



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



Origin of Satellites and their roles (Part 5)





This lecture will answer the following inquiry:



What are the types of Satellites?





What are the types of Satellites?

The video shows a type of satellite that weighs 4.3Kg with dimensions of 30cm × 10cm. The satellite has solar cells for charging the batteries; in addition to several small-sized electric circuits. It also has 2 Onboard Computers; one of them is a small-sized mobile phone. The satellite measures the earth magnetic field using sensors mounted on the satellite surface. It also takes images of earth and performs some other applications. These mobile phone satellites are called Phonesat.



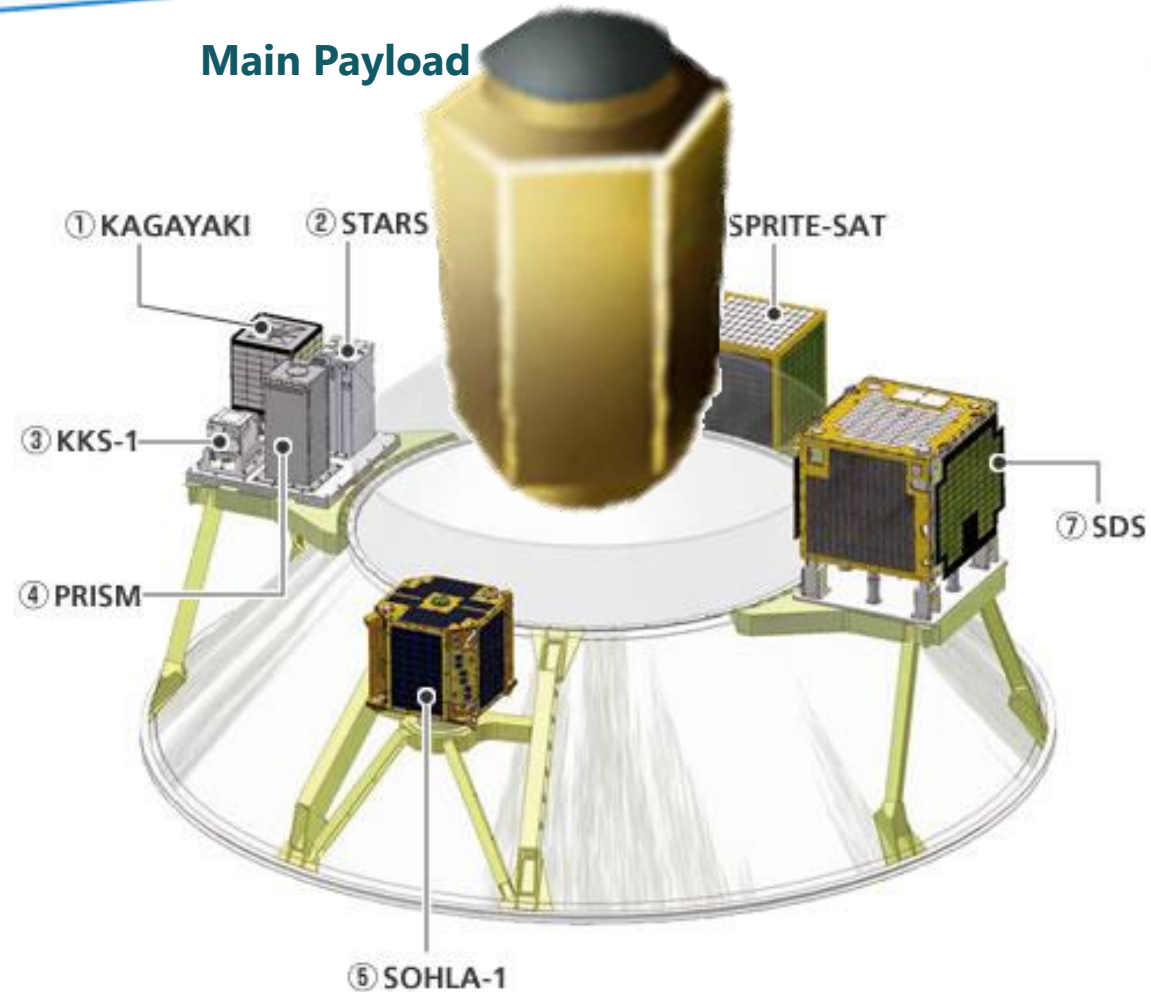
Source: Surrey Space Center



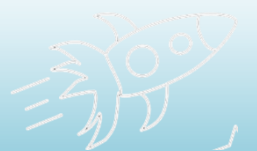
Cont.. What are the types of Satellites?



