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SPACE POWER SYMPOSIUM (C3)
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GENERATION OF POWER TO CHARGE THE BATTERIES IN THE SPACECRAFT BY HARNESSING THE ENERGY FROM THE SHOCK WAVES DURING RE-ENTRY.

Abstract

In any of the application, endo-atmospheric or exo-atmospheric, batteries play a very important role in providing power to the vehicle. In spacecraft batteries are essential to power up various on board instruments. Charged batteries sent from the earth have some specific endurance limit depending upon the on-board devices it is powering. They cannot be used for multiple re-entries and deep space travel. Some other power source is required to charge them. The paper describes the idea of generation of power by harnessing the energy from the shock waves during re-entry to charge the batteries. The basic idea is to use the piezoelectric effect to convert the pressure energy to electrical energy to charge the batteries. While atmospheric re-entry a large pressure difference is created across the detached bow shock. There is huge temperature and pressure rise across the shock. These rises in temperature and pressure are forms of energy which are wasted throughout the re-entry. This pressure energy can be reused to produce electricity. Compression corners are produced when the flow passes over a diverging surface and it produces a huge amount of pressure rise across the shock. The idea is to introduce a bulkhead inside the spacecraft. The bulkhead will be made up of piezoelectric transducers. This bulkhead will be positioned where the compression corners are produced. The pressure across the compression corners is high enough to change the geometry of the spacecraft if proper measures are not taken. This much high pressure is capable of producing good amount of electricity. This method is even applicable in places where the intensity of sunlight is relatively low. This idea is only applicable in the celestial bodies which have thick atmosphere. The major challenge would be to implement this idea in places with relatively thin atmosphere with same effectiveness. A huge amount of heat energy is produced across the shock during re-entry which is wasted as well. The challenge would be to harness this energy for space travel.