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DEPLOYABLE ORIGAMI-INSPIRED STRUCTURES FOR FUTURE SPACE APPLICATIONS:
LESSONS LEARNED FROM ZERO-G FLIGHT EXPERIMENT AND NEW DEVELOPMENTS

Abstract

Origami folding techniques can be applied to design deployable space mechanisms, leading to volume and mass savings inside a fairing while enhancing their functionality in orbit. A promising fold pattern is the Miura-ori pattern, which has multifaceted perks: ample volumes can be folded flat with only one degree of freedom, while preserving rigid faces and accommodating for material thickness.

The reported project tested the deployment of four model variations based on this pattern in 2022 during a zero-g flight experiment campaign. The Kapton prototypes approximated the shape of domes and cylinders, portraying future space structures: habitable modules, resource and fuel tanks, or even debris removal envelopes.

This paper presents the results of the experiment and provide insight on how the design, manufacturing process and protocol affected them, subsequent improvements and design and manufacturing means for a second iteration of origami structures testing in zero-g.