

Surveillance Governance for Aircrafts with Point Satellite Constellation Matrix Simulation for Collision Detection and Avoidance

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Abstract— Automatic Dependent Surveillance Broadcast (ADS-B) is a new observation innovation technology intended to help modernize the air transportation framework. It gives foundational innovation to enhancements identified with the cutting edge Air Transportation System. Since ADS-B will wind up planning compulsory by 2020 for most airspaces, it is imperative that viewpoints, for example, limit, applications, and security are examined by an autonomous research group. One of the objectives of ADS-B is to expand security of air activity. While the security of ADS-B was already addressed, in this paper we show that assaults are both simple and essentially practical, for a reasonably complex assailant. Created and confirmed as a reasonable low-cost swap for ordinary radar, ADS-B permits Air Traffic Controller to screen and control planes with more prominent accuracy and over a far bigger rate of the world's surface than has at any point been conceivable some time recently. The ADS-B convention has no implicit security instruments, which renders ADS-B frameworks powerless against an extensive variety of pernicious assaults. This study first abridges the assaults and issues that have been accounted for in connection to ADS-B security. From that point, it overviews both the hypothetical and useful endeavors which have been beforehand directed concerning these issues, including conceivable security measures. The work and functionality performed by the space satellite will be taken over by highly sophisticated and dedicated point satellites which are concentric towards aircraft navigation. The point satellite which is kept at the distance of just 200 to 440 miles to avoid atmospheric interference. Lesser distance will help in speedy communication and most importantly will support ADS-B ground requirements, hence curbing the problem of signal shortage over oceanic regions, which

is one of the main short comes in Aviation Transport Tracking.

Index Terms— Big Data, Soft Handover, GBPS, Aircraft Communication, ADS-B Security, Optical Laser Communication, Aerial Communication.

I. INTRODUCTION

Safety and security is the main concern. Timely and Efficient analysis have been drawn over each and every minutest technology to emerge an excellent and fault free system. The oversight of the interactive meeting led by various components of ADSB such as Satellite which radiates GPS information without procrastinating the deliverance, the receiver unit fixed at the craft station. Control station, radio station at the ground level. [1]ADSB is the master component in global flight safety and is satellite concentric system will be centric and is heading towards critical protection communication and navigation simulation for aircrafts. The system definitely safeguards the travel campaign for safety for flights globally [2].

Promised by the Automatic Dependent Surveillance Broadcast (ADSB) to be more valid and error free, to be a complete faultless and hence an unambiguous system can be guided by the high tech GPS based tracking satellite linked by aircraft system which transmits GPS based position twice every second .

ADSB sends up signals to constellation of satellite as well as down, for vigorous and constant tracking and location of crafts regardless of their location and heights. The monitoring is based on ADS-B line.

Argumentation system or ALA's is intelligent enough for handling and locating aircrafts for every second of trip with ADSB the plane has a transponder that gets global navigation feature enabled with the information with the plane side member , altitude information, landing , airliner speed. So the Advance ADSB unit [3].

Apache Sqoop is a tool to transfer content from traffic security its predictive ability is remarkable if can detect the occurrence of traffic.

The main game in Big Data surveillance is played by GPS vehicle location tracking guidance system. The data analysis layer uses information coming from data mining technology, big data technology along



Fig.1 Side View of the point satellite while launching it into the space

In the other part of this research paper we will demonstrate the underlying technology of how the processor of the radar base stations should be made up of, the Massively parallel processing with each deca core processor each having a separate operating system uploaded , will prevent future deadlock and hence is well needed in critical systems. Application of Big Data is to develop a smarter way of intelligent Traffic System monitoring. With the rapid growth of Aircraft transport industry, the surveillance industry is facing an unprecedented challenges. Big data has definitely solved the problem of traffic management. The terms greatly used in Air traffic management area are Data Storage pattern, analytics and Data management. We have various Data management environments Hadoop being one of the best Big Data Technologies which sub model data chunks by map reducing it into well-defined chunks. Hadoop into RDMS, Big Data has improved the

with various mathematical models for real time Traffic Model Drawing. Handling. This huge chunk of data requires highly efficient Processing Technology based on MPP. Massively parallel processing is well coordinated by the set of processor units processing each program thread. Each individual unit communicate using messaging interface. In some implementations more than 200 processors can work on same application, which is remarkable.

II. ADS-B SECURITY AND WAYS TO IMPROVE ON THEM

The barebones of ADSB rely on computation and communication which are hack able, which threatens the existing system. Being a part of a life critical system such as an aircraft every piece of work which form an integral part of the system should be an ambiguous and fault free. Hacking into the aircraft is

not only making it crash but is also returning essential data associated with it. Homomorphic Encryption method recently patented by IBM is a way to process data into its encrypted form which later is processed and communicated without decrypting it on using the method of encryption we can easily maintain the security discipline [4]. This technology can be highly valuable and can be definitely implemented in the real time highly critical systems like that of an aircraft, the encryption method in a critical real time system should be end to end along with the end to end way of encryption the security should be high at the bottleneck point of the concern that is our devices because the hackers can and do target bottlenecks. So well developed hardware running verified authenticate software [5]. Security of the aircraft system should be as much that the data and critical information should now be decrypted else were other that by some authenticated hardware certified devices that can add decorum to the functional unit as a critical system [6].

III. RADAR WITH ADS-B SUPPORT COMBINING THE RADAR DATA WITH COORDINATE REPORT FROM ADS-B

The idea behind the development of an effective and an improved system of surveillance match the foundation of our research paper which is concentrated and aims to improve the mechanism. The massively parallel processing made along with the map reducing skill of our database in radar can help us analyzing the location of our aircraft in a more precious and error freeway. In this paper we have framed a logical algorithm which is an improvement to the present deployed system.

The Algorithm is based on the principle distance calculating between the ground based radar system and our aircraft firstly, the distance between the aircraft and radar is calculated and then it is compared with the adjacent radar neighbor and the shortest is processed and communicated to aircraft as well as the ATC Tower. The perpendicular distance being the shortest distance and is calculated along with latitudinal a longitudinal coordinates can determine the distance between aircraft and the Radar Base Station which is grounded [7].

So calculating distance will be from the information derived from latitude and longitudinal is mentioned. One of the methods to formulate the distance is the

Haversine formula. Initially in a Radar the controller doesn't use any formula. They impartially stare at the distance on the graph of radar scope which was graphed by a radar. Though we have a formula to calculate the shortest distance between the aircrafts, we don't use the formula to determine in real life.

Radar Signal simulator is a Matlab tool that can generate raw complex radar data based on supplies. On assuming earth is leveled flat and the coordinate system is orthogonal using simple Pythagoreans formula we can formulate the distance to some significant digits (It's not really true for north and south poles)

Calculate the shortest distance:

```
if (R1 << R2 && R1 << R3)
{
Output = Use R1
}
If else (R2<<R1 && R2<<R3)
{
Output= Use R2
}
Else
{
Output= Use R3
}
```

We have to use multiple radar within the surveillance system, each of which were encounters a specific area regime. The data information of each of our functional unit radar will be processed by MPP parallel processes and each data set will be chorally combined and handled.

