about the US government headwinds that he survived.

Mr. Anderson's strategic endowment of the Space Frontier Foundation as well as the his creation of the Foundation for the Non Governmental Development of Space, have laid the groundwork for projects such as the "asteroid watch" and the CATS Prize (Cheap Access To Space) and opened the door to the Commercial Newspace movement.

Elon Musk and many other space entrepreneurs have much to thank Mr. Anderson for as his early work in support of the commercial space industry faced many challenges. Mr. Anderson encountered resistance in both the professional and personal realms, but now a robust and growing Newspace industry exists worldwide.

Key members of the Avealto leadership team also have contributed to a number of organizations, such as Teledesic, INMARSAT, the NewSpace Business Plan Competition, MicroSat Launch Systems as well as designing equipment that flew on three Space Shuttle missions.

We are excited to open this two-way dialogue with the Avealto community and ecosystem and look forward to your thoughts and comments on our INSIGHTS editions and podcasts, our email is enquiries@avealto.com.

issue one FOCUS

Avealto's Mission: Avealto is developing lighter-than-air, solar-powered, uncrewed High Altitude Platforms (HAPs) to provide telecommunications infrastructure around the world.

Avealto will provide connectivity to unserved and underserved regions, mobile operators and the maritime industry. Each of Avealto's HAP vehicles will remain in a stationary position at an altitude of 20 km to 22 km (65,000 to 80,000 feet).

Issue One focuses on both the history and technology of the commercial satellite services sector and **Issue Two** will focus on the market, players and near term future with respect to the latest development and trends in the world.

As with all Editions of Avealto INSIGHTS, we will be recording more in depth interviews and summaries via the Avealto INSIGHTS Podcast. Thank you for joining us on our INSIGHTS journey and we look forward to your feedback and input.

"The boundary between space and the earth is purely arbitrary. And I'll probably always be interested in this planet - it's my favorite."

- Carl Sagan

GEOSat versus LEOSat versus HAP: A Market Primer & Tech Overview

Geosynchronous Orbit Satellites (GEOSats) orbit directly over the equator at an altitude of around 36,000 kilometers (22,000K miles). Their orbital speed allows them to remain over the exact same position as the earth turns. This allows a ground-based antenna to be fixed in position to send and receive radio signals to and from the satellite.

A GEOSat now costs over US $350M to build and launch into geosynchronous orbit, with launch failures a constant risk. Most GEOSATs have an on orbit lifetime of around 12 years. GEOSats cannot be serviced or upgraded while on station.

Due to the orbital distance from earth, a GEOSat signal will have a very high latency or propagation delay. This is highly noticeable on voice calls transmitted by satellite. This 500 millisecond (1/2 second) delay also reduces the effectiveness of error correction for data transmissions which can severely limit the capacity of Internet bandwidth.

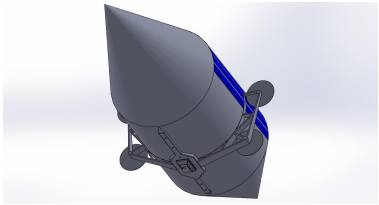
Low Earth Orbit Satellites (LEOSats) travel in orbit closer to the earth. To maintain orbit they must travel at a higher speed and change their position relative to the ground very quickly. A LEOSat requires less signal strength to send a radio signal to the earth since it is orbiting closer to the earth than a GEOSat, however LEOSats support much less bandwidth than GEOSats.

A large number of LEOSats are needed to provide complete coverage so that one is always overhead. Current examples include Iridium and Globalstar, which each operate a constellation of LEOSats.

Each LEOSat spends a large part of its orbit over areas where there are few or no potential users and can only provide a very small amount of bandwidth per satellite. More sophisticated LEOSats for telecom are being developed, but the cost of these networks will be many billions of dollars.

High Altitude Platforms (HAPs): HAP vehicles fly above currently controlled airspace at an altitude at of above 20 km. They can provide telecom services or perform remote sensing, for civilian or business applications. These aircraft may be airplanes, airships manned or unmanned.

