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 Orbits
(Part 1)

This lecture will answer the following inquiry:

What is the importance of the accurate design of a satellite orbit?

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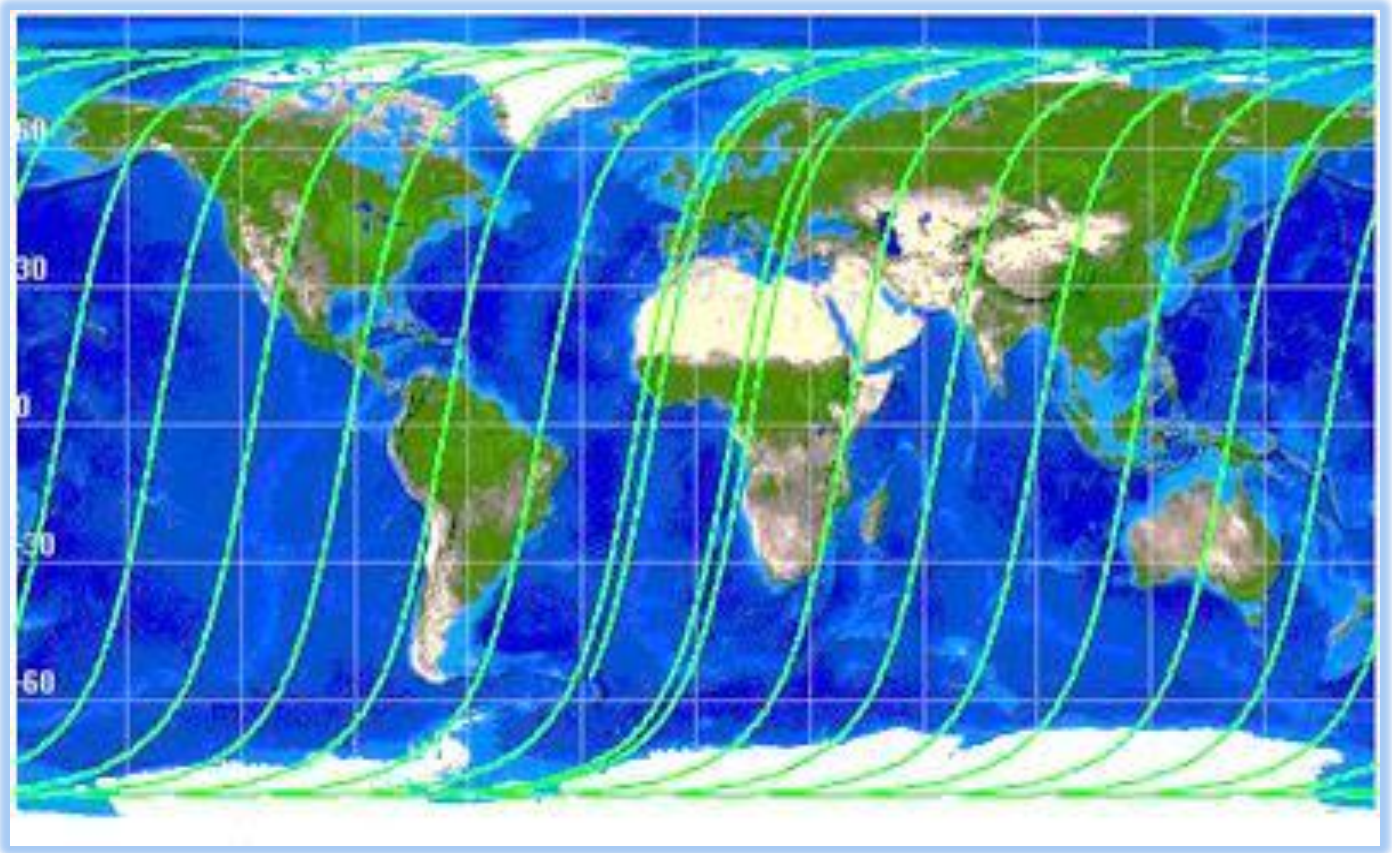
- The process of an orbit design is considered the most crucial phase in satellite production. It represents the first design process, which is performed directly after specifying the satellite mission and before designing any other satellite's components. Each satellite mission has its suitable orbit. A satellite cannot successfully achieve its mission in other unsuitable orbits.