This paper illustrates (defines) the concept of introducing high level synchronized processing and integration to data box at every radar work station [8].

This simple Algorithm is for selecting the Radar we will communicate with from the Aircraft System. ADSB being the core underlying technology of next generation system of navigation and air traffic control. It uses the satellite based and location of system broadcasted between aircraft and ground station. Through ADSB provides with a better coverage and accurate system then traditional network of ground based radar TCAS.

Air traffic reconnaissance as mandatory in controlled airspaces these days overwhelmingly utilizes ground stations fortified with Primary Surveillance Radar

and Secondary Surveillance Radar together with Mode-S transponders [9].

IV. SOLUTION TO THE LIMITATIONS OF AIRCRAFT COMMUNICATION IN ADS-B

The distance makes it tougher for the ADSB to cover over the huge matter covered areas. Although ADSB broadcast is transforming all major segments of the contest unit in aviation. Due to the satellite interface it has become a real time tracking unit; making the surveillance system more efficient and unambiguous to track.

ADSB is the new in the world of aviation which is replacing TCAS. Data analysis for ADSB shows that 70% of the commercial passenger aircrafts are equipped with ADSB Transponder. The technology is in the process of development and growth. And very soon around 2020 it will be over taken [10]. ADSB Receiver's grounded receive flight information from aircraft equipped with ADSB Transponders and sends the information to and fro in the system. The farther away from the receiver tower less will be the coverage and higher it will have to fly. Though we had a means to calculate the portion of non-ADSB equipped with the help of a multilateration (MLAT). To sort the limitations we are upcoming with a new idea of covering the oceanic area we can have an inboard satellite which covers the overseas space [11].

V. 5S FEDERAL INTEGRATED MAJOR MECHANIZATION FOR RADAR

GIS – Geographic Information System, RS – RS Video Capturing, GLONASS – Global Navigation Satellite System, AESA – Active Electronically Scanned Array, UAPS – Underwater Acoustic Positioning System, Multiple Carrier Modulation for increasing in signal strength.

Internally and externally in a radar which can be used to comprehend 5S Integrated system. Firstly, for tracking of underwater vehicles and marine archaeology when the aircraft is collapsed under water through the method of Long baseline (LBL) acoustic positioning system. Moreover, we are operating the Geographic Information System technology for apprehending storing, inspection, examining of data including location, altitude, latitude and longitude. Data capture concept comes into use when putting information into GIS.

Furthermore, AESA is working in collaboration with GLONASS which gives the precise location of the proximate aircrafts to the radar which provides the information to ATC towers and the message goes on to the pilot by means of multiple satellite systems with active electronically scanned array which is well-regimented by means of a computer measured array in which the radio waves can be electronically generated to dissimilar directions without moving the antenna [12].

Previously TCAS and presently ADSB is a technique with mainly aimed at the minimizing the incident happening in mid-air collisions between two aircrafts by using a system of board transponders, processors and GLONASS as an alternative for GPS for finding the accurate position fixed more quickly through multiple satellite technique [13].

It conveys out by execution a three dimensional interstellar around the plane and it's present air space, with respect to Altitude, airspace, holding on for respect to the moving toward opponent aircraft, as convinced and antedate if a risk of impact conquers. Any imaginable collision will be promptly be trailed by a complementary system for both the aircrafts, called resolution advisory, with strategies conveying by the inflight instrument and a computer-generated voice using ADSB technology.

Federal Aviation Administration is initiation up-to nearly 100,000 aircrafts will be equipped with ADSB out by 2020. But according to the aviation industry facility paralleled with time it is very low expectation. ADSB is equipped with Mode S transponder above (18000) feet with ADSB transmitter, and universal access transceiver (UAT) should meet the requirements of TSO-C154C for installing the ADSB in any aircraft in the United States of America [14].

VI. CONCEPT OF POINT SATELLITE

To curb the problem of ADSB coverage we are up with a new idea of point satellite which we will fix in middle of the thermosphere it will cover the oceanic uncovered area. To hold our point satellite above our shoulders at a height of around 200 Km, will keep in covering oceanic regions which was a pin fault in ADSB. The authentic fact remains the basics of the reality that from 210 miles and above is the start of

the region were the atmospheric interference is minimum.

The limitations can be overcome by the conceptual representation of placing a point satellite in the thermosphere. The point satellite will inculcate all features of the base unit. Radar system which is generally grounded.

The underlying motion of the point satellite is to rectify the limitations of overseas communication

frequency radio wave are not obstructed by ionosphere; they can well travel the huge distance.

The high frequency we use like UHF and VHF and microwave frequency and highly used in Aviation system location. Two waves with lower frequency will have more wavelength and less energy and less speed to travel. Hence appropriate to interferences that is the reason for using VHF and UHF for Aerial communication state interference can hinder the



Fig.2 Aerial view of the point satellite

method for Aerial transport system. This should be a starting point of developing a strong base of experience and highly innovative, trust worthy point satellite based satellite radar system. Though undoubtedly communication is the basic function of all the satellite. The power to interact using TT&C system is the starting point. We have frequency generation, amplifiers which converts and receivers.

VII. THE AERIAL COMMUNICATION MODEL STRUCTURING

The Aerial communication system comparison of a series of modulation and demodulation technique in the radio. The modulated wave is received at the receiver station.

Since the aircraft fly 100's of Km above the ground surface; we use high frequency, high energy waves to track our Aerial flying system through the high

communication.

In contemporary satellite communication systems we have enlarged the frequency range of UHF and VHF radio signals. By employing satellite we can receive and transmit signals through large covered areas.

Nowadays the similar satellite system is used to support sophisticated telecommunication system and these satellite units help in removing the dyed space and hereafter increasing aerial communication excellence, less precision and higher coverage.

The example to clarify that how frequency is plotted with the efficiency of locating the transmitter of the frequency, we can quote an example of a moving airplane which moves away from the observer. The effect is renowned as the drop of pitch of frequency befalls as the airplane moves farer from the observer/Receiver.

VIII. SOFT HANDOVER BY POINT SATELLITE

Knowing a satellite being an artificial body launched

disadvantage by using point to point data like connection for every 15 minutes to the pilot [16].