- The video demonstrated that the manufacturing companies tend to reduce satellite weight in order to decrease the manufacturing and launching costs.
- The image shows an internal view of the Fairings located in the front of the rocket. Small satellites are mounted as Piggyback Satellites with the Main Payload located in the same launching rocket.
- Some rockets can launch one large satellite as a Main Payload; accompanied by around 20 small satellites as Piggyback Satellites in the same launching process. The rocket places each satellite in its orbit.



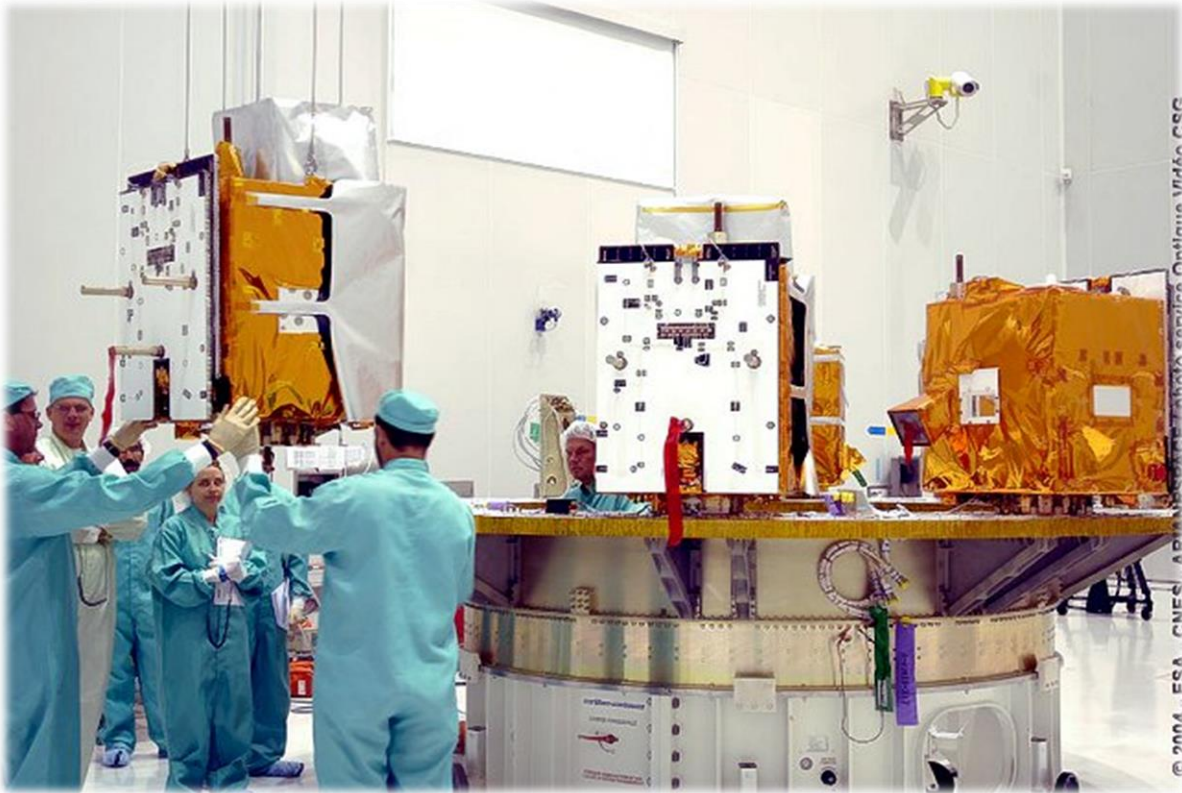
Source: JAXA





Cont.. What are the types of Satellites?

- ✚ The images show fixing small satellites next to the Main Payload in the Fairings.



Source: ESA, CNES, Arianespace





Cont.. What are the types of Satellites?



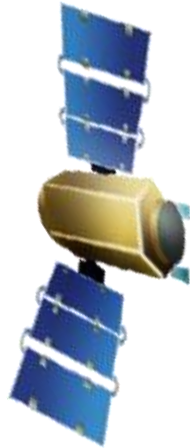
Due to the bias of manufacturing companies to reduce sizes and weights of satellites, types of satellites are classified according to their size as follows:



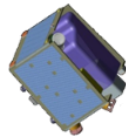
Large Satellites



Minisatellites



Microsatellites



Nanosatellites



Picosatellites



Femtosatellites





Cont.. What are the types of Satellites?

Large Satellites:

Their weight exceeds 500Kg and can reach several tons. Examples are communication Satellites, Remote Sensing Satellites and Navigation Satellites.



