



Note: This file can not replace watching the video lecture. Because the video lecture contains more explanation through graphical elaboration.

Certified Junior Astronaut Training Course

Satellite lifetime and factors influencing it (Part 1)





This lecture will answer the following inquiry:



When does the lifetime of a Satellite end?





When does the lifetime of a Satellite end?



A satellite is supposed to keep rotating forever in its orbit in space due to the absence of any resistance that affects its movement such as air resistance or friction with any object. However; there are some cosmic factors that affect the movement of a satellite and gradually deviate it away from its right orbit. In Astronomy, These cosmic factors are called "Perturbations".



Source: IKONOS 3D Animation





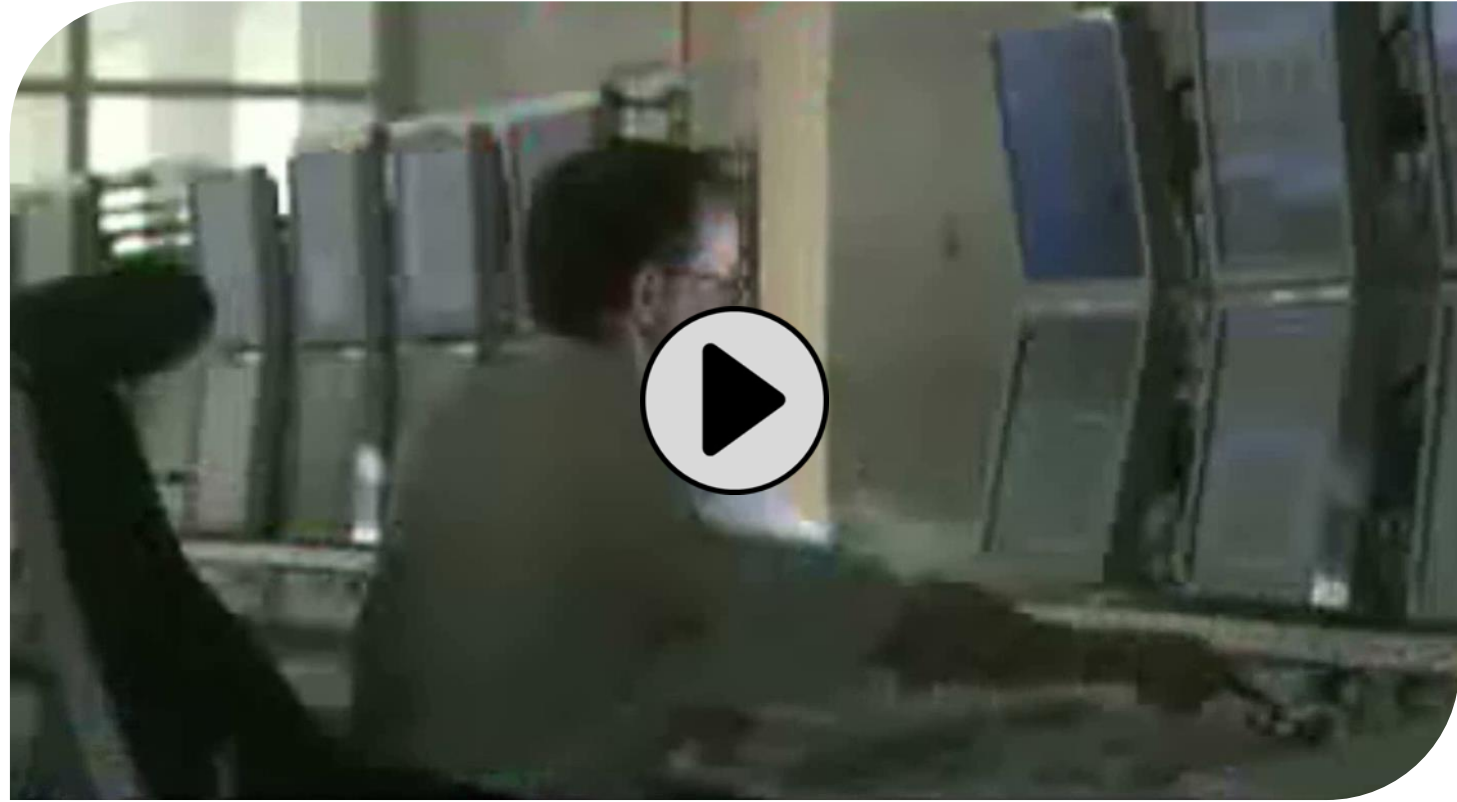
Cont.. When does the lifetime of a Satellite end?



