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SYSTEM ENGINEERING AND INTEGRATION OF PRATHAM, INDIAN INSTITUTE OF TECHNOLOGY BOMBAY'S FIRST STUDENT SATELLITE

Abstract

Students from the Indian Institute of Technology Bombay (IITB) are currently in the process of building a fully functional microsatellite named 'Pratham', which is slated for launch by Indian Space Research Organization (ISRO) in the fourth quarter of 2010. The satellite being built is a 26X26X26 cm cube and weighs nearly 10kg. This landmark project has completed the phases of Requirements Capture, Conceptual Design, and Preliminary Design and is currently in the Detailed Design Phase. Detailed documentation and thorough reviews were conducted by ISRO scientists and IITB faculty before the conclusion of each of the above Design phases.

The four-fold Mission Statement of Pratham include educating students and faculty in the field of Satellite and Space Technology, developing the Flight Model of the Satellite, launching it into orbit, measuring Total Electron Count (TEC) of the Ionosphere and involving students from other universities in our Satellite mission. This paper will discuss the various aspects of System Engineering and Integration involved in the making of Pratham. Using a 'V-model', the System Requirements from the Mission Statement and environment are broken down into Sub-System Requirements. After capturing inter Sub-System requirements, the target parameters for each of the Sub-Systems are created. These target parameters are tested at Sub-System level using Level 1 Test. Two to three Sub-Systems come together to perform Level 2 Test, like Hardware In Loop Simulation (HILS), Communication and Ground Station check, etc. Finally Level 3 test like Vibration, Themovac, etc. are performed for the whole satellite. The use of the 'V-model' has helped immensely in the System Engineering of this project.

This paper also discusses the steps taken towards maintaing budgets of Weight, Power and Data. The evolution of the Operation Sequence from the Mission is described. Finally the Integration Sequence and strategies for routing of wires followed in the Pratham project are also discussed. It is envisaged that the System Engineering and Integration concepts used in the Pratham project will serve as valuable stepping stones for student satellite projects all over the world.