Paper ID: 67154
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IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
In Orbit - Postgraduate Space Education (4)

Author: Prof. Filippo Graziani
G.A.U.S.S. Srl, Italy

KEYNOTE: UNISAT PLATFORM AND LUNAR-MARS MISSION IN GAUSS

Abstract

This paper presents the evolution of Astrodynamics from theorical to practical approach which GAUSS S.r.l company (Group of Astrodynamics for the Use of Space Systems) carried on for more than thirty years along with Scuola di Ingegneria Aerospaziale of Roma, evolving from a merely didactical dimension to an innovative company reality. Astrodynamics is usually defined as celestial mechanics applied to engineering. The methodology used to study the Astrodynamics problems has two different approaches: one is more mathematical, and the other is an "engineering approach" that allows to "see" the practical results besides being able to formulate it. During all these years I tried to apply an "engineering approach". This methodology could inspire the students and make them passionate about the Astrodynamics. It is the transition from theory to practice in the field of Astrodynamics: Astrodynamics applied to engineering problems, that is Applied Astrodynamics. The applications were focused on satellites low-cost, small and simply manufactured by university students. (University satellites). Later the size of these satellites changed and were proposed different kind of satellites even smaller due to the electronic components miniaturization, especially micro, nano, pico and femto satellites, intended as CubeSat and PocketQube. We can notice that while Cubesats have attracted university students and teachers due to their accessibility and have become an exciting way to gain experience, for long time they were considered "students toys". Nobody could believe in their development and their possibilities. However, the results obtained by universities opened the doors to the commercial use of CubeSats. The interest in CubeSats is moving now from universities to industry and the interest of "big" players increases investments which make CubeSats more powerful. As they are getting more industry-oriented, the whole process of satellite development is becoming more and more conventional in technical terms. This trend evidences the importance of the CubeSat in this field. It is now time to face new challenges in the study of astrodynamics: the possibility of reaching planets through low energy orbits, the use of electric propulsion, green propellent, different type of material to manufacture satellites, as wooden highly resistant to temperature changes and sunlight. For example, a Japanese company and Kyoto University propose to launch in 2023 a satellite totally made by wood (LIGNOSAT).