Avealto HAP is being designed to remain in a stationary position in relation to the ground for months at a time. A footprint of a 240 km diameter (150 Miles diameter) will serve an area of 10,000 km2 – even in a remotely populated areas each HAP could serve many people and multiple market segments



The International Telecommunication Union (ITU), is an international treaty organization which coordinates radio frequency use worldwide. The ITU, at their 1997 Annual Conference, recognized the term "High Altitude Platform Station" (HAPS) defined it as a telecommunications station located at an altitude of 20 km to 50 km and at a specified fixed point relative to the Earth.

(Continued on Page Three)

from the HEADLINES

Satellite Connectivity Can End the Digital Drought

(Via Satellite) The digital economy has become a major driver of total economic growth. The United Nations Conference on Trade and Development (UNCTAD) estimated the combined value of platform companies with a market capitalization over $100 million at more than $7 trillion in 2017 – which is 67% higher than just two years previous. But as of 2020, 41% of the world's people have never yet connected to the internet, according to InternetWorldStats.com. As writer William Gibson noted, the future is already here – it's just not evenly distributed.

Via Satellite

The irony is that the satellite industry has, in theory, the ideal solution: connectivity that can reach nearly everywhere on Earth where people live. But neither the physics of packing subscribers onto transponders nor the economics of space communications have ever worked in favor of the world's unconnected. In recent decades, governments have subsidized internet via satellite project in many nations – but the sustainability hasn't been there, due to cost and the complexity of installation and maintenance on the remote end.

That is finally changing, through a combination of technology advances and the right distribution model. The technology advances are the high-throughput technologies in space and ground segments, which are delivering massively greater amounts of bandwidth at significant lower price points. The distribution model goes by the name "community Wi-Fi."

Excerpt from article by Robert Bell, executive director of Space & Satellite Professionals International. SSPI produces the Better Satellite World campaign, which dramatizes the immense contributions of space and satellite to life on Earth.

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GEOSats versus LEOSats versus HAPs: A Market Primer & Tech Overview

(Continued from Page Two)

The HAP business model is based on the ideal combination of built on-demand infrastructure, alongside recurring revenue. HAPs are much lower in cost as compared to GEOSats and LEOSats. They have lower latency for better data and voice quality as well as higher throughput for increased data capacity. In addition, HAPs can utilize existing satellite ground stations.

HAPs serve multiple, primary market segments, including:

- Maritime communications
- Mobile backhaul
- Aeronautical communications
- High speed trading links
- Public Sector: Governments and NGOs

Comparing the Options

Following is a key comparison of HAP versus GEOSat versus LEOSat - each has advantages, but in a world where the new normal is placing even higher demand on the web, HAPs can be deployed both quickly and strategically, at a much lower cost while offering higher performance:

Criteria	HAP	GEOSat	LEOSat
Latency	Less than 4ms	500+ms	30-110ms
Deploy Time	3-6 months	3+years	3-4 years
Cost	$5M per HAP	$350M per Sat	$6M-$8M each (1000s required)
Upgrades	Every 6 months	Not Possible	Not Possible
Coverage	240Km Circle	1/3rd of planet	900Km Circle

NEWSWORTHY...

UN looks for answers as global networks see demand spikes of 800%: Governments, telecoms, and tech leaders around the world are grappling with how to handle a surge in demand for internet access.

Quarantines and stay-at-home orders amid the coronavirus pandemic have made internet access as critical as any other public service, forcing governments around the world to have tough conversations about how to expand access and availability. On a call organized by the United Nations and the International Telecommunication Union, world government, telecoms, and technology leaders discussed astronomical spikes in network demand and how they have tried to address them.

Doreen Bogdan-Martin, director of the Telecommunication Development Bureau of the International Telecommunication Union, said internet providers were seeing spikes in demand reaching 800%.

"COVID-19 is taxing global networks to the limit. Operators and platforms are reporting huge, huge surges in traffic as the world has transitioned almost overnight to online working, schooling, shopping, and socializing," Bogdan-Martin said.