ADS-B with satellite is the first way which has

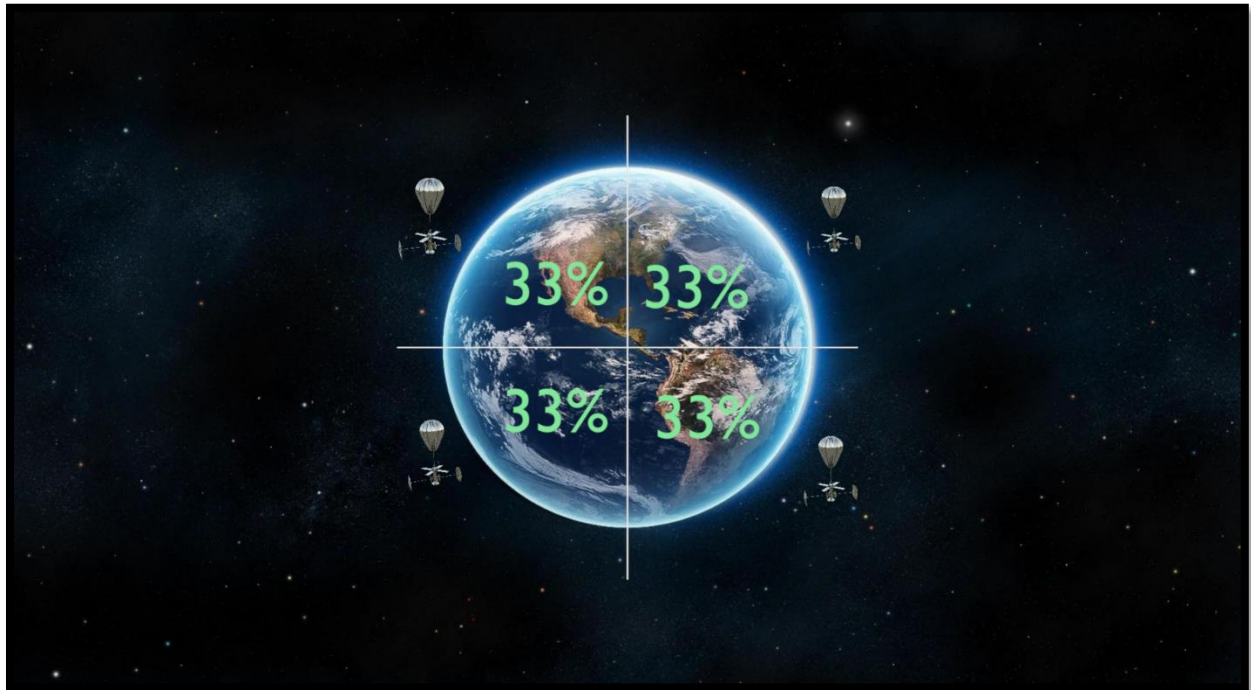


Fig.3 Superficial Arial View of Point Satellites from space

into space outside earth perpetrate. The main motto to launching this intelligent piece of work is to help us in various crucial phenomenon. The top in the hit being TV Broadcasting, Telecommunication, Internet, Weather Forecast etc.

We will divide earth range area into 33% area coverage and each satellite will handle 33% of earth area [15]. The diagram will illustrate the area ranged and connected by each satellite and Hence to avoid handover we use satellite distance formula and Hence get the distance as supporting it to the ADS-B embedded in our point satellite.

For SESAR and Next-Gen definitely it is the main underlying technology which locates and is busy in its continuous flight surveillance. ADSB (Automatic Dependent Surveillance Broadcast) has evolved and in evolving at a higher pace.

Most of the earth space being non covered and uncontrolled airspace. In area with no Radar Reportage (Coverage) which in terms of technology and service is effected on Non-Radar airspace like Polaric regions, oceanic space and on diversifying earth grounds through ADS-C is removing the

proven the feasibility of space base ADS-B. Earth satellite will take care of 33% of earth area and hence we will not face any Network shortage and Handover signals wearing. The Handover at the satellite outskirts showed to be soft handover and hence, the network should be in track. The soft handover may involve using connections to more than two cells when the aircraft is in its track [17].

VIII. GEOSTATIONARY BALLOON POINT SATELLITE (GBPS) FOR ELIMINATING THE DISADVANTAGES OF ADS-B TECHNOLOGY

The high-altitude balloon is one in all the earliest aeronautical inventions that typically ferry instruments/equipment to higher altitudes to measure temperature readings and plan weather patterns with the help of APRS, Automatic Packet Reporting System, transmitters or GPS, Global Positioning System, and can be tracked with the assistance of radio stations and radar. It relay's information back to the ground such as atmospheric pressure, humidity, temperature and wind speed.

The point satellite which we are making ought to be kept in the thermosphere so up to 700 km (50 to 440 miles) which is a geostationary balloon point satellite. Thermosphere is the second highest layer in the earth surface, the density is too low in this layer and temperature can rise from 2700° F or 1500° C. This layer is free of water vapor and there is no clouds formed so there will be no disruption to the point satellite [18].

One of the source for receiving the energy is this layer is by solar wind energy. There will also be some of the ultra-violet radiations in that layer so we need to protect the satellite by constructing it with appropriate materials which can resist the low/high temperature and radiations in thermosphere. The impetus framework / propulsion system would permit the inflatable to move into and keep up its positions. The GBPS satellite will be fueled and equipped with the extremely powered solar panels which can resist any kind of disorder in the atmosphere. The air in the thermosphere is so thin and regardless of the fact that the deliberate temperature is extremely hot, the thermosphere would really feel exceptionally frosty to us in light of the fact that the aggregate vitality of just a couple of air particles dwelling there would not be sufficient to exchange any calculable warmth to our skin.

There are also two different types of waves which is present in this layer: Firstly, one is the internal waves through finite vertical wavelength which can conveyance wave energy upwards & secondly, peripheral waves through infinite enormous wavelength which cannot transport wave energy. Before making the GBPS satellite there are several things taken into consideration like energy input, energy budget, solar radiation/wind, atmospheric waves, thermosphere storms etc.

Mainly the process of building the point satellite is done in three stages:

- 1) Designing (Conceptual Design Phase)
- 2) Engineering (Preliminary Design Phase)
- 3) Manufacturing (Detailed Design Phase)

The thermosphere has a low thickness gas with very less particles and they have high energy but they don't mix together to form vitality by and large. For example, we can sit in a sauna at 85°C for a long time but we cannot keep our hand in 85° C water because the temperature in the layer is matching but the heat is very different, because temperature is how much

energy individual particles have but, heat is measure of how much energy is contained by all particles in a given space.

The balloon will be in any case be warned by radiations, obviously, yet this is effectively countered by building them of intelligent/brooding materials.

This high altitude GBPS satellite is specially used for in the aviation industry for ADSB coverage with light weight, by using composite materials for construction but we can also use this satellite for various weather monitoring, wireless network for internet etc [19].

The balloon we are using should be super pressurized balloon filled with helium and the pressure in the balloon with depicts its height and hence energy with several progressive gases.

The satellite is attached to the balloon which not only has an ADSB network but it also acts as a radar tower in the ground station. We will have a convertor filled with the solar power which will keep the balloon filled with the gases required to float the satellite in the atmospheric layer. Any difference in the pressure level will be normalized by the additional pressure balance sensor equipped in the satellite.

