

49th STUDENT CONFERENCE (E2)
Educational Pico and Nano Satellites (4)

Author: Mr. Dnyanesh Rokade
College of Engineering, Pune, India

Mr. Juber Shaikh
College of Engineering, Pune, India

Ms. Chaitra Shet
College of Engineering, Pune, India

Ms. Tanaya Bapat
College of Engineering, Pune, India

Ms. Vaishnavi Butte
College of Engineering, Pune, India

SELECTION OF CROSS-SECTION AND DESIGN OF BOOMS FOR A SOLAR SAILING
NANOSATELLITE**Abstract**

Booms are components with a characteristic profile used for deployments in space systems. The paper presents the design of booms used for deploying the solar sail of a nanosatellite COEPSAT-2, being developed by the students of the College of Engineering Pune (COEP). The satellite aims to demonstrate orbit manoeuvring using a solar sail while characterizing the charged particle density in space. The square-shaped sail having an area of 40 metre-square is deployed using four booms each of length 4.47 m along the diagonals of the sail. A deployer stores the coiled booms and provides for their controlled and smooth deployment. The large slenderness ratio of booms causes bending and buckling failure, which motivates the selection of an appropriate cross-section for the booms. A study of the forces acting on the boom during and after the deployment is done with the help of Finite Element Analysis on Abaqus software. Triangular Rollable And Collapsible (TRAC), Lenticular, S-shaped and C-shaped cross-sections were studied and compared based on their stiffness. The dimensions of the selected cross-section are optimized such that the stresses in the coiled state are minimized and the forces acting on the boom during and after the deployment are sustained while maintaining a significant factor of safety.