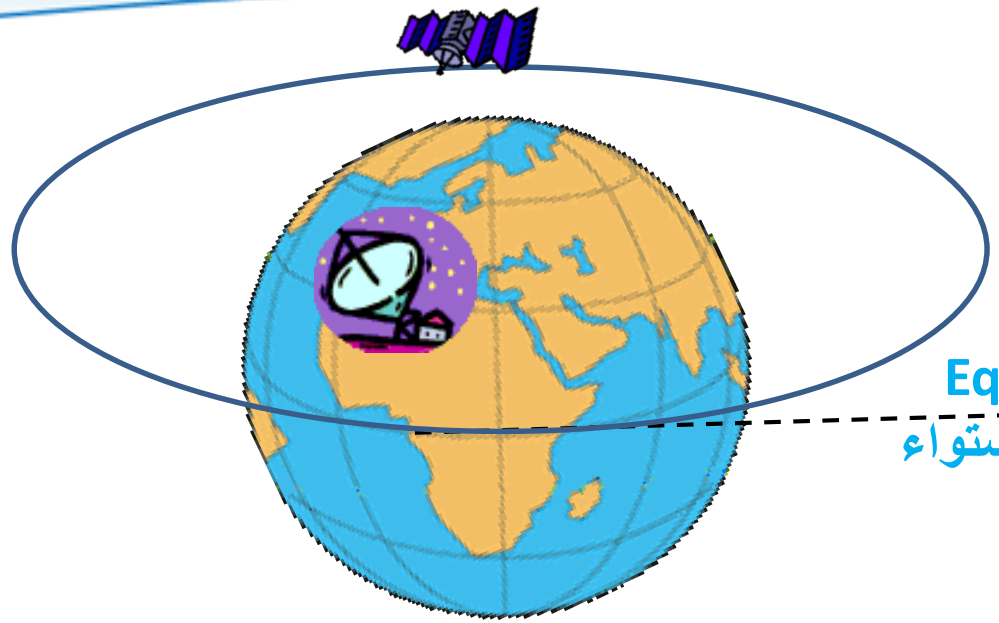
Cont..What is the importance of the accurate design of a satellite orbit?

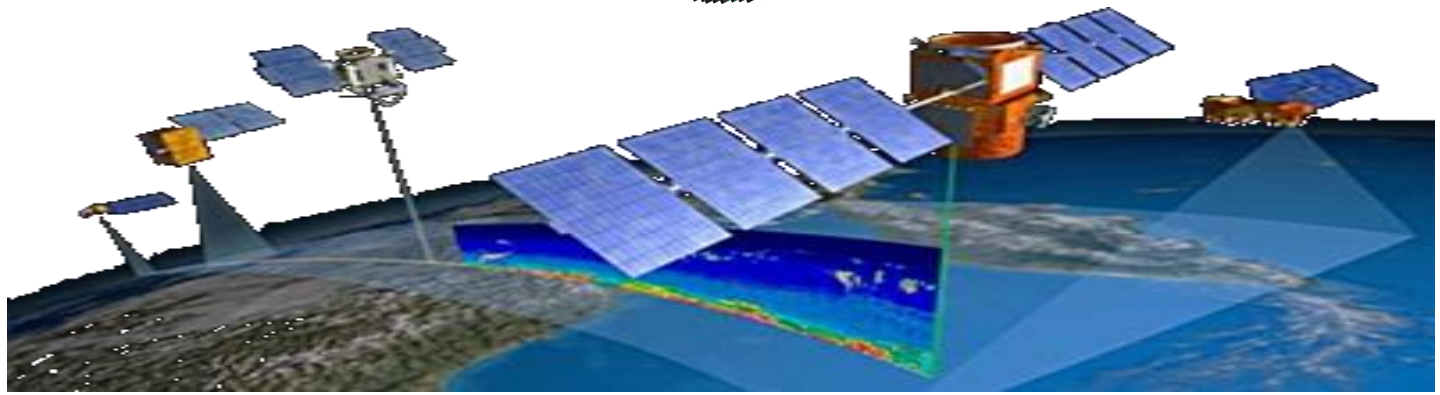
- According to the final design of the orbit, the other satellite components are designed. These components are the imaging sensors, thermal isolation systems, communications systems, fuel tanks, thrusters and others. In order to know the importance of a good orbit design, the following examples show the problems which may occur in case of the existence of errors in the orbit design, or errors in the orbit orientation caused by the launching rocket.



Cont..What is the importance of the accurate design of a satellite orbit?

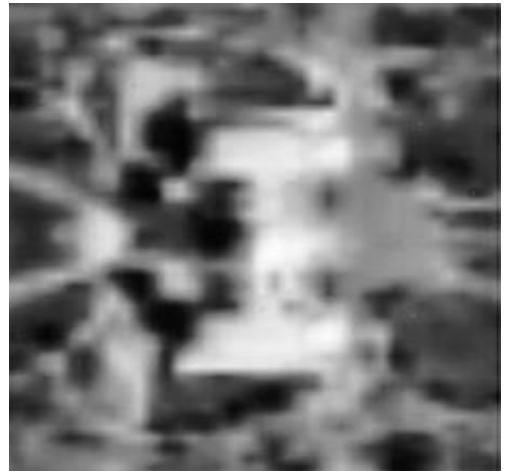
- **First example:** In case of launching a satellite in an orbit with a wrong orbit inclination angle, which is less than the angle specified in the original orbit design, this will lead to many problems, for example; the satellite may rotate in an orbit away from the Receiving Stations and Control Stations. Thus; these stations may not be able to communicate with the satellite; either for receiving images or for controlling it. Also, the same error may lead to preventing the satellite from passing over the areas of interest, and accordingly; it will not be able to capture images for these areas. In both previous cases, the mission of the satellite will fail.