After investigating on the several incidents in balloon technology while landing, now for our balloon satellite GBPS we can change the balloon in air itself without any accidents in while landing.

Using different latest technology like robotics equipment etc. So these four Balloon satellite can cover the whole oceanic regions so that there is no network shortage for ADSB technology in the aviation industry [20].

IX. THE PROPOSAL OF SPACE BASED POINT SATELLITE WITH MICROWAVE WIRELESS POWER SYSTEM

The main idea behind launching this satellite is to develop the wirelessly microwave powered unmanned aircraft. The satellite which we are launching will be having four solar panels and two mirrors attached to the satellite which work with microwave wireless power system. Microwaves are better for transferring the information from one place to another because the microwaves have the capacity to penetrate rain, snow, smoke and clouds. They are of three types: Firstly, short range with inductive coupling. Secondly, medium range with reverberating induction. Thirdly, long range power transmission with electromagnetic waves. In our satellite we are

using the third type with long range electromagnetic waves [21].

The basic configuration of the solar powered system SPS is that there are two parts: In the first part of space segment, sunlight will strike the solar array then converts to DC power microwave circuits the too spacetenna, then in the second part of ground segment, the waves from the spacetenna with microwaves will convert to rectenna then at last it converts rectenna to DC-RF conversion it is the commercial power network.

The aircrafts will be moving in the stratosphere which is the level between tropopause and stratopause from 0 to 50 km from ground. The vitality picked up from the profoundly controlled solar panels can be able to send the remote power transmission to the ground stations as well as if required if the aircraft skin is designed in such a manner that the aircraft can have the capacity to engross the solar energy from the satellite as microwave frequency energy and convert it in to power and works with wireless power in case of any emergency like inadequate fuel or any other necessities during flight.

The radiated microwaves which come from the thermosphere which will pass through the Ionosphere, in this stage the expanding of electrons temperature, variety of plasma thickness, excitation of plasma waves will happen then passing microwaves will be having the variation in the microwave beam pattern and little bit decreasing of microwave power, this happen in the ground.

For instance simply like listening/hearing to a radio when the wave is conveyed from the radio station then it verves out in all directions, then the antenna picks up the wave, and transforms it into sound waves. In its place of changing over the radio waves into Sound waves out of a sound framework, we convert the radio waves into DC power. The whole processes of power transmission is done wirelessly.

The satellite gathers the sun based power from the second top most layer in the air, thermosphere and pillar it towards the ground stations by focusing mirrors which are available on the boards with photovoltaic cells change over light to power and with the assistance of small scale wave transmitter dish, in the wake of changing over to power then it is changed into radio recurrence vitality and it will beam towards the ground based electric lattice.

The satellite has a reception apparatus antenna, which comprises of dipoles and diodes for retaining microwave vitality and is an electrical device which changes over electrical energy to microwave recurrence waves.

The world first fuel free unmanned aircraft which used the wireless powered microwave energy to fly in airspace is SHARP- Stationary High Altitude Relay Platform, in year 1987 at Canada. In its place of evading the power mugging by power being loosed for the duration of distribution and transmission due to confrontation of wires used for grid. The technology of transmission of electrical energy without wires was introduced in the year 1893 by Sir Nikola Tesla. He was able to light about 200 lamps from a distance of 40 kilometers. The multiple solar satellites which we are using should be able to transmit the energy universally by which energy crisis can be decreased in the aviation industry [22].

As in the previous concepts and papers written by few authors of wireless power transmission to the unmanned aircrafts can be done by maintaining a charging area from the ground station and they will also be doing the observation and Monitoring but in our solar satellite which is kept in between mesosphere and thermosphere which can form a charging area in the sky itself for the aircrafts to charge instead of ground based charging.

To produce the microwaves, scientists have proposed vacuum tubes, for example, magnetrons, klystrons, or voyaging wave tubes, in light of the fact that their energy transformation productivity is sensibly high—ordinarily 70 percent or higher—and they're moderately reasonably priced.

The power transmission can be ground based or it also can be space based. The space based power broadcast is chosen over ground centered because there is 24 hours sunlight, no scarcity essential for nighttime power, the energy accessible in space is 4 to 5 times than on ground in earth surface, there is no lengthier winter nights, storms, cloud creation on thermosphere [23].

The aircraft or the ground station should be built in such a manner that it is able to convert microwave frequency energy to electricity again after receiving high frequency waves from the satellite. This mean that we need to build the ground stations as Rectenna which consists of rectifier and antenna. The pretentious Rectenna is constructed using a Schottky

diode. At the point when there is any hindrance in the middle of the microwave recurrence while transmitting towards the earth surface like people, receiver do not hinder the transmission of power and magnetic field have a tendency to collaborate feebly with the natural tissues of the body, thus not inclined to create any harm to any living creatures. This innovation is solid, proficient, quick, low upkeep cost, can be utilized for short and long range.

A High Altitude Balloon (HAB) is a vast latex helium balloon that is fit for quite a group of objects to near space. These inflatables are loaded with helium or hydrogen and grow as they rise through Earth's climate. The satellite is fitted to a HAB is every so often raised to as the payload and every payload fills a specific need. It is consist of a parachute, satellite, radar, communication follower/tracker, and microwave power system. HAB's are overwhelming because they permit you for rapid and reasonable right of entry to space. The inflatable's different 360-degree cameras will record the whole voyage in top notch [24].

A ground group will screen climate conditions and the soundness/heath conditions of the inflatable Balloon. People call it as "the poor man's space program". Individuals fly High altitude balloons consistently everywhere in the globe. In the US, the National Weather Service flies High altitude balloons

twice every day to gauge the air qualities to help drive their forecast models. They are propelled from weather stations and airport terminals the whole way across the nation.

Climate inflatables / Weather Balloons are ordinarily made from latex. Latex is a distinctive material. Plants utilize latex as a barrier against herbivorous creepy crawlies. This drain like fluid can be separated from trees much like maple syrup is extricated from maple trees. Once the latex is normally extricated, it is spun in a form in the state of the inflatable and cured. Each inflatable is then expanded and examined for holes and imperfections before being transported out to merchants or clients.

A balloon loaded with helium will fly for a similar reason like oil skims on water. Oil has less thickness than water. The oil comes on the surface of the water. Similarly as the oil has less thickness than water and ascends to the surface of the water, helium ought to have less viscosity than air and will ascend to the surface of the earth atmosphere. This is something to be helpful in the fact that the surface of our air is the place space starts and where we need to fly our payload. By duping the helium inside a balloon, we can ascribe a line to the balloon, called the flight Pullman, with our payload deferred at the other end.