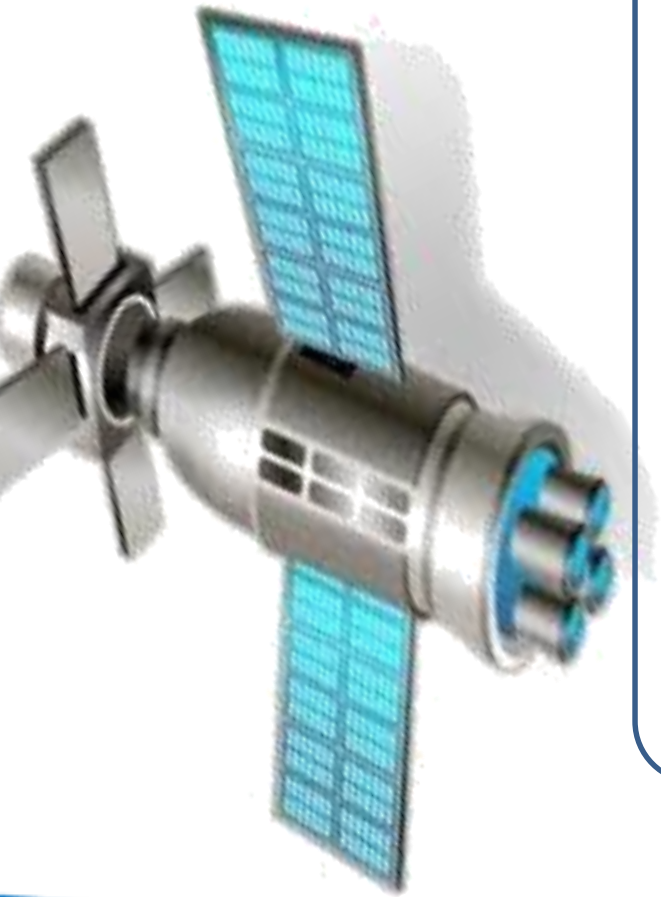
Source: <http://www.thehindu.com> (Communication satellite by ISRO & Boeing)



Cont.. What are the types of Satellites?



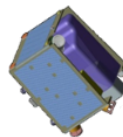
Large Satellites



Minisatellites



Microsatellites



Nanosatellites



Picosatellites



Femtosatellites

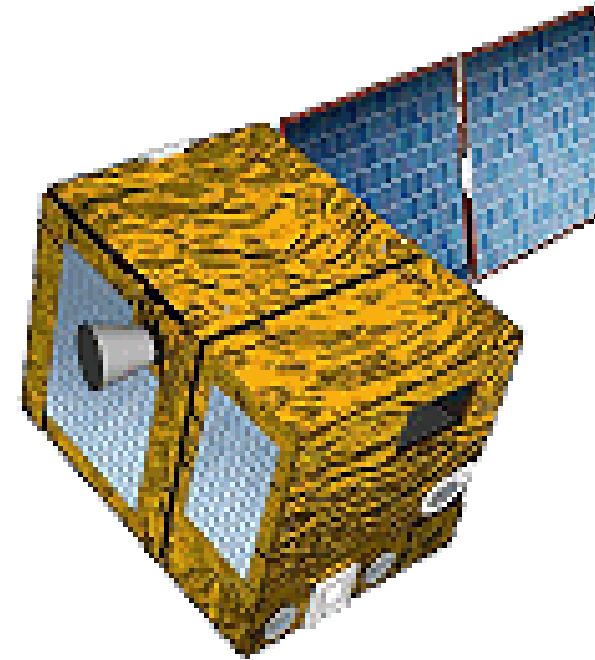




Cont.. What are the types of Satellites?

+ Minisatellites:

Their weight ranges between 100Kg to 500Kg. Examples are Remote Sensing Satellites and Scientific Research Satellites that study the atmosphere such as the French PARASOL Satellite.



PARASOL Satellite

Source: PARASOL Satellite, <http://smc.cnes.fr>



Cont.. What are the types of Satellites?



