



A new technique for space debris controlling process

Rohit Gupta

Department of Physics, Agra College, Dr. Bhim Rao Ambedkar University, Agra, Uttar Pradesh, India

Abstract

In this Paper, I have discussed about space debris controlling techniques. At present, there are two or more space debris or space junk controlling and disposing techniques but these are not much powerful at present. So, space researcher, astronomers and astro scientists are developing new and more powerful techniques. Using these techniques, the human made space debris can be controlled. There are some previous techniques like prevention techniques and removal techniques which are also discussed in this paper. But another new technique is proposed here which is named as Back To Earth. In this technique, we use an additional rocket or reusable satellite launcher. With the help of this technique, the non-working space devices will come back to earth.. There are two advantages of using this technique. The first one is controlling of space debris and other one is its use in the non-functional space devices after repairing it. So we can say back to earth technique is better than other techniques.

Keywords: space debris, de-orbit, collision, prevention technique, back to earth and removal technique

Introduction

The space debris is serious issue for spacecraft, satellites and orbital planner for several decades. The space debris warns about future space missions in LEOs (Low Earth Orbits). The LEOs is mainly effective by high energy collision at spacecraft and satellites by space debris.

The space debris is divided in two parts - humans created space debris and natural space debris. The humans created space debris is non-functional hardware like, non-working satellites, launch vehicles and several operational satellites. The main part of humans created space debris is non-functional hardware approximately 94% and other is operational ^[1].

The natural space debris like, small pieces cometary and steroidal material is very large in number in space atmosphere ^[1].

Low Earth Orbits (LEOs) satellites are used for public communication and for scientific purposes. So, in these orbits, many space crafts and satellites also perform functions and most space debris are present in these orbits. The space debris are more effective to LEOs space crafts and satellites at present and future. So, I have discussed here about space debris controlling process in LEOs.

Effect on LEOs

The main effect by the space debris is on LEOs satellites, space crafts and spaceship etc. Because in this orbit, most of the space junk is tracked. The altitude is around 500-2000 km from earth surface which is very nearest to earth surface. So the cost of launching of the satellites are low and don't require high signal strength and take less delay time by LEOs because it is near to earth orbit. So in this orbit, the large amount of manmade object is found among the other orbits, like MEO and GEO ^[2].

NASA has tracked approximately 5,00,000 space debris in LEOs travelling around the earth with 17500 miles per hour (28,000 Kilometres per hour) and most of them is 1-10 cm in size or may be small but size is large enough to cause serious damages ^[2]. The object is large than 10 cm about 14,000 and there are total 7,50,000 space debris ^[2].

The space debris are different in size, speed and direction in the LEOs. The space debris are distributed randomly in all directions. At these conditions, the collisions will be with ultra fast speed and the satellites, space crafts and space walking astronomers will have to confront serious hazards by the tiny piece of space debris and due to force of earth pull, the object will start to enter in earth atmosphere and at the time of entering of objects in earth atmosphere, the speed of the object is very high (ultra high speed). So, it will burn just entering the earth atmosphere because in earth atmosphere atoms, molecules, ions and other particles are also available, collisions by this makes the objects to be burnt. NASA estimated that one piece of space debris return back everyday on earth surface. NASA, other international and national space agencies, space developers and astro-scientists have space debris really such a serious issue and develop the plan to mitigate space debris and control space debris in future. If we can't develop plan to dispose space debris in future, it will be a major issue in future, and the satellites, space crafts and astronomer will not safe in future in space orbit because space population is very high

and most of concentration or population of space debris is in very low orbit. The space debris isn't distributed equally all earth directions or earth orbits, but usually in LEOs^[3].

The life span time of LEOs satellites is around 5 years. After it, these stop functioning and stay in the orbit. The LEOs is used for several application like communication applications, military service, surveillance service, international space station (ISS), spy satellites and observation satellites but mostly used for communication purpose. The example of communication satellite is iridium phone system satellite which is used for remote sensing purpose because its orbit is sun-synchronous orbit. There are new ideas to take place which uses communication satellites in LEOs. Previously, the communication satellites is used for GEO. Satellite Satellites in GEO have signal latency and take long time to travel than LEOs. But in LEOs, orbit strength, less time delay and latency make it lucrative. So, the satellites owner don't face serious hazards^[4].

