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WOLFSAT-1: 1U LEO DEMONSTRATION OF BIOLOGICAL DEGRADATION OF PET

Abstract

The WolfSat-1 is a proposed 1U CubeSat with a primary educational mission; however, it will also have a biological research component as its secondary mission. The WolfSat-1 will analyze *Ideonella Sakaiensis* in the microgravity environment. *Ideonella Sakaiensis* is a species of bacterium that has the unique ability to digest polyethylene terephthalate (PET), which is the primary component of most single-use plastics. The mission aims to determine if these bacteria can survive in microgravity and assess how microgravity impacts its ability to digest PET. If the *Ideonella Sakaiensis* can be shown to metabolize polyethylene in microgravity, then prolonged manned space missions will have another means of recycling otherwise single-use plastic. In order to accomplish this mission and measure the amount of PET the *Ideonella Sakaiensis* has consumed, a light-emitting diode will be utilized. A PET sample will be placed on top of the light emitting diode. As the bacteria eats and digests the sample, there will be more photons that are observed by a photodetector. Before launching the payload, ground tests will be conducted. This will allow the team to receive data from a one-gravity environment, so that the microgravity results can be accurately compared and interpreted.

The microgravity environment may accelerate the speed at which *Ideonella Sakaiensis*' enzymes degrade PET. Numerous studies document that various biochemical processes can be altered by weightlessness, such as enzyme activity. Additionally, a study conducted by the Louisiana State University found that certain enzyme kinetics were enhanced by 25 to 30