The HAB will then lift our payload to the edge of space. Be that as it may, as the HAB trips higher, the

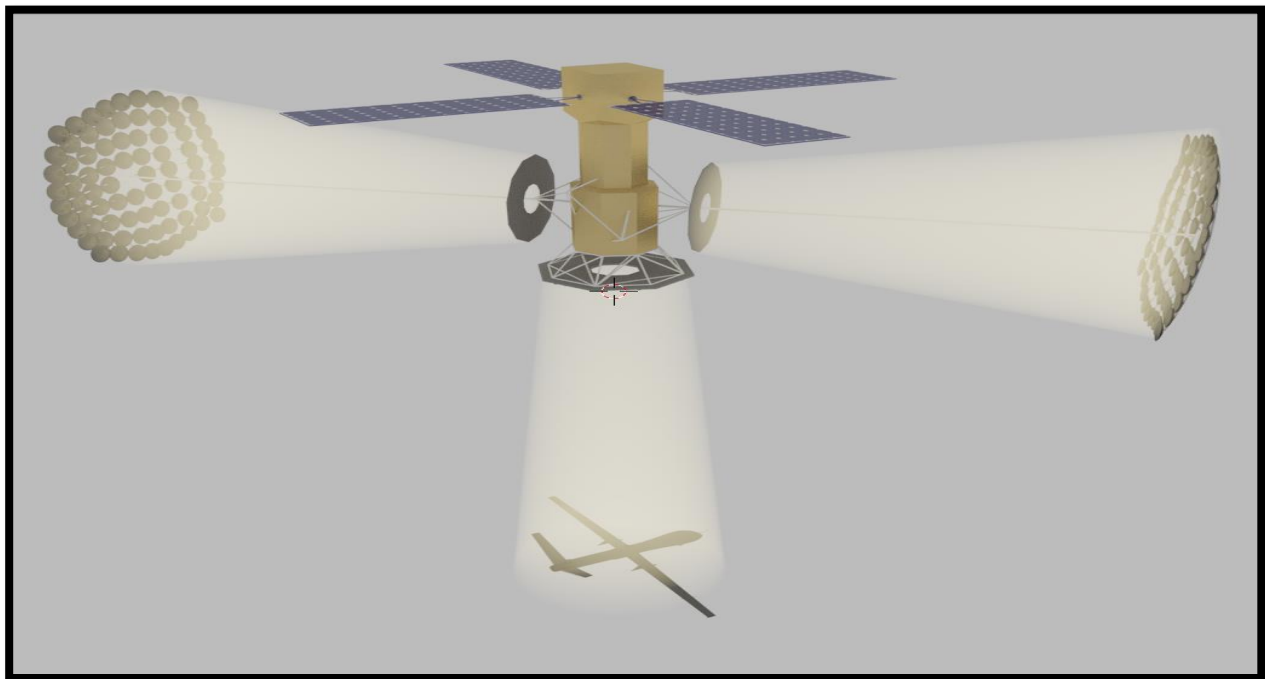


Fig.4 Solid CAD Model of the Microwave Wireless Power Transmission from Point Satellite to Unmanned Aerial vehicles

weight in the climate diminishes. The lessened weight causes the inflatable to grow. Climate inflatables are uniquely intended to have the capacity to extend to a huge measurement.

X. USAGE OF OPTICAL LASER
COMMUNICATION FOR PRECISE
ANGLES TO COMMUNICATE TO THE
ADS-B POINT SATELLITE FROM
GROUND STATIONS

Space Communications is necessary for any space travel as it can help us give commands and send back to us information back to earth. While conventional satellites rely on radio frequency to communicate, it takes a lot of power in this process. So we can come across this issue by using optical communication, which uses lasers in precise angles to communicate to the satellite. In the Point satellite, ADCS has also an inbuilt instinctual response system that alerts the satellite to protect itself. This is more efficient as it does not rely on the main computing brain. 3D Printing can be used in the future for construction of different satellite parts for decreasing the cost and for the greener and sustainable emission free future [25]. Aside from transfer speed confinements, a moment concern is data security of ISR information, since radio transmission utilizes a portion of the electromagnetic range that is defenseless against both listening stealthily and sticking. This is not the situation with optical correspondence, which is greatly hard to block or upset [26].

For a particular optical profundity of the scrambling medium, estimations of the information rates are resolved for which correspondences can be kept up within the sight of direct foundation clamor brilliance while a negative edge for higher information rates will bring about an over the top mistake free rate. Procurement and high rates move between flying machine in low-perceivability climate appear to be attainable giving a moderately secret framework with high invulnerability to sticking. Laser correspondences through optical strands/fibers move several terabits of information

consistently amongst different communities and crosswise overseas. So this technology we can introduce in the future ADSB technology for overcoming the signal problem or shortage over the oceanic regions and also to overcoming the missing and crashing airplanes due to losing the contact between the Air Traffic Controllers and the pilot in the aircraft. So our point satellite can be the solution for the various problems facing in the aviation industry especially in the ADSB technology [27].

XI. BIG DATA RECORD ANALYSIS IN
AVIATION

The various discipline of aviation rely on data science, the fact can't be denied. Every day the aircraft travelling from Heathrow Airport goes to Ireland via say two stops Liverpool and Duplin. The data science methodology will help us keep a record of the trajectory followed by returning the point location of the trajectory path which will automate the aircraft system broadly force a smooth way out for communication. The build in data trajectory of the aircraft will be well maintained by the aircraft with the help of data science analytics. We can also create a predefined trajectory path for aircraft's to communicate, smoothly using the concept of big data [28].

With it the data can be stored and maintained in over point satellite and at the base station unit. Big Data can and has changed the entire picture of how aircraft system functions, it provides us a map of all highlights of airline traffic. The data collision will form data Inventory to determine whether the flight flow will be smooth [29].

To generate highly accurate real time system we need to store every bit of data in such a manner that our system never crashes and hence the data flow towards and outwards should be smooth. The increasing density of the air traffic, traffic volume and data associated is growing and the fact stands erect to used limited resources by very efficiently. The aircraft is flooded with significant amounts of ADS-B data, weather information and other communication based information.

