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INFLIGHT ZERO G TEST OF A CUBE-SHAPED ROBOT DESIGNED FOR THE
EXTRAVEHICULAR ACTIVITIES**Abstract**

As part of our academic journey, we, as students at IPSA, an aerospace engineering school, were selected by CNES - the French space agency- to participate at the 63rd parabolic flight campaign in 2022 with our project: "AMIS" - Assistant Maintien Interventions Spatiales meaning Space Intervention Maintenance Assistant. This cube shaped robot is designed to ultimately help astronauts during their EVA by transporting tools or wide-angle camera for example. The objective of this flight was to determine the drift of the robot to correct it with gas ejections at a later stage.

The experiment on board the 0G Flight consisted of the study of a cube shaped robot attached to a mechanical arm equipped with an electromagnet. The robot contained an Arduino control card linked to an accelerometer and three cameras.

During the 31 parabolas, the operators had to release the robot once the weightlessness was stable and ensure that the robot's trajectory is altered as little as possible by gravity disturbances. We shall describe the protocol during the different phases of the flight.

This study enables us to determine afterwards the quantity of gas to be ejected to give the robot enough speed and acceleration - around 0,20 m/s and 1.4 m/s² - to stabilize its drift. Based on these results, we simulated the pressure of the internal circuit to understand how pressure is distributed inside the robot, and what initial pressure must be delivered to ensure sufficient output pressure to move the AMIS. Our preliminary results confirmed that the robot can be stabilized with a pressure of 5 bar. This will enable us to achieve stabilization speed with an ejection time of just 2 seconds.

Our results are encouraging and allow us to continue the development of this ambitious project, which could be used on future space missions to assist astronauts and enable them to carry out high-risk tasks safely.