In order to overcome these Perturbations, the Control Station should send commands to the satellite for readjusting its orbit every now and then. This orbit correction is achieved through the satellite's thrusters that provide it with

a precise amount of thrust; which is calculated with a very high precision towards a specified direction that readjusts the satellite in its right orbit.

When the amount of propellant in the satellite tank is finished, the thrusters will stop working. Accordingly; the ability to correct the orbit also stops and the satellite keeps gradually deviating away from its orbit until colliding with the atmosphere and then it is destroyed. At this point, the satellite's life time ends.



Source: SES Global Company, Messenger Propulsion System

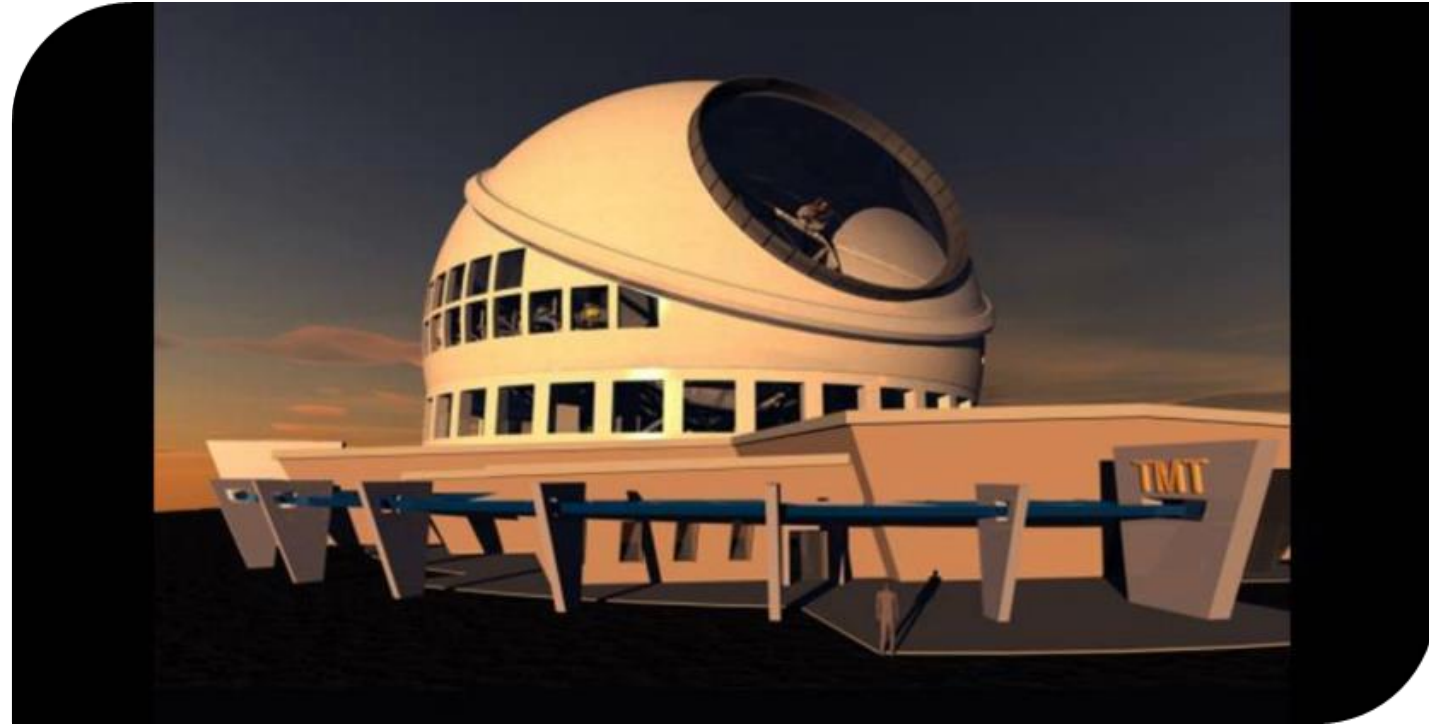


Cont.. When does the lifetime of a Satellite end?



