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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