- Source: TechRepublic

avealto development IN ACTION

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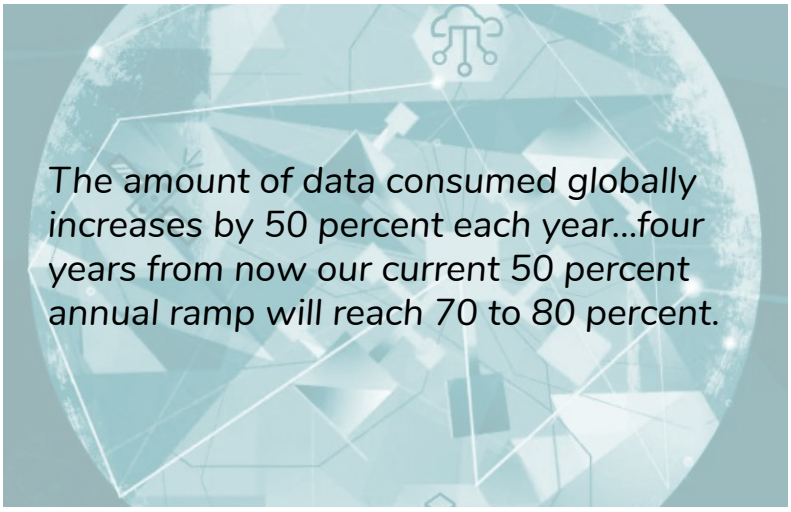


Source: *Deloitte Insights, Connectivity of Tomorrow*

HISTORICAL PERSPECTIVE

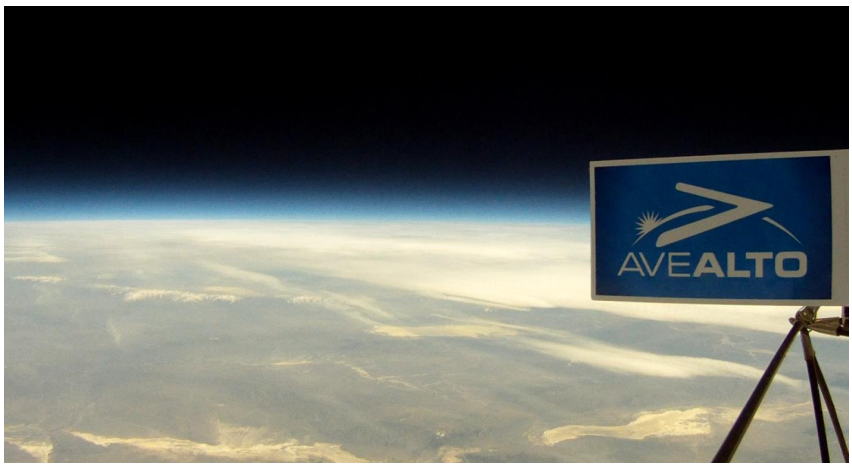
What is a Satellite?

(Space.com) A satellite is an object in space that orbits or circles around a bigger object. There are two kinds of satellites: natural (such as the moon orbiting the Earth) or artificial (such as the International Space Station orbiting the Earth).

There are dozens upon dozens of natural satellites in the solar system, with almost every planet having at least one moon. Saturn, for example, has at least 53 natural satellites, and between 2004 and 2017, it also had an artificial one — the Cassini spacecraft, which explored the ringed planet and its moons.

Artificial satellites, however, did not become a reality until the mid-20th century. The first artificial satellite was Sputnik, a Russian beach-ball-size space probe that lifted off on Oct. 4, 1957. That act shocked much of the western world, as it was believed the Soviets did not have the capability to send satellites into space.

There are an estimated half-million artificial objects in Earth orbit today, ranging in size from paint flecks up to full-fledged satellites — each traveling at speeds of thousands of miles an hour. Only a fraction of these satellites are useable, meaning that there is a lot of "space junk" floating around out there. With everything that is lobbed into orbit, the chance of a collision increases.



infrastructure TRENDS

High Altitude Platforms (HAPs) — bringing connectivity to all

(ITU News) HAPS systems have the potential to become an important tool for bringing broadband to hard-to-reach and unserved areas, supplementing existing networks to meet ever-increasing demand, and serving as "instant infrastructure" in emergency communications and disaster relief.

Why HAPs?

First, HAPs can be deployed quickly to cover wide service areas — approximately a 50 km radius — over any type of geography, including difficult terrain, because minimal ground infrastructure is required.

Second, HAPs are reliable. Advances in aeronautics, as well as battery and solar power technology, allow HAPS to operate continuously for long periods of time without many of the risks that other networks face (e.g., accidental damage, theft, conflict areas, and natural disasters).