+ Destruction of a satellite leads to severe problems as a result of scattering several debris from the destruction of the satellite in space. Each debris uncontrollably rotates in a separate orbit which subjects other satellites to collide with these debris and then destruction in their own orbits.

+ This has previously occurred with several satellites. The image demonstrates satellite destruction due to collision with one of those scattered debris in the space; taking into consideration that these debris are detected and tracked by observatories; where simulation of its movement in the space are performed. These debris are called "Space Debris".



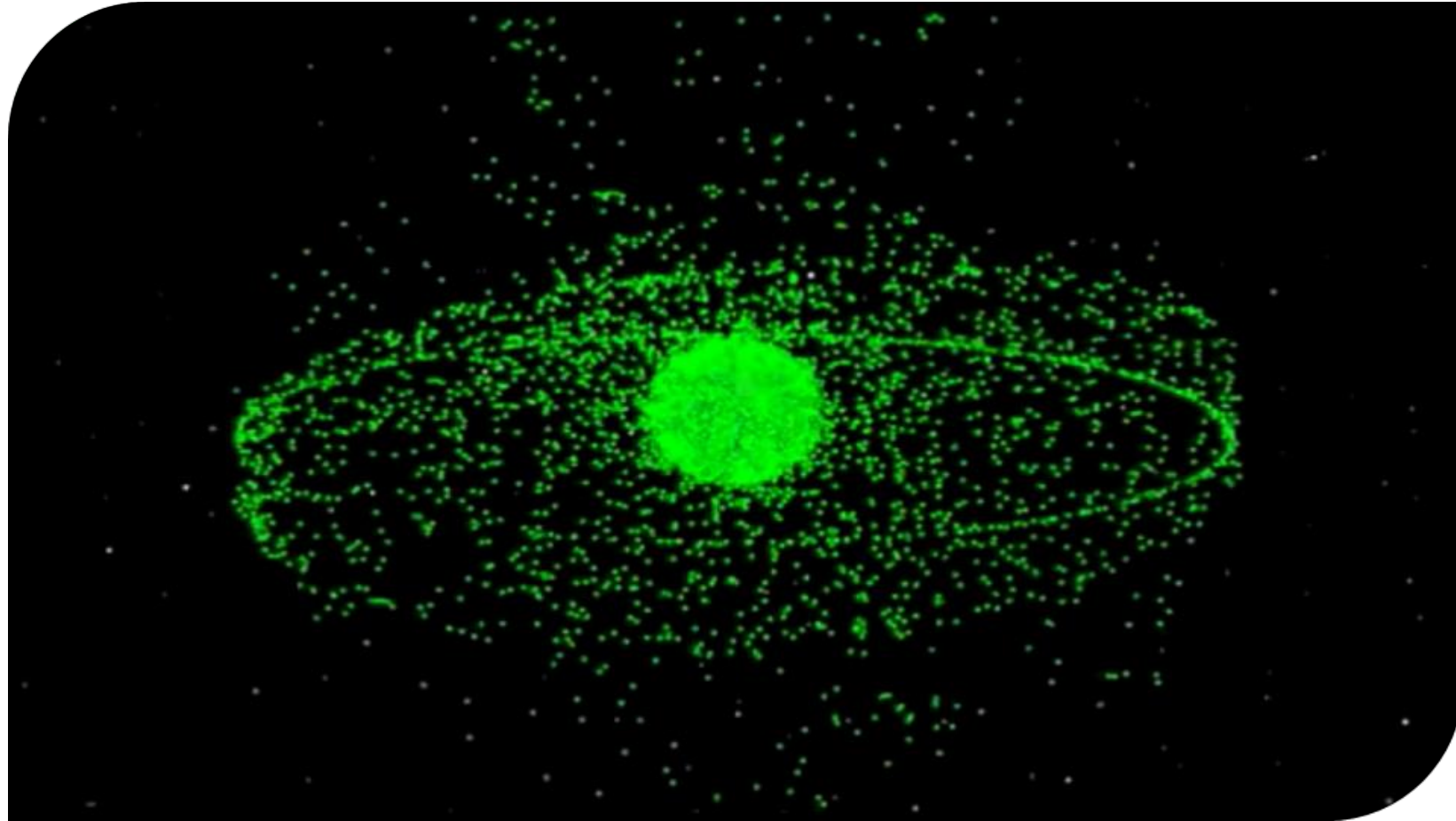
Source: NASA, www.barinas.net.ve





Cont.. When does the lifetime of a Satellite end?