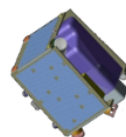
Large Satellites



Minisatellites



Micorsatellites



Nanosatellites



Picosatellites



Femtosatellites

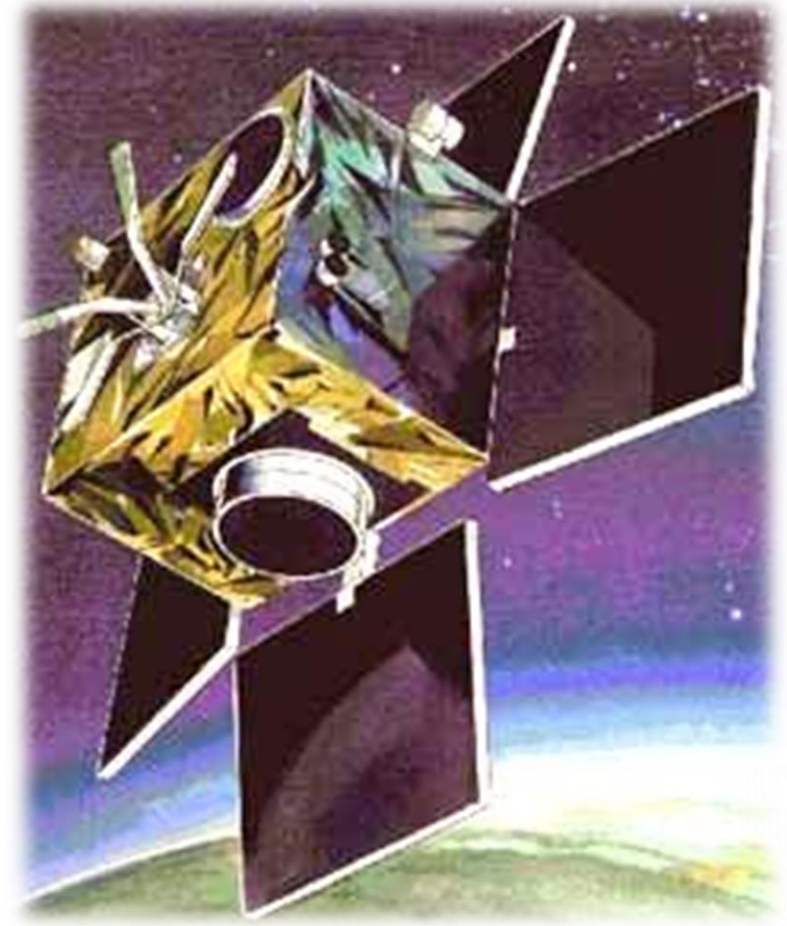




Cont.. What are the types of Satellites?

■ **Microsatellites:**

Their weight ranges between 10Kg to 100Kg. Example is the Swedish Scientific Research and Experiment Satellite "Astrid 1" that studies several cosmic radiations and phenomena.



Source: Astride-1 Satellite, <http://space.skyrocket.de>



Cont.. What are the types of Satellites?



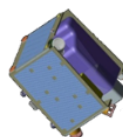
Large Satellites



Minisatellites



Micrsatellites



Nanosatellites



Picosatellites



Femtosatellites





Cont.. What are the types of Satellites?

✚ **Nanosatellites** : Their weight ranges between 1Kg to 10Kg. They sometimes require another larger satellite called "Mother Satellite" to launch them in space and make them able to communicate with Control Stations and Receiving Stations.

✚ Example is the 6U Cubesat group that serves as a Satellite Constellation; in other words, they serve as an integrated working team that is composed of 35 Nanosatellites; with each satellite weighs 8Kg. They are used to capture images of earth.



Source: 6U Cubesat, <http://scienceillustrated.com.au>



Cont.. What are the types of Satellites?



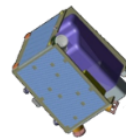
Large Satellites



Minisatellites



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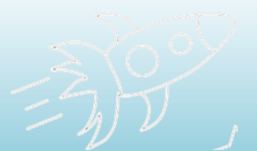
Cont.. What are the types of Satellites?



Picosatellites: Their weight ranges between 100 grams to 1Kg. They are often produced by students in research centers and universities due to their low costs; either in manufacturing or launching, which suits the budget of research centers. They similarly work as the previous "Nanosatellites" regarding their dependence on a "Mother Satellite".



