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INTERPLANETARY HITCHHIKING TO SUPPORT SMALL SPACECRAFT MISSIONS BEYOND EARTH ORBIT

Abstract

The development of educational spacecrafts at educational institutions has traditionally been hampered by the high costs of launches. Federal programs such as NASA's Educational Launch of Nanosatellites program (ELaNa), kick started the concept of hitchhiking for free (or at greatly reduced cost) on a rocket launch to low-Earth or geostationary orbit. An ELaNa launch is typically provided by grouping multiple educational nanosatellites to a rocket that is already carrying a larger and more expensive primary payload. In essence, it provides them with a free "hitchhike" to space. The program promotes research and education, while simultaneously giving participants first hand experience in spacecraft design and development.

Although the ELaNa program has given unprecedented opportunities for student engagement and in technical spacecraft design innovation, it is limited in scope to Earth orbits. Given the success of the program, it is time to consider the next leap in hitchhiking, namely to interplanetary destinations.

While CubeSats have been utilized as technology demonstrators for missions in Earth orbits and have provided for both scientific and cost breakthroughs, they have not yet been seen beyond Earth orbits. Arguably, these could have the same critical impact, both in terms of science and cost reductions, as well as in terms of providing valuable experience with more complicated space mission development to students.

With space missions and space technology becoming increasingly complex, it's valuable to society that students are able to prepare adequately for the demanding jobs related to these missions. While an electrical engineering student for example gets to work with real projects close to his or her interests in many application areas, an electrical engineering student with an interest in spacecraft development rarely gets the opportunity to work with a spacecraft that could carry out missions in an interplanetary orbit.

By adding missions that go beyond Earth orbit to the ELaNa program, educational institutions will be able to afford such missions by securing a hitchhiking ride with interplanetary missions. This will allow students to gain experience with developing complex space missions and provide an opportunity for secondary missions to creative scientists.

Because interplanetary missions are fewer and further between than Earth-orbiting launches, ELaNa will likely have to be more constrained in granting launches, putting more pressure on institutions to design spacecrafts that can provide value to society.

This paper explores the benefits and potential missions for an ELaNa program that is expanded to include interplanetary missions.