- ✚ The number of scattered debris in the space whose cross-section exceeds 10cm is more than 21 thousand pieces. Debris of cross-section from 1 to 10cm is more than 500 thousand pieces; while those less than 1cm are more than 100 million pieces; according to the office of Space Debris in NASA.



Source: Space Debris by Michael Reher



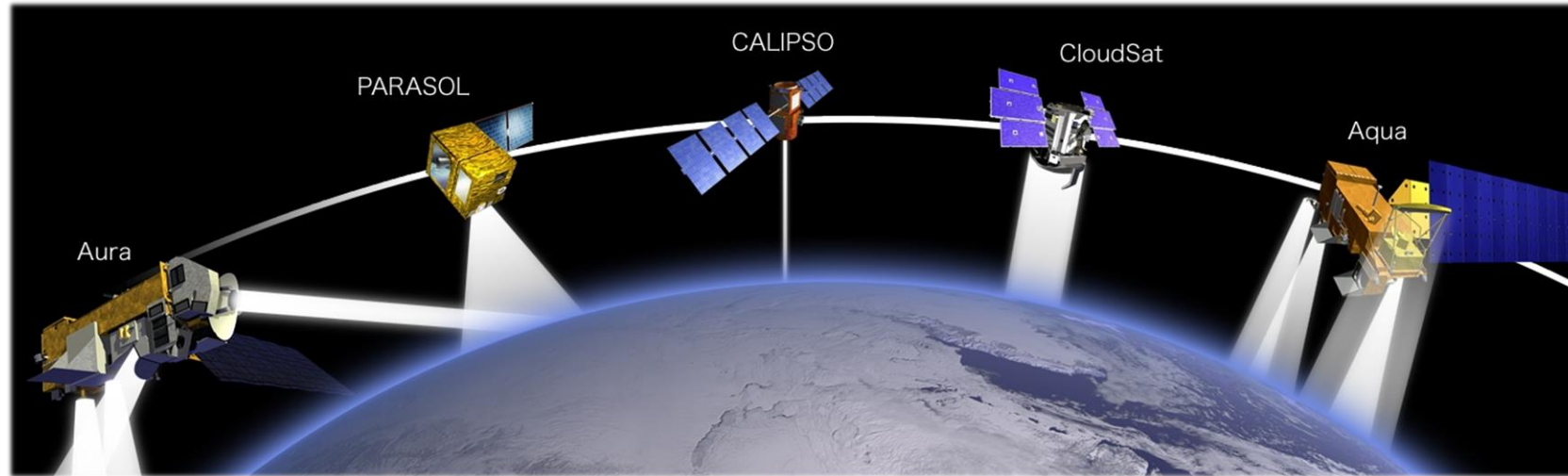
Cont.. When does the lifetime of a Satellite end?



Small satellites that don't have thrusters which enable them to correct their orbits are the satellites that most likely facing collision threats with space debris.



Large Satellites conduct Orbital Maneuver using their thrusters that enable them to avoid the collision with these debris; according to the previously calculated tracking data from observatories.



Source: NASA





Thanks for your undivided attention