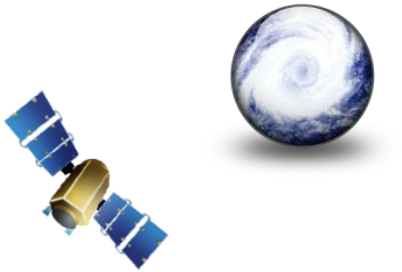




Cont..What is the importance of the accurate design of a satellite orbit?

- **Second example:** In case of launching the satellite to a wrong orbit, which has a higher altitude over the earth surface than the correct one specified in the original orbit design, clarity of the captured images will decrease compared to what is originally required.
- This higher altitude also increases the exposure of the satellite to sun heat, which may be unsuitable to the level of thermal isolation surrounding the satellite body, and this may affect the equipment inside the satellite.

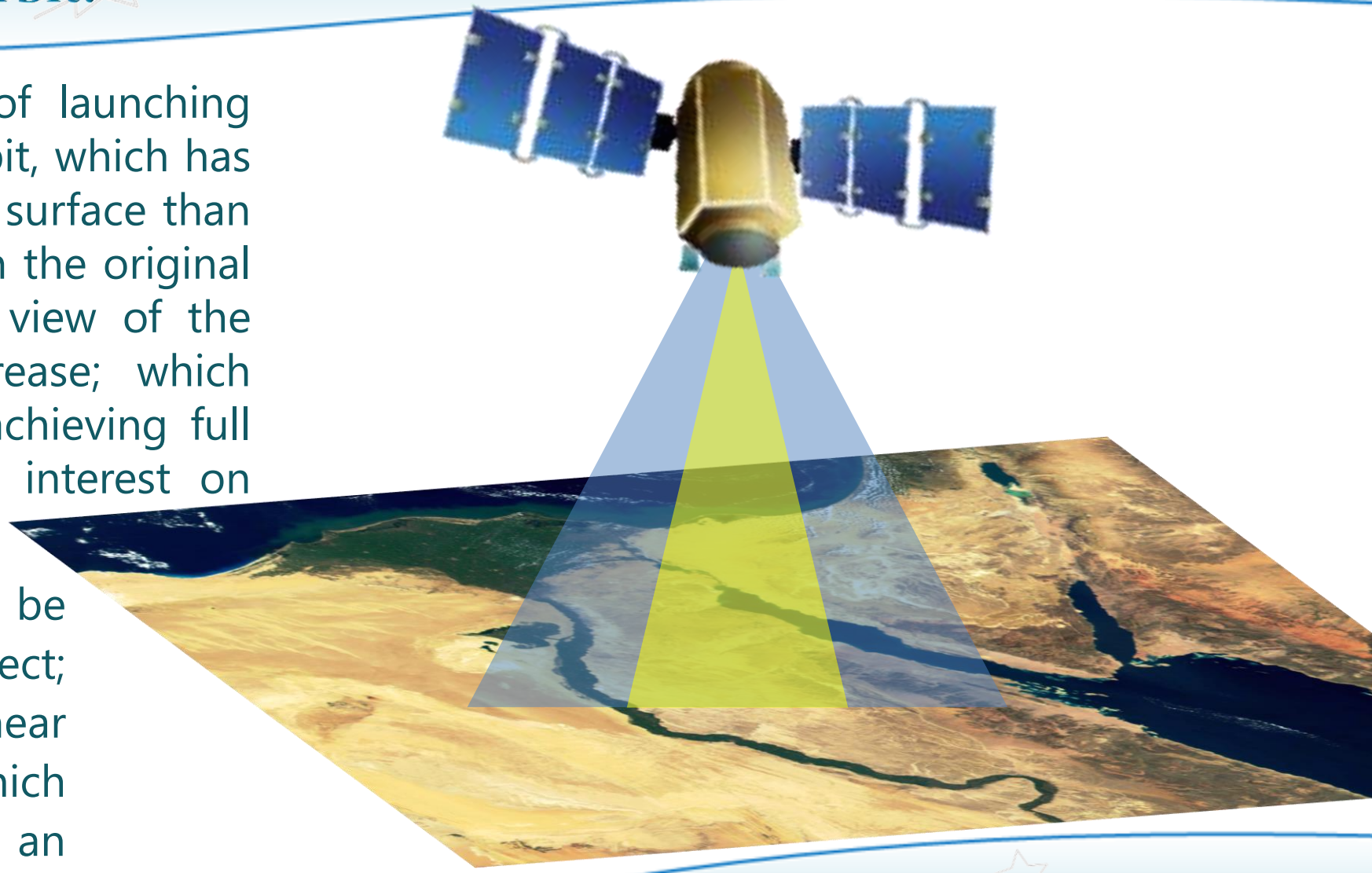




Cont..What is the importance of the accurate design of a satellite orbit?

- **<u>Third example</u>:** In case of launching the satellite to a wrong orbit, which has a lower altitude over earth surface than the correct one specified in the original orbit design, the field of view of the imaging sensor will decrease; which may lead to a failure of achieving full coverage of the areas of interest on earth.

The satellite may also be subject to more cosmic effect; named "Perturbations" near the earth surface which terminates its lifetime at an earlier duration.



Thanks for your undivided attention