Only small piece of space debris causes the serious hazard of working satellites by the collisions. Two historical events of collision play major role in LEOs space debris. The first event come in into the picture in 2007 when china anti-satellite (ASAT) destroyed which produced 1,50,000 space debris in LEO large than 1 cm and second event in 2009, when iridium-cosmos collision takes place. It was an accidental event which took place when working iridium satellite collided with non-functional Russian military satellite. In this event, 2,00,000 space debris produced in LEOs which are larger than 1 cm in size. Production of space debris in this type of collision can't be ignored. It also indicates that this type of collisions can happen any time. Throughout this causes, the LEOs is known as critical orbit. The LEOs is critical because several large fragmentation events occur in this region and space debris lifetime may be in decades. In LEOs, the collision also become risky. In these orbits, the tracking of large objects (non-functional satellites and other large space junk) stop suddenly the growth rate of the space debris. In this orbit, only natural removing process are effective because of atmospheric drag^[4].

Debris Controlling Process

The space debris controlled techniques is way of controlling the space debris in earth orbits. There are two types of space debris controlling techniques, which are discussed below.

Prevention Technique

In prevention techniques, passivation, mission related objects (retention of covers and separation devices) and transfer to disposal orbit (de-orbiting) are also included. An important category of debris prevention method is passivation of hardware to avoid break up by explosion. The process is known as removal of all stored energy from space crafts or upper stage by depilating and venting propellants and pressurants and open-circuits batteries so that the object becomes inert. The LEOs rocket bodies, the expulsion propellants and pressurants have been used successfully in past and provides a significant measures of safety for the future^[4].

Removal Techniquis

In removal technique, re-trivalent de-orbiting (propulsive, manoeuvres, tether, drag argumentation, solar sail, laser) are also included in it^[4].

The techniques retrieval means that the hardware and space crafts come back on earth surface without any damage with the help of vehicle who is capable for atmospheric entry, like space shuttle or Soyuz capsules and retrieval hardware, Westar-6, Palapa-b, Sfu, Ldef, Eureka and a solar array from a Hubble space telescope. These objects were retrieved for reasons other than debris mitigation. The capabilities of retrieval space shuttle are limited to 600 km above the earth surface. The retrieval of large dilapidated is highly expansive and difficult, but it is certainly more difficult and highly expensive to recuperate the debris created from the atomization of such objects^[4].

But another new space debris controlling techniques can be developed. According to this technique, all satellites are attached with an additional rocket. After the life span time of satellites, the rocket return back to earth.

Back To Earth Technique

In this technique, we can use reusable satellite launcher or an additional rocket other than launch vehicle which will be used for back to earth from space orbits. after life span time of satellites (when the satellites convert into non-functional satellites). Back to earth technique will be mostly used for LEOs satellites because the orbit is near to earth. So additional rocket don't need much power and only low power single stage rocket will be suitable in this technique. Most space is in LEOs and hence dangers due to space debris approximately vanishes. Another advantage of this technique is that it can be reused after repairing the satellites. So, this technique is financially beneficial for us.

Results

In the study of space debris (space junk), the astronomer and space scientists don't developed space debris disposal techniques presently at large level (more effective). But space agencies also need to dispose space debris in future for health of satellites in earth orbits at large time.

The astronomer and space scientist are developing given techniques and thinking different types of techniques for disposal of space debris from earth orbits. But at the present time, the space scientists and astronomers don't develop more effective techniques for disposal of the space debris.

Conclusion

In the study of space debris (space junk), space debris is somewhat controlled at the present time and don't affect or damage the satellites and space craft at large level. If we launch the satellites at the present rate in future and don't take proper steps about the disposal of space debris in future then it will be most effective at satellites life span time. Due to increment in the number of space debris in earth orbits, the satellites life span time decreases. Therefore, we can say that the space debris play major role in future on the satellites span life time.

There are two or more techniques available for disposing the space debris from earth orbits, the techniques are applying for disposing the space debris from earth orbits and the techniques are known as removing space debris and de-orbiting space debris. Both techniques are not effective at large level for disposing the space debris yet. So we must need grow up the given techniques and develop another technique for disposing the space debris from earth orbit in future. So, I am suggesting Back to earth technique for disposing space debris from LEOs.

References

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