



Colorado State University

Martian Soil Sampling Drone for Colonization

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Abstract

Colorado State University's Competition Rocket Team's Payload team is tasked with designing and building a payload that will collect surface soil data on the planet Mars with an unmanned arial vehicle quadcopter. The purpose of the mission is to collect surface soil data of unexplored terrain inaccessible with current Mars rovers due to geographical discrepancies such as ravines or steep craters. To solve this issue, we have designed and are building a drone into a 5U CubeSat volume to interface with the rocket airframe diameter. The drone will utilize folding arms which will unfold when jettisoned from the flight vehicle. Once the drone jettisons from the vehicle, it will be able to hover in place at a specific waypoint while collecting samples and testing the soil. Research was conducted on the type of data desired for sampling soil on extraterrestrial planets. Since demonstration will be done on Earth, more extensive research is being done on how to alter the current device to fly in the different atmosphere of Mars, like changing the size and shape of the propellers. As of now, the drone and its deployment system are going through numerous rounds of testing for each subsystem. The drone will encounter its final test during a full-scale launch with a liquid bi-propellant rocket. This rocket will reach an apogee of 10,000 ft then begin its recovery. At 500 ft, the payload will deploy out of the vehicle and be able to demonstrate its ability to conduct soil sampling research. Lastly, we are pursuing this project since we believe drones are the future for planetary exploration as they provide greater capability of surveying. The current industry is also looking towards colonization of Mars in the future, and this device would facilitate part of the research required to get there.