

POWER TRANSFER AND GROUNDING

(Rendezvous and Docking satellites)

~SUMEDHA (RA1611004010874)

¹SRMSAT Lab

²SRM Institute of Science and Technology Kattankulathur (603203)

Contact: sumedha580@gmail.com

ABSTRACT

The failure of power systems in most of the satellite missions is the reason behind mission failure. Since the power transfer method using another satellite by the method of rendezvous and docking can be introduced considering the concept of the surrounding particle conditions.

POWER TRANSFER

- According to papers “potentials of surfaces in space” by Elden C Whipple, In the last decade, large electrostatic potentials of the order of tens of kV have been measured on spacecraft in the Earth’s magnetosphere. Observations in space have led to the inference of large potentials on natural objects in the solar system. The result for spacecraft can be material damage and operational interference caused by electrostatic discharges. Natural objects such as dust grains can be disrupted, and their motion influenced by electromagnetic forces. The potential of a body in space is determined by a balance between various charging currents. The most important is a transfer of charge from plasma particles, photoemission, and secondary electron emission, with other charging mechanisms sometimes contributing. The currents are affected by the body’s charge and motion and by local magnetic and electric fields. Dielectric surfaces may have surface

potential gradients which can affect the current balance through the creation of potential barriers.

- During docking, the two satellites will get attached to each other requiring an option to transfer power in between both the satellites. therefore while docking it would get joined by some probes which will help in the relative transfer of power.
- The probes are to be static. (we can't use wires as they can't get connections while docking; therefore, we need something static that may help in better connections)
- At the time of docking, the probes are joined at feasible connections and hence further power transfer takes place.
- The probes are made up of conducting materials and should be protected with some protecting shield to avoid power loss.

GROUNDING

- The probability that spark may occur at the instant of connection of both the grounds at the common point. This may cause mission failure.
- Solution: Providing resistance between the two grounding ports will deal with the voltage difference for n number of times.
- Using a moderately high resistance with respect to the assumed worst potential difference in between the ports can overcome every such possible situation.

CONCLUSION

Hence the power can be transmitted from one satellite to another satellite easily resulting in saving the satellite from mission failure. Mission life can also be increased according to the requirement based on such kind of power transfer.