



# International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijircce.com](http://www.ijircce.com)

Vol. 4, Issue 12, December 2016

## Airborne Internet: Network in the Sky

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**ABSTRACT:** Mobile connectivity is a growing technology in our society today. From wireless LANs at home and the office to wireless connectivity with Personal Digital Assistants (PDAs), people are utilizing new methods to extend the traditional network connectivity that originated with a wire to a computer. The concept of basic network connectivity could be used to connect mobile vehicles, including automobiles, trucks, trains, and even aircraft. Network connectivity could be obtained between vehicles and a ground network infrastructure. The idea of an *Airborne Internet* was begun as a supporting technology for NASA's Small Aircraft Transportation System (SATS). Program planners identified the need to establish a robust communications channel between aircraft and the ground network. But the utility of Airborne Internet has the potential to extend beyond the SATS program.....It could open up a whole new set of operating capabilities, safety and efficiency for tomorrow's aviation industry.....and beyond !

**KEYWORDS:** Aircraft, Internet, Network, Protocols, Satellites, Bandwidth.

### I. INTRODUCTION

The Airborne Internet is a proposed network in which all nodes would be located in aircraft. The network is intended for use in aviation communications, navigation, and surveillance (CNS) and would also be useful to businesses, private Internet users, and government agencies, especially the military. In time of war, for example, an airborne network might enable military planes to operate without the need for a communications infrastructure on the ground. Such a network could also allow civilian planes to continually monitor each other's positions and flight paths.

The concept of the Airborne Internet was first proposed at NASA Langley Research Center's Small Aircraft Transportation System (SATS) Planning Conference in 1999. The goal of the SATS initiative is implementation of small aircraft for public transportation. In one conference session, it was suggested that such a system would require a peer-to-peer communications network among the aircraft. The Airborne Internet Consortium formed subsequently to promote and aid in the development of such a system. Consortium members include Aerosat, C3D Aero, and United Airlines.

Three different methods have been proposed for putting communication nodes aloft. The first method would employ manned aircraft, the second method would use unmanned aircraft, and the third method would use blimps. The nodes would provide air-to-air, surface-to-air, and surface-to-surface communications. The aircraft or blimps would fly at altitudes of around 10 mi (16 km), and would cover regions of about 40 mi (64 mi) in radius. Data transfer rates would be on the order of several megabits per second, comparable to those of high-speed cable modem connections. Network users could communicate directly with other users, and indirectly with conventional Internet users through surface-based nodes. Like the Internet, the Airborne Network would use TCP/IP as the set of protocols for specifying network addresses and ensuring message packets arrive.



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## II. WHY AIRBORNE INTERNET?

The two reasons for the development of Airborne Internet are:

- ❖ Small Aircrafts Transportation System
- ❖ Need For A Higher Bandwidth

**Small Aircrafts Transportation System:** As the chances of plane crashes greatly increased, NASA developed the Airborne Internet. When people travel, they experience “connectivity down time” in which they are detached from the wireless networks. The first reason for the development of A.I is SATS. NASA is creating an infrastructure for fleets of small aircraft. People won’t have to fly between large cities on jet airliners. Instead, they will be able to fly themselves right to where they want to go. This would speed up air travel. But, it would need a major change in air traffic control to be able to manage thousands of small airplanes filling the skies. That’s where the “Airborne Internet” comes in. This project is being developed along with the Small Aircraft Transportation System (SATS). The SATS is studying the possibility of a system of 2- to 10-passenger airplanes. People could fly these small airplanes to and from small community or neighbourhood airports. Communication is one of the problems that will have to be fixed. They would be flying to and from small airports are rapidly emerging to help fill this void. People that travel with laptops or personal digital assistants can obtain short term network connectivity from a business establishment when they stop for a break. Airport terminals are becoming popular “hot spots” for wireless connectivity as people have time before and between flights to connect to the wireless network. We design transportation systems to interconnect to complimentary forms of transportation. But these designs have ignored the information connectivity needs of the people who use it. The time people spend in transit could be turned into more productive time if network connectivity were available. This can be accomplished using the A.I.

**Need for A Higher Bandwidth:** The second reason the need for a higher bandwidth. The computer most people use comes with high speed modem, which means that in an ideal situation the computer would download at a rate depending on the modem. That speed is far too slow to handle the huge streaming-video and music files that more consumers are demanding today. That's where the need for bigger bandwidth – broadband -- comes in, allowing a greater amount of data to flow to and from the computer. Land-based lines are limited physically in how much data they can deliver because of the diameter of the cable or phone line. In an airborne Internet, there is no such physical limitation, enabling a broader capacity.