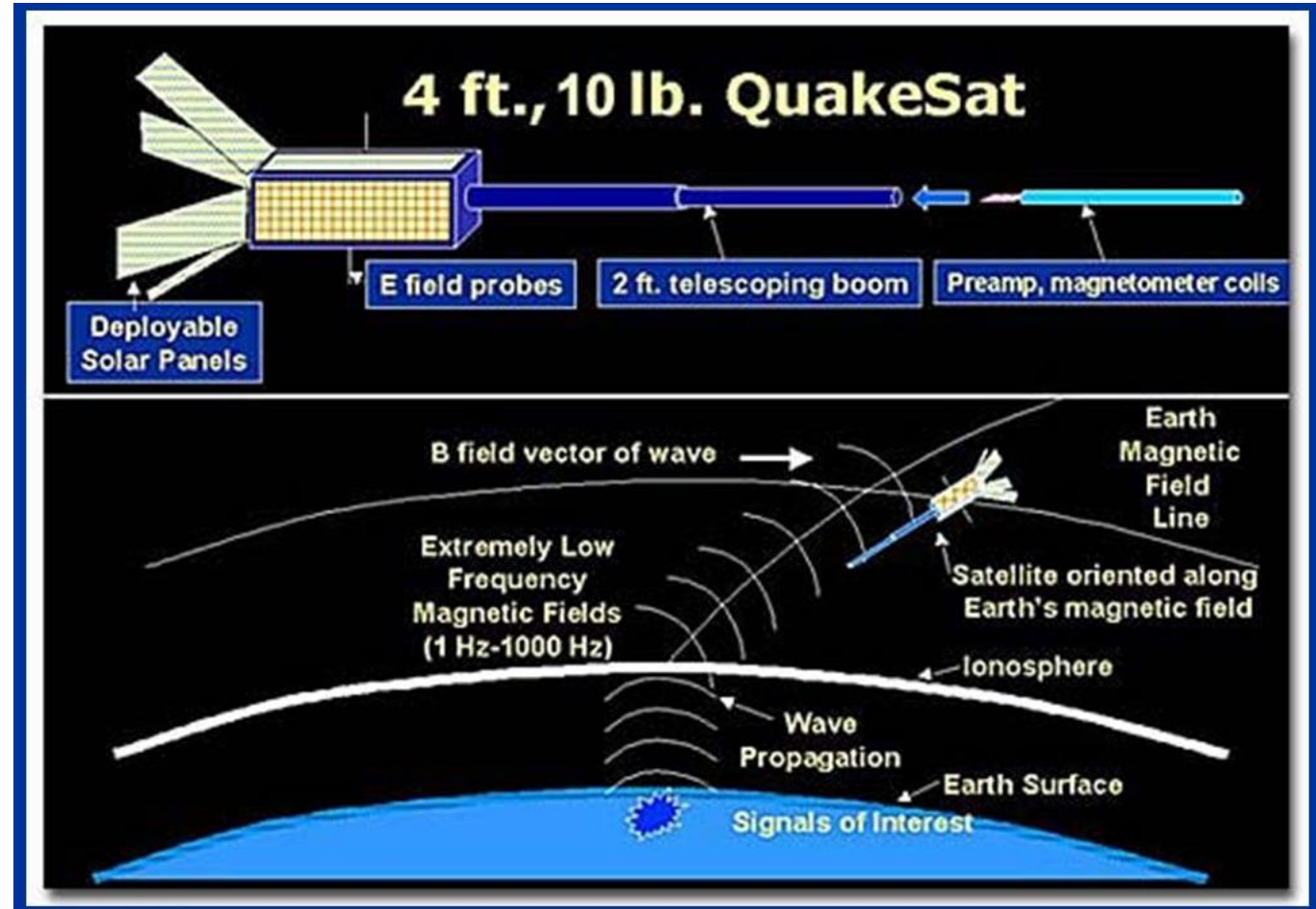
Source: Cubesats, news.cnet.com





Cont.. What are the types of Satellites?

Picosatellites: An example of these satellites includes US Quakesat Satellite series that are used in scientific researches. It is composed of 3 satellites and has a telescope that detects earthquakes by detecting magnetic waves which are believed to precede earthquakes.



Source: QuakeSat, <http://www.dedalonews.it>



Cont.. What are the types of Satellites?



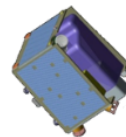
Large Satellites



Minisatellites



Micrsatellites



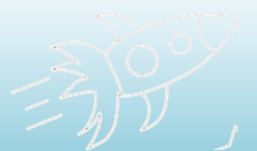
Nanosatellites



Picosatellites



Femtosatellites





Cont.. What are the types of Satellites?



- ✚ The image shows the US Satellite Kicksat which is a square of 3.8cm in each side.

- ✚ The satellite contains solar cells to obtain electric energy that is stored in capacitors and then utilized to operate each of the Microcontroller that plays the role of a computer and the transceiver that sends waves through the Antenna to be received by small receptive devices on earth.

- ✚ The first three satellites were launched in 2011 by the American space shuttle. Astronauts fixed them on the surface of the International Space Station for testing them as a lead-in to spreading thousands across space.



Source: Cornell University





Thanks for your undivided attention