We should have a Big Data process base in our point satellite which constantly communicate with the aircraft, handling its data, managing it and organizing the data need to smooth flow and movement. Starting from network monitoring to bandwidth analysis, to firewall management to weather broadcast to base.

testing of transponders and associated ADS-B units have results in error proven system of locating the flight. There are number of software available to encode and decode ADS-B signal but still errors prevail the system proposed in this paper improves and guarantees proper and error free system for generating a surveillance technology in aviation to

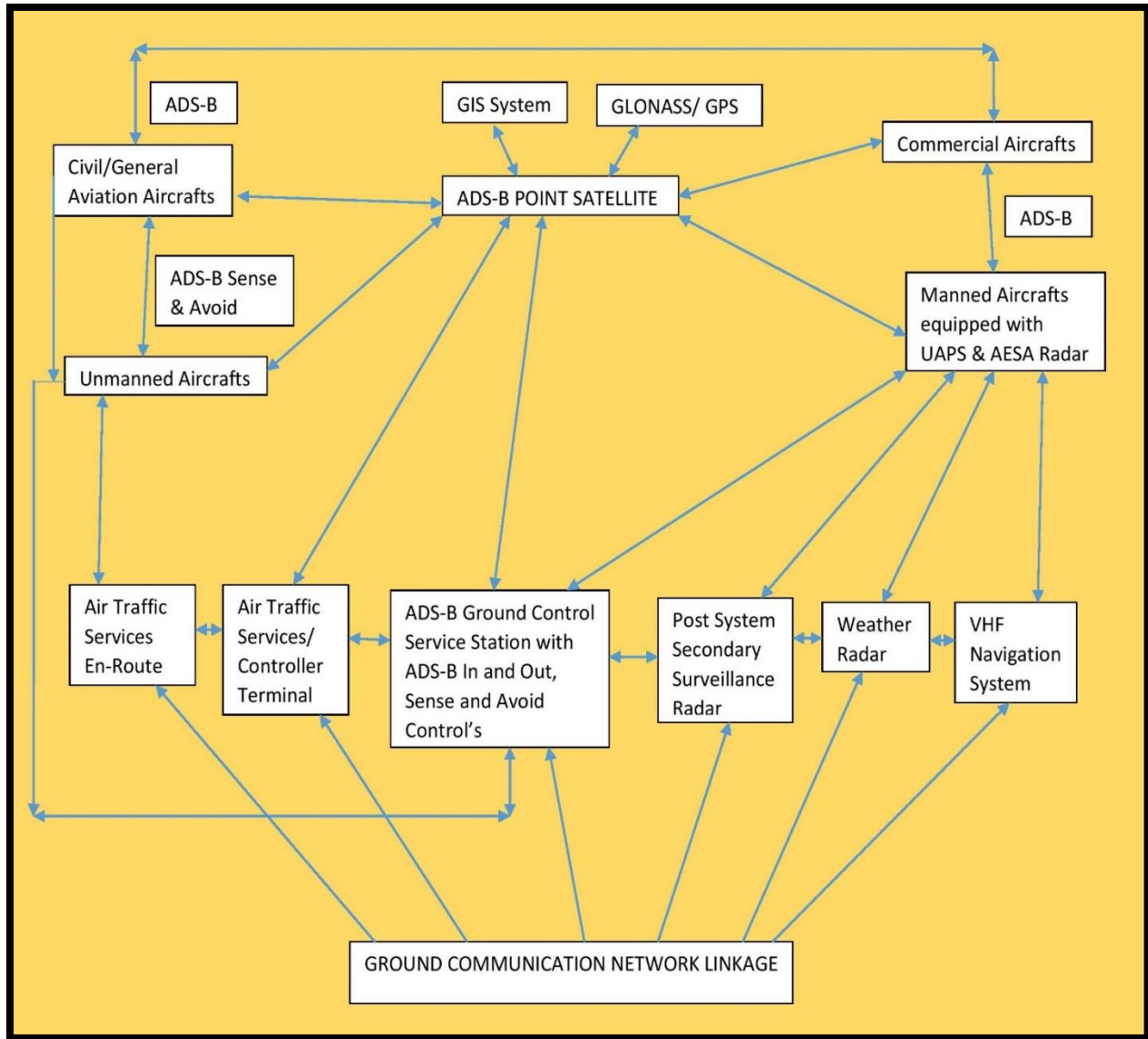


Fig. 5 Communication Network of the ADS-B Point Satellite

XII. NEED OF THE HOUR IN TRACKING

The milestone on the path of recovery to extract a highly efficient and rebuts surveillance technology in aircraft broadcast for proper positioning and tracking. The efficiency being about 6.8 times per sec on 1090 MHz. We have many incidents of improper ground

track aircrafts velocity status , and position. ADS-B signal alternates which can be removed by point satellite support system which contains the support for ADS-B and hence assists the base station. Eventually on improving the efficiency of point satellite the work load on base station will be covered.

The underwater acoustic positioning system can aid a helping hand to track the aircraft which has collapsed in water. Even if our aircraft collapses it should be designed in such a manner that it has a capacity to float. This paper also proposes an idea of a floating suit that can be wore out of our aircraft and will keep it afloat in water and will prevent its sinking.

The aircraft now a days take arduous flights take shorter, more fuel efficient, and plot joiner in rough weather, and even fly higher and deeper in sky in high traffic sophisticated areas.

The proper tracking system will keep a track map of aircrafts and map the trajectory of the location calculations will thereby be faster track then previous array because the distance between the point satellite and aircraft is much lesser than the satellite and aircraft which results in faster, better and highly efficient way to tracking the aircrafts. To compensate, we induce this method of transmitting ADS-B signals to satellite overhead, rather than ground based receiving stations. To reduce the number of overheads in ADS-B signals. The construction of the point satellite should pave the way to an efficient and overhead free system which is much faster and preferred.

XIII. STRUCTURAL FEATURES OF THE POINT SATELLITE

The main features of the point satellite include the following:

- 1) **Solar Panels:** - It is a panel intended to absorb the sun beams as a wellspring of vitality for producing electricity. Sometime solar panel can't derive the required energy in that case radioisotope thermoelectric generators are used to derive power.
- 2) **Radar:** - It is a system/framework for distinguishing the nearness, bearing, separation, and speed of the airplane, ships, and different objects, by conveying beats of radio waves are reflected off the protest back to the source. Will be a part of the point satellite which will help monitoring the path traced by the aircraft.
- 3) **GPS receiver/ GPS navigation device, GPS Antenna:** - GPS is a device that is equipped for accepting data from GPS satellites and afterward to precisely figure its land area. The GPS is a worldwide route satellite framework made of a network of at least 24, however right now 30,

satellites put into space by the U.S. Bureau of Defense.

- 4) **Telescope:** - An optical instrument intended to make far off article show p closer, containing a plan of focal points, or of curved mirrors and focal points, by which beam s of light are gathered and centered and the subsequent picture amplified.
- 5) **Big Data Process Box :-** Takes care of real time data processing ,it has a scalable distributed parallel processing which speeds up rich querying and high speed data structure transform for high level data analytics.
- 6) **ADSB Signal processor (in and out):-** ADSB-Out transmits data about elevation, velocity, and area got through GPS from a prepared airplane to ground stations and to other prepared airplanes in the region. ATC controllers utilize the data to see flying airplane in real-time with the objective of enhancing activity administration. ADSB-IN which is not some portion of the order and requires extra equipment, permits taking an interest in airplane to get traffic information and climate data from ADSB ground station and close by airplane broadcasting their positions through ADSB –Out.
- 7) **Large and Small parabolic dish for communication:** - It is an intelligent surface used to gather or venture vitality, for example, light, radio waves. Its shape is a piece of a circular parabolic, that is, the surface produced by a parabola spinning about its hub/axis.
- 8) **S-Band Antenna and UHF Receiver with Tri frequency communication (S Band, Ku-Band, and Ka-Band):** - S band is a part of the microwave band of the electromagnetic range. It is characterized by an IEEE standard for radio waves with frequencies that range from 2 to 4 GHz, crossing the customary limit amongst UHF and SHF at 3.0 GHz.
- 9) **Helium Extractor:** - Is the component within the point satellite which extracts helium from the balloon when triggered by the pressure sensor.
- 10) **Inside Satellite:** Fuel Tank Batteries, On Board Processors, On Board Computer, Switch, Reaction Wheel

