Inflight Resources Recycling and Pollution Mitigation Impacts Through the WolfSat-1 CubeSat Mission

The Aerospace and Innovation Academy, Wolfpack CubeSat Development Team, & BLUECUBE Aerospace, Inc.

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Mission: A CubeSat to Monitor Enzyme Activity of Ideonella Sakaiensis in the Microgravity Environment

Image courtesy of Science News for Students

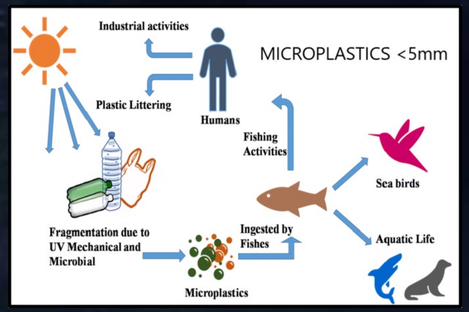


Image Courtesy of Issac, M.N., Kandasubramanian, B. Effect of microplastics in water and aquatic systems. *Environ Sci Pollut Res* **28,** 19544–19562 (2021). https://doi.org/10.1007/s11356-021-13184-2

Problem/Solution

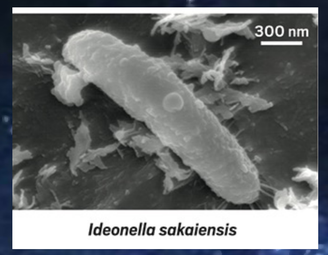
- Micro-Plastics are ubiquitously contaminating Earth's Environment.
- These plastics are limiting biodiversity and endangering many different species.
- Scientists are concerned that we will contaminate the space environment with the same micro-plastics.
- One of the potential solutions for this problem is a bacteria known as Ideonella Sakaiensis.
- Ideonella Sakaiensis is a bacterium with two enzymes which allow it to digest polyethylene.
- The WolfSat-1 intends to explore Ideonella Sakaiensis as a medium to combat plastic pollution here on Earth, and subsequently in space.

Team

- Wolfpack's goal is to develop a scientifically interesting proposal that meets NASA's strategic goals: Discover, Explore, Develop, and Enable.
- Wolverine CubeSat Development Team preceded the current Wolfpack CubeSat Dev Team
- WeissSat-1, the first middle school team in the country via CSLI
- CapSat-1, second CubeSat selected to be launched in December via SpaceX's CRS-24 mission to ISS
- The WCDT collaborates with NASA for the acceptance and development of our CubeSats. Our team also works with AIAA and other aerospace professionals f.
- Public Outreach is an important team effort.
- We had some ideas to do this such as publish informational children's books to engage younger youths in the STEAM pipeline.

Process

- Ground based Emulators
- Tethered Balloon missions
- HAB using a NearSpace Launch GlobalStar radio, the Habhub.org simulator, Dashboard Payload Integration,
- Utilize the NASA Engineering Life Cycle.
- Conduct in-person PDRs to meet the NASA requirement for technical and merit reviews



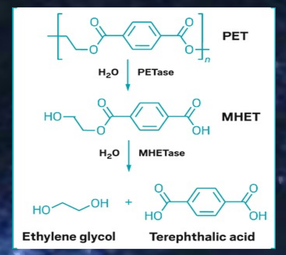
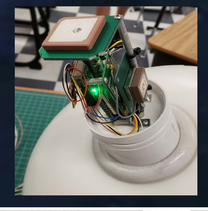
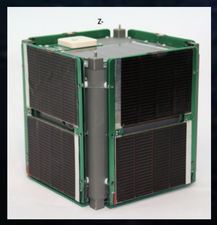


Image and reactions courtesy of Chemical and Engineering News (https://cen.acs.org/articles/94/i11/Bacteria-feast-plastic.html)

Mission/Technology

- Utilize a 1U FastBus
- Sytox staining and other proprietary novel payload sensors
- Investigate survivability in LEO
- Ideonella digests polyethylene, a primary component of single-use plastics.
- It will aid in understanding the responses of biological systems to spaceflight and contribute to the efforts of achieving spaceflight and planetary sustainability.
- This mission is also an educational mission by allowing students to conduct hands-on scientific research.
- WolfSat-1's educational mission goes hand-in-hand with the on-going advocacy efforts of Wolfpack CubeSat Development Team students, who are active members of the Aerospace Public Policy Institute. They work to expand hands-on STEM education opportunities for all students across the nation.





Images courtesy of Kevin Simmons. top row: Student HAB prep and ground station. Second row: EyeStar GlobalStar radio ceramic patch and image ~25 km above West Palm Beach, FL. Third row: NSL HAB Dashboard (similar to orbital dashboard) and recent NSL HAB buoy launch configuration. Fourth row: potential WolfSat-1 payload hardware and a notional WolfSat-1 based on WeissSat-1.

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*To **B**uild, **L**aunch, **U**tilize and **E**ducate using **CubeSats***

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