

22nd IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)  
Innovative Concepts and Technologies (1)

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THE CONCEPT STUDY OF AN INFLATABLE ROCKET FOR THE MARS SAMPLE RETURN  
MISSION

**Abstract**

The inflatable mechanism has already been applied on re-entry vehicles as a decelerator, which has the advantage of lightweight. As it is too expensive to send payloads to the Mars, a compact and light Mars ascent vehicle is desired in the sample return mission. In this paper, a rocket with inflatable parts, including nose, body and fins are proposed. The aerodynamic configuration is designed considering the special mission. An aerodynamics study of the flexible body is carried out with Computational Fluid Dynamics techniques, which is utilized to design the ascent trajectory. Moreover, a small-scale rocket is manufactured and tested to evaluate the flight performances of the inflatable rocket.