- 11) **Thruster:** - It is a small auxiliary engine to keep the satellite in its precious location, utilized for exact moving and support of position.
- 12) **Star Tracker:** - It is an optical gadget that measures the position of star and utilizing photocells or a camera.
- 13) **Photovoltaic cells convert light into electricity:** - Photovoltaic is best known as a technique for producing electric power by utilizing sunlight based cells to change over vitality from the sun into a stream of electrons. The photovoltaic impact alludes to photons of light energizing electrons into a higher conditions of vitality, permitting them to go about as charge transporters for an electric current.
- 14) **Concentrating Mirrors (Primary and Secondary Mirrors):-** Concentrated sun based power framework produce sun based power by utilizing mirrors or focal points to think a huge territory of daylight, or sunlight based warm vitality, onto a small zone. Power is produced when the concentrated light is changed over to warmth, which drives a warmth motor associated with an electrical power generator.
- 15) **Microwave Transmitter Dish:** - Microwave transmission is the transmission of data by electromagnetic waves whose wavelength are measured in little qualities of centimeter; these are called microwaves. This piece of the radio range runs crosswise over frequencies of approximately 1.0 gigahertz to 300 GHz.
- 16) High energy microwave beam transmitter
- 17) **GIS (Geographic Information System):-** A geographic data framework is a framework intended to catch, store, control, break down, oversee, and present spatial or geographic information.
- 18) RS – RS Video Capturing
- 19) **GLONASS (Global Navigation Satellite System):-** It is a space based satellite route framework in the radio navigation satellite administration and utilized by the Russian aerospace defense forces. It gives another option to GPS and is the second option navigational framework in operation with worldwide scope and of practically identical exactness.
- 20) **Helium balloon:** - These are made up of light weight, synthetic fiber, help in keeping the point satellite floating high. The pressure density within the helium balloon will depict and determine its capacity and high from the ground.
- 21) **Pressure Sensor:** - It will sense the pressure within the helium balloon and will signal the convertor according to the pressure in the balloon, if the pressure is less the pressure will trigger the convertor to produce more helium, hence increasing the pressure within the balloon to make it float smoothly.
If the pressure is more the helium balloon can burst and hence the converter is triggered by the pressure sensor to decrease the level of helium in the balloon for the appropriate point balloon balancing.

XIV. SAFETY AND SECURITY OF THE POINT SATELLITE

Safety and Security at the top heart level of everything we try to implement are greatly analyze and endure, the importance of safety [30] measures in this new area of Aviation which is controlled by a nearer and a better system of governance here called as the point satellite, which has the ADS-B signal processing capacity [31].

The satellite technology which keeps a track of aircrafts are though allocated a specific band in radio spectrum band. The spectrum band allocated should be highly secured, SSL and Secure Certificates should be induced which will protect the connection from being intercepted from the intruder. Assisting Secure certificates we have Access Control Server RSA Security with adds to our shield. Threats like Jamming, spoofing and intruding can be obstructed by security measures to a great extent [32]. The

satellite, the GPS installed in the satellite provides critical positioning capabilities is connected to the pressure sensor of the point satellite which keeps a trail of the pressure on the satellite from all the sides which in turn is attached to the helium converter. The pressure scale will tell our helium converter to generate helium and through the filler can add it into the balloon, hence keeping it flowing high. C1 is the first comparator which takes the feedback and compares it to the reference balance scale which

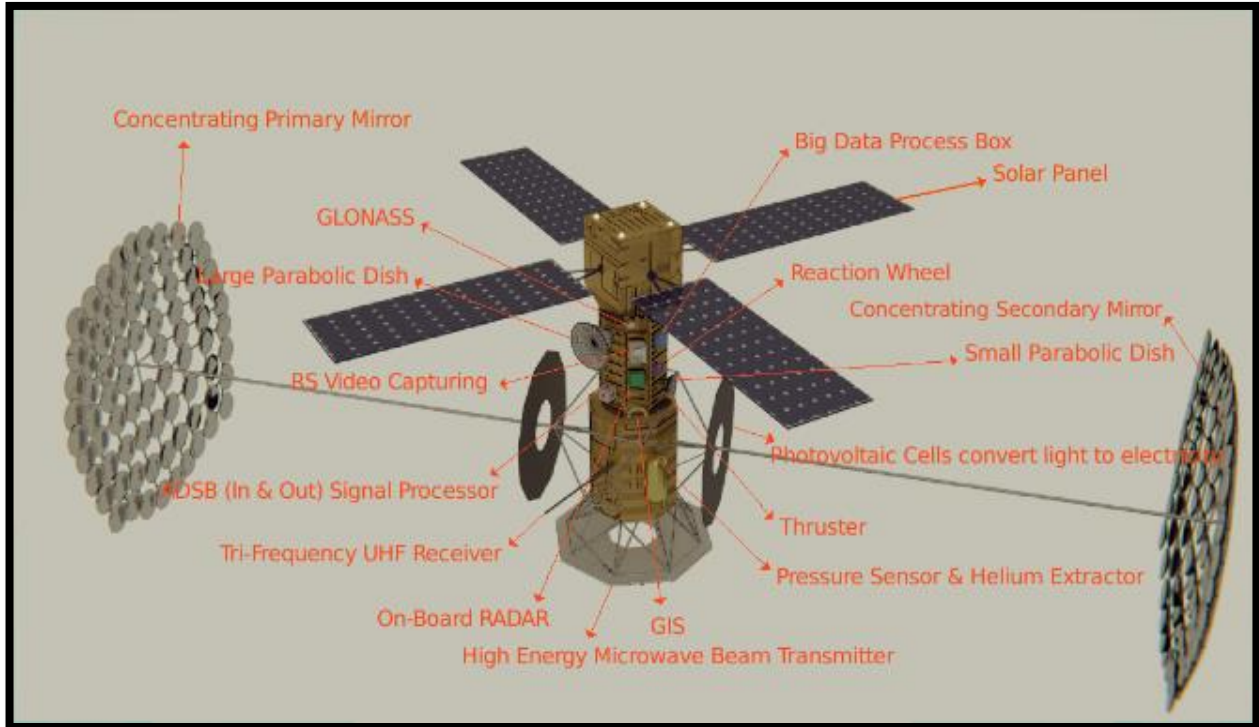


Fig.6 Structural Labeled Model of the point satellite deployed in the space

attacks on the physical layer such as non-stop jamming and more frequent message deletion are difficult and hard to defend against [33].

