

In-space Recycler Technology Demonstration

Description

In 2014, a 3D printer was installed and used successfully on the International Space Station (ISS), creating the first additively manufactured part in space. While additive manufacturing is a game changing technology for exploration missions, the process still requires raw feedstock material to fabricate parts. Without a recycling capability, a large supply of feedstock would need to be stored onboard, which negates the logistical benefits of these capabilities.

Tethers Unlimited, Inc. (TUI), received a Small Business Innovation Research (SBIR) award to design and build the first In-space Recycler for demonstration aboard the ISS in 2017. To fully test this technology in microgravity, parts will be 3D printed, recycled into reusable filament, and then reprinted into new parts.



**Tethers Unlimited, Inc. (TUI)
In-space Recycler Prototype.**

Success Story

Recycling scrap into printer filament is quite challenging in that a recycler must be able to handle a large variety of possible scrap configurations and densities. New challenges include: dealing with inevitable contamination of the scrap material, minimizing damage to the molecular structure of the plastic during reprocessing, managing a larger volume of hot liquid plastic, and exercising greater control over the cooling/resolidification of the material.

TUI has developed an architecture that addresses these challenges by combining standard, proven technologies with novel, patented processes developed through this effort. Results show that the filament diameter achieved is more consistent than commercial filament, with only minimal degradation of material properties over recycling steps. In May 2016, TUI completed fabrication of a flight prototype, which will ultimately progress to the demonstration unit for the ISS as a testbed for future exploration missions.

Benefit

This capability will provide significant cost savings by reducing the launch mass and volume required for printer feedstock as well as reduce waste that must be stored or disposed.

Development Team Leads

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For more information: <https://techport.nasa.gov/view/11874>