Third, HAP systems are broadband- capable, thanks to unprecedented advances in communication technologies.

These features make HAPS economically viable as backhaul for broadband and 5G, as part of both terrestrial and satellite networks in areas where other technologies may be hard to deploy due to difficult terrain or long distances from population centres. Additionally, HAPS can provide "instant infrastructure" to extend connectivity rapidly during natural disasters.

HAPS development — fuelled by a growing industry ecosystem

The technological development and commercial maturity of HAPS has been fuelled by a growing industry ecosystem that includes leaders in the communications, content, and aerospace sectors...Satellite operators too have also shown an interest in incorporating HAPS into their networks to facilitate access to data-intensive applications in remote areas. For example, HAPS could be used to create a "hotspot" of concentrated capacity where needed within large satellite footprints.

- Michael Tseytlin, Dir. of Engineering, Spectrum and Standards ITU & Chris Weasler, Head of Global Spectrum Policy and Connectivity Crisis Response Program at Facebook

How The Satellite Industry Will Change The Way We Communicate

(Forbes) Sixty years ago, Dwight D. Eisenhower was the U.S. president, Elvis Presley released the single “Jailhouse Rock,” Mickey Mantle hit his 200th career home run, Congress passed the Civil Rights Act of 1957 and the USSR launched Sputnik I, the first artificial Earth satellite.

The 60-year-old satellite industry is currently facing four major shifts that we cannot afford to ignore, as they will have a drastic impact on the way we communicate.

1. **Making mobile communication available everywhere**: No roaming, no dead zones and no borders are certain to drive broad adoption. For communications professionals, this means a mobile-first strategy will become even more critical than it already is.

2. **Connecting people that have never been connected**: No towers, no hard wires and no distinction between metropolitan markets and rural and isolated areas means more people around the globe will have access to broadband internet and therefore the global economy. Communications professionals must take an even broader perspective on potential audiences and market opportunities while balancing global compassion and awareness.

3. **Addressing congestion**: Networks bogged down by the number of users and high-demand video and gaming applications will be a thing of the past. Limited capacity of wireless mobile networks won’t be an issue, even when tens of thousands of fans gather for a sporting event. Augmented and virtual reality applications present an opportunity for communications professionals to engage with consumers in meaningful ways wherever they go and however they get there.

4. **Making broadly available mobile communications possible**: No gimbals, no moving parts and no complicated set up will make satellite, in combination with 5G, the hybrid solution of choice for a broad set of mobile applications and will spur on a new set of business opportunities. This means better tracking, on-demand and streaming information and entertainment.

- Lisa Dreher, Forbes Councils Member, published originally at Forbes.com

the space ECONOMY

How the United Nations and business together approach and addresses the peaceful development of space

The United Nations Office for Outer Space Affairs (UNOOSA) is the United Nations office responsible for promoting international cooperation in the peaceful uses of outer space. UNOOSA serves as the secretariat for the General Assembly's only committee dealing exclusively with international cooperation in the peaceful uses of outer space: the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS).

Business is an essential partner in achieving the Organization's goals, marking a new chapter in UN business relations. Driving this cooperation is the recognition that although the end-goals of the United Nations and business are quite distinct, there are many critical common objectives - such as building markets, combating corruption, safeguarding the environment, increasing food security, and ensuring social inclusion.

The 2030 Agenda for Sustainable Development - a fundamentally important strategy for our common future - acknowledges that the implementation of sustainable development will depend on the active engagement of both the public and private sectors, and recognizes that the active participation of the private sector can contribute to the achievement of sustainable development.

In addressing the global problems and challenges, UNOOSA promotes the "Space2030" agenda, including one of its pillars - space economy, and it is representative of broad, cross-cutting and strategic areas in which space is seen as a main driver and contributor to overarching development goals and strengthened international cooperation, in particular for the benefit of developing countries.

Space economy constitutes the full range of activities and the use of resources that create and provide value and benefits to the world population in the course of exploring, understanding and utilizing space, and is aimed at addressing the economic benefits of the space sector and strengthening its role as a major driver for a dynamic economy, and in this regard in strengthening space-derived economic benefits.

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