There were some tracking errors while tracking aircrafts ,indeed ADS-B acronym of Automatic Dependent Surveillance is a technology embedded for better safety point satellite has an ADS-B signal processor which as added safety.

A closed Loop control system governs the balancing of the point satellite, the GPS System unit in our point satellite will provide the set position of the

measures and determines the pressure at all sides and deviations will trigger the helium convertor which will pump on the balloon strength to grow higher. The Closed loop Control system diagram clearly demonstrated the working of the Balancing system. To meet future demands and specifications of Air traffic control the concept on point satellite was brought into existence, through the old gardens of traditional navigation facilities limitations, enhanced the flight safety. Indeed the two security goals had been handled separately by means of message authentication codes and encryption techniques.

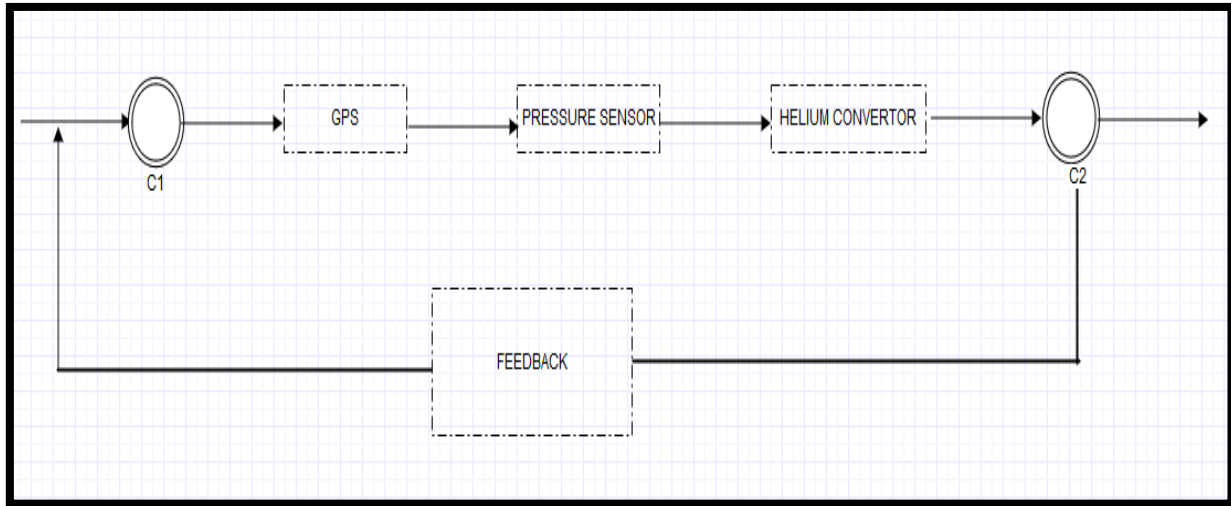


Fig.7 Closed loop control system demonstrating the pressure balancing in a point satellite

XV. MPP EXASCALE PROCESSING DESCRIPTION

Exascale is a fairly a new innovation way of making our radar base station smarter. Countries like China, France, and US are working hardcore to shape and have been successful in designing exascale base system. In the base station radar system the highly successful MPP method constructs the foundation; the input in the case which comes from the aircraft are broken and slotted. Then using artificial intelligence we can picturize and modelize the data received and can analyze it in tracking the aircraft and for the trajectory controlling path setting.

This highly intelligent data base radar system can communicate with our satellite and can transmit the traffic picture of the area. In every one see the traffic map screen in aircraft gets updated 20 times, which revels the efficiency of processing. Each ground station based radar also communicates with other radar to picturize the path/trajectory of aircraft in move.

The encountering of unprecedented number of threads exhibiting highly dynamic behavior will be deeply complex with huge number of thread, memory prefetching that can be successfully done only when

the processing capacity of the ground system is highly effective.

Exascale is based on stratergetic layer interportability support for tool component sharing tool layout

holding the software library files. Managing the low and high level protocols. Managing all hierarchical interoperability in the working work space with shared resources to develop tools. Exascale system though is expected to involve multilevel memory sectors to keep the data managed and well organized in the form which is ready to be processed.

Though data science is a very latest concept but not in aerospace industry because the underlying inputs from sensors, the weather data input stream are all aggregated, organized and managed. Just because of the high pace data stream coming it should have more managing capacity which marks the incredibility of the system. Though data which is incoming is to be handled by software's. The next question to be answered is what will the software do with data once processed; the data should be analyzed and later the result should be optimized and graphed till 24 hours with the local saver and later refreshed automatically. In parallel to the processing speed to process data we have an additional benefit. The point satellite is at a moderate range of distance hence number of base station can be minimized and radars are replaced by ADS-B system which are fixed in our point satellite [34].

XVI. CONCLUSION

This research paper key aim is to illustrate the importance and the practicality of High-Altitude Helium Balloons with point satellites can be launched for eliminating the signal unavailability near the oceanic regions for ADSB technology in aviation and

as the components are getting easily accessible. The foremost tenacity of our paper is to spectacle that the high-altitude helium balloons are very practical to set up in the aviation industry.

ADSB is the technology that is emerging with time and as a factor of time, it needs more research and more funding to be done in order to be implemented. It is already practical but it also keep the speed of development in check as a lot of money is being placed at an endeavor in outer space where anything is possible. The initial gas-balloon voyages dated was to the late 18th century when Nicolas-Louis Robert and Jacques Charles piloted the initial gas-filled balloon in France on Dec 1, 1783, era that humanoid flight was congenital. Meanwhile then, gas ballooning has progressed into high-altitude ballooning, and over the latter half century, hundreds of balloon voyages providing science with not only precious data, but some breath-taking interpretations of our globe. In detail, high altitude ballooning was rummage-sale as an equivalent in the development of humanoid spacecraft's. This is a consistent, resilient and dependable mode of exploring the edge of space. This helps us view and get information from the edges of the atmosphere.

The concept of point satellite in aviation can solve many pitfalls and can bestow the way to establish a well tractable and tracked system, the solar panels will provide the required energy needed for the inception drive of the system, co-supported by the helium convertor which refills the balloon to keep its pressure constant. The balloon strength will be measured by a pressure sensor and deviation in the balloon pressure can result in deviations that is why the point satellite will be supported by an additional balloon. Hence making the system a dual balloon point satellite. In addition to the pressure sensor we will have a balance sensor and any deviation in the balance sensor will pop up a new balloon to keep the system high in the sky.

Our research paper shows the potential of a High-Altitude helium balloon that can be done for the future of ADS-B and RADAR technology in the aviation industry. These innovations, now at its conceptual stage, will implement or open up a new field of aviation to the wider populous.

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