## III. HOW THE AIRBORNE INTERNET WILL WORK?

The Proteus plane will carry the network hub for the HALO Network. HALO Network uses the Proteus plane, which will carry wireless networking equipment into the air. The Proteus plane was developed by Scaled Composites. It is designed with long wings and the low wing loading needed for extended high-altitude flight. Wing loading is equal to the entire mass of the plane divided by its wing area. Proteus will fly at heights of 9.5 and 11.4 miles (15.3 and 18.3 km) and cover an area up to 75 miles (120.7 km) in diameter. The plane still needs to receive approval from the Federal Aviation Administration.

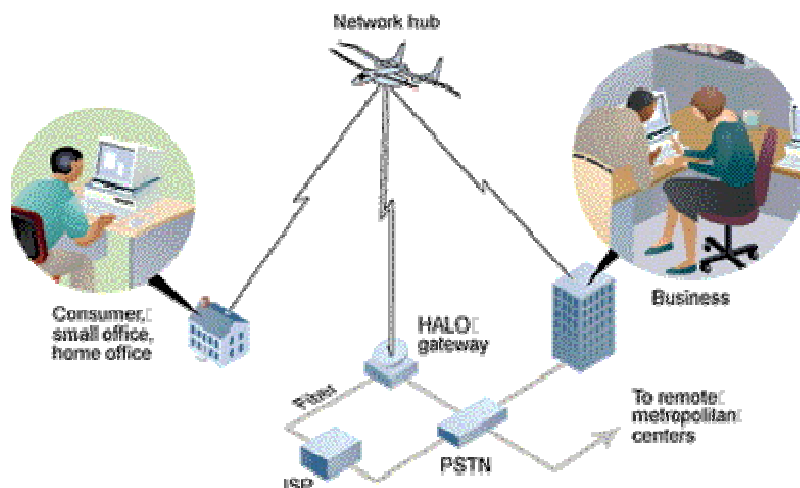
Airborne-network hub, which is what allows the plane to relay data signals from ground stations to your workplace and home computer. The airborne-network hub consists of an antenna array and electronics for wireless communication. The antenna array creates hundreds of virtual cells, like mobile-phone cells, on the ground to serve thousands of users. The payload is liquid-cooled and operates off of about 20 kilowatts of DC power. An 18-foot dish underneath the plane is responsible for reflecting high-speed data signals from a ground station to your computer.

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**Fig.1.1 This shows how the HALO Network will enable a high-speed wireless Internet connection**

Each city in the HALO Network will be allotted three piloted Proteus planes. Each plane will fly for eight hours before the next plane takes off. Angel CEO Marc Arnold says his company has identified 3,500 airports in the United States that can meet HALO's operational needs. After takeoff, the Proteus plane will climb to a safe altitude, above any bad weather or commercial traffic, and begin an 8-mile loop around the city. Each plane will accommodate two pilots, who will split flying duties during their eight-hour flight.

## IV. REQUIREMENTS

The airborne Internet won't be completely wireless. There will be ground-based components to any type of airborne Internet network. The consumers will have to install an antenna on their home or business in order to receive signals from the network hub overhead. The networks will also work with established Internet Service Providers (ISPs), who will provide their high-capacity terminals for use by the network. These ISPs have a fibre point of presence -- their fibre optics is already set up. What the airborne Internet will do is provide an infrastructure that can reach areas that don't have broadband cables and wires.



**Fig.1.2 Airborne-Internet systems will require that an antenna be attached to the side of your house or work place.**



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## V. IMPLEMENTATION SYSTEMS

Three companies are planning to provide Airborne Internet by placing aircrafts in fixed patterns over hundreds of cities.

### 1. Angel Technologies

Angel Technologies Corporation, with headquarters in St. Louis, Mo., is a privately-held wireless communications company using proprietary High Altitude Long Operation (HALO™) aircraft to deliver services worldwide. Augmenting terrestrial towers and orbiting satellites, Angel's HALO aircraft will fly fixed patterns in the stratosphere above major cities to deliver metropolitan wireless services at lower cost, with increased flexibility and improved quality of service.

