PORTABLE OTK

TESTING MEETS PORTABILITY

Air Bearing Floor Off-Loader Test Kit

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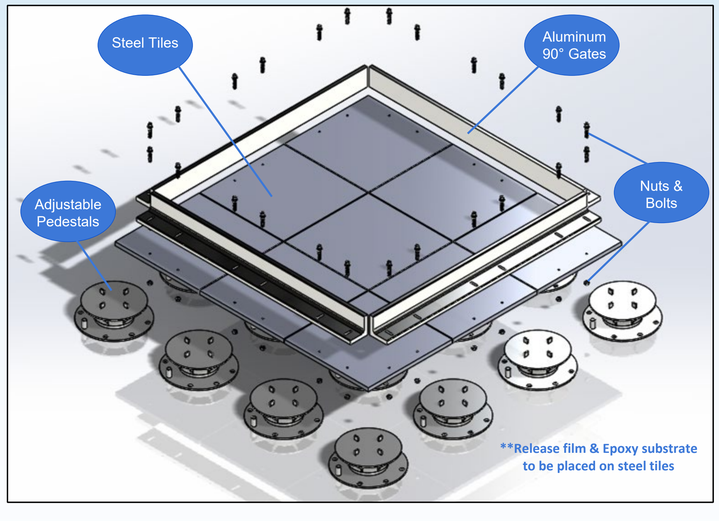
Background

Northrop Grumman is a leading producer of deployable space systems such as deployable booms, solar arrays, and antennas. In order to accurately test the deployment of these systems, the zero-gravity environment of space needs to be simulated on Earth. This requires a testing platform that can provide a frictionless environment and be able to endure a range of high and low temperatures.

Overview

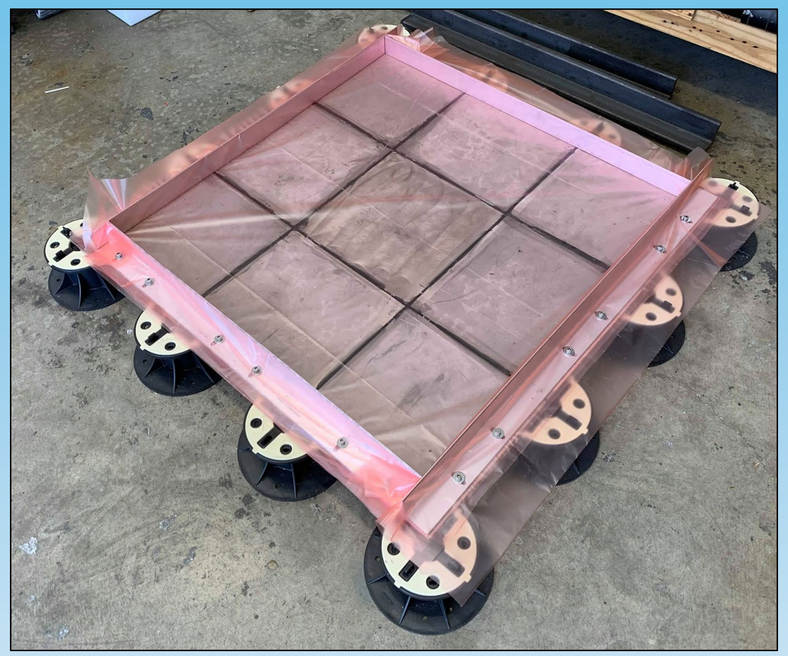
- An all purpose off-loader test kit that utilizes air bearings was created to simulate deployment sequences with negligible friction
- Surface finish and flatness of the floor are vital to air bearing performance
- An epoxy substrate is used as the air bearing floor to create a flat, self-leveling, and frictionless surface
- A modular sub-frame which holds the epoxy substrate is scalable and portable for large scale testing

Exploded View



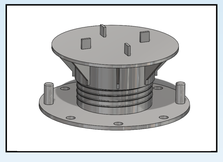
Off-Loader Design Concept

Portable OTK

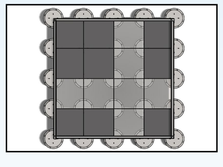


Off-Loader Test Kit

Key Design Features



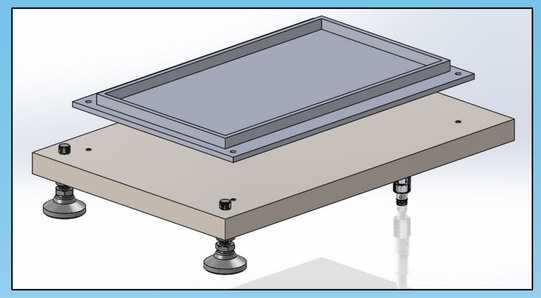
Actuating Pedestals
- Provides rough leveling capability
- Supports weight of assembly



Modular Subfloor Assembly
- Allows testing area to be scaled
- Can disassemble for portability

Epoxy Substrate
- Creates smooth surface
- Enhances leveling properties of floor

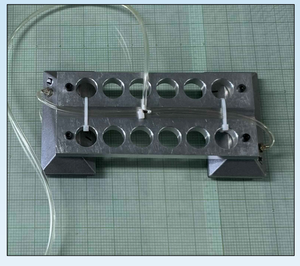
Quantifying Friction Coefficient



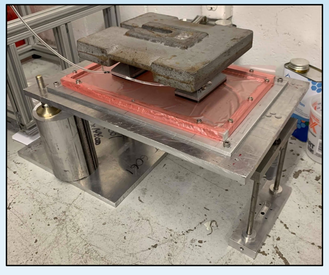
Test Rig CAD Model

To determine if the cured epoxy substrate can float an air bearing, a friction test rig was designed and built. Using the inclined plane method, a micrometer gradually raised one end of the platform until the air bearing displaced.

Epoxy	Angle	Friction Coefficient
Pro Marine Epoxy	0.03528°	0.0006



Air Bearing



Test Rig w/ 20lb Weight

Conclusion

- Modular design allows for scalability and fast assembly
- Components were chosen to operate from -60°C to 60°C
- More epoxy substrates that can consistently produce a desirable flatness tolerance and surface finish must be tested in the future

NORTHROP GRUMMAN

Acknowledgements:
Nathan Walker, Kirk Fields, Tyler Susko, Trevor Marks, Andy Weinberg, Sean Linley

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