

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
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DEPLOYMENT STRATEGY AND SIMULATION OF AN ADAPTIVE AEROSHELL UNDER  
VARIOUS SPEED ENVELOPES WITH DISTINCT CONFIGURATION

**Abstract**

Planetary exploration is becoming a key research area in the field of space exploration to find the possibility of other habitable areas. Exploration rovers like Opportunity, Curiosity and Perseverance are a great milestone in going forward in this area and helping us in understanding the geology and climate of the planet. With the advancement of technology and research aspects, these spacecrafts or rover will be carrying much heavy loads like drill machines or maybe human crew in future. Using an adaptive deployable heat shield will not only help in increasing the payload capacity of spacecrafts but will also accommodate the entire structure in existing payload fairings of launch vehicles. In this research, we are designing a control loop algorithm to control the deployment of the adaptive heat shield in different velocity regime. The morphed structure will be deployed in hypersonic, supersonic and in stowed/unstowed conditions according to the instantaneous sensors data. The structure deployment can be done using mechanical actuators and the sensors will supply the input value of instantaneous speed and dynamic pressure values. The simulations and graphs of the deployment strategy are hence presented. This idea will improve the deployment strategy and can be further used for spacecrafts in futuristic human crew mission to Mars.