### 2. Sky Station International

Sky Station International has pioneered technology that utilizes a solar powered lighter-than-air platform held geostationary in the stratosphere to provide high capacity wireless telecommunications services to large metropolitan regions. Worldwide regulatory approval for the use of stratospheric platforms was granted by the ITU in November 1997 and by the U.S. Federal Communications Commission (FCC) earlier that year.

### 3. Aero Vironment with NASA

AeroVironment Inc is a technology company in Monrovia, California, and Simi Valley, California, that is primarily involved in energy systems, electric vehicle systems, and unmanned aerial vehicles (UAVs). Paul B. MacCready, Jr., a famous designer of human powered aircraft, founded the company in 1971. The company is probably most well-known for developing a series of lightweight human-powered and then solar powered vehicles.

## VI. FEATURES

The key features of the Airborne Internet Network are:

- Seamless ubiquitous multimedia services.
- Adaptation to end user environments.
- Enhanced user connectivity globally.
- Rapidly deployable to sites of opportunity.
- Secure and reliable information transactions.
- Bandwidth on demand provides efficient use of available spectrum.
- It helps to avoid the connectivity down time of people in transit.
- It helps to achieve a broader bandwidth.
- It has the potential to provide cost savings for aircrafts operators.

## VII. ADVANTAGES

The airborne Internet will function much like satellite-based Internet access, but without the time delay. Bandwidth of satellite and airborne Internet access are typically the same, but it will take less time for the airborne Internet to relay data because it is not as high up. Satellites orbit at several hundreds of miles above Earth. The airborne-Internet aircraft will circle Helios Aircraft Weight 2,048 pounds (929 kg) Wingspan 247 ft (75.3 m) Length 12 ft (3.7 m) Wing Area 1,976 square ft (183.6 m<sup>2</sup>) Propulsion 14 brushless, 2-horsepower, direct-current electric motors Range 1 to 3 hours in prototype tests, 6 months when fully operational Speed 19 to 25 mph (30.6 to 40.2 kph). Overhead at an altitude of 52,000 to 69,000 feet (15,849 to 21,031 meters). At this altitude, the aircraft will be undisturbed by inclement weather and flying well above commercial air traffic. Networks using high-altitude aircraft will also have a cost advantage over satellites because the aircraft can be deployed easily -- they don't have to be launched into space. However, the airborne Internet will actually be used to compliment the satellite and ground-based networks, not replace them. These airborne networks will overcome the last-mile barriers facing conventional Internet access options. The "last mile" refers to the fact that access to high-speed cables still depends on physical proximity, and that for this reason, not everyone who wants access can have it. It would take a lot of time to provide universal access using cable or phone lines, just because



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of the time it takes to install the wires. An airborne network will immediately overcome the last mile as soon as the aircraft takes off. The time people spend in transit could be turned into more productive time if network connectivity were available. It would be a high-speed digital network. It has the potential to provide significant cost savings for aircrafts operators and the FAA, as it allows the consolidation of many functions into a common data channel. Numerous applications can use the same data channel. Since the Aircraft are operated from regional airports, the equipment will be routinely maintained and calibrated. This also allows for equipment upgrades as technology advances yield lower cost and weight and provide increased performance.

## VIII. APPLICATIONS

Since the airborne internet provides broad band services, it increases the speed of downloading & uploading of data through it primary application for A.I. is to track aircraft for the air traffic control system. Aircraft pilots would let the traffic controllers know where they are through the network. The network would give the crew information that would help them avoid collisions. It would also allow information to be sent from aircraft to aircraft without having to go through ground facilities. The system could also be used to send safety warnings to aircraft. Using xml aviation services, aircraft operators could receive automatic updates of weather, landing conditions at the destination airport, turbulence ahead, and other information. AirborneInternet could be the means by which the aviation industry will realize these benefits by providing xml services capability to aircraft.

## IX. CONCLUSION AND FUTURE WORK

Thus this airborne internet technology has a wide range of utilities in the field of aviation services like aircraft monitoring and air traffic management, weather information etc., and also provides an opportunity for the passengers to access the internet at very high altitudes that is, in the aeroplanes and other conventional services. This new technology, has already begun creating splashes in the industry. With the advent of Airborne Internet the remote sections of the world may get into main frame development. However, the technology still has to undergo testing of potential network performance. Facility to increase the antennas to control the traffic needs to be provided. Economic feasibility of the project also needs a review. Thus it is a further new trend in this mobile world which is establishing the connectivity by building network in the air.

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