Paper ID: 43660
student

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Hands-on Space Education and Outreach (8)

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PROMOTING HANDS-ON CUBESAT ACTIVITIES FOR SPACE EDUCATION AND OUTREACH IN BRAZIL

Abstract

Promoting STEM activities in Brazil has a surmount importance as statistics shows these carriers are lagging behind. The space segment is a sensitive one due to the highly interdisciplinary topics it might tackle. Therefore this work presents a set of activities where the cubesat concept and all major ancillary space systems engineering topics are introduced in a 30-minute hands-on seminar for a team of up to 4 people. The script of ludic activities follows a typical space mission lifecycle starting with Phase-0/A - Mission and Feasibility Analysis and ending with Phase F - System Disposal. In the Phase-0/A the concept of mission goals and CONOPS diagram are worked with a team of participants. Phase B asks for preliminary design definition where the team defines the payload subsystem suitable for achieving mission goals. Detailed design definition follows next in Phase C where payload details are asked and an Arduino-based cubesat platform is handled with dummies for solar sensor, reaction wheels, temperature sensors, telemetry feedback (a overheat buzzer alarm and led for solar position indication), batteries and on-board software for orchestrating all subsystems. In Phase-D, the team works with cubesat manufacturing, AIT, qualification concepts and are asked to assemble the electronics using breadboards, power-up with batteries and perform systems checking. The launch and operation concepts are briefly introduce in the Phase-E where the cubesat is enclosed in ludic box and on-board systems performance and telemetry functions checked. Systems disposal, Phase-E, closes the seminar where participants de-assemble the cubesat box and internal components and return them to their prior location. This allows for next session of seminar to commence its activities orderly and presents the importance of recycling for a better world. Feedback collected from seminar participants is quite encouraging since this presents complex concepts in a ludic yet funny way making the audience open to space education and outreaching for future projects and STEM carriers.