

# DYMAFLEX: Dynamic Manipulator Flight Experiment

## Problem Statement

- Investigate the coupled dynamics and associated controller based mitigation strategies for a free-flying vehicle with a high-performance manipulator performing tasks analogous to satellite servicing
- The flight provides verification of models and control algorithms for dexterous manipulators and spacecraft
- Goddard Space Flight Center, Naval Research Lab, Jet Propulsion Lab.

## Technology Development Team

- Dr. David L. Akin, University of Maryland Space Systems Lab, [dakin@ssl.umd.edu](mailto:dakin@ssl.umd.edu)
- Funding support: University of Maryland discretionary funds
- Potential partners: Northrop Grumman

## Proposed Flight Experiment

### Experiment Readiness:

- The dexterous robotic manipulator has been tested in the laboratory environment and approximately one month of system verification is needed. Additionally, approximately 2 months is needed to finalize the test stand for parabolic flight

### Test Vehicles:

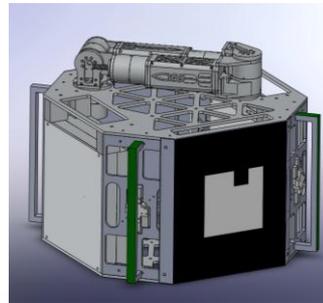
- The requested test platform is a Parabolic flight

### Test Environment:

- The requested test environment is microgravity to simulate the effect of on orbit servicing

### Test Apparatus Description:

- Computer for data capture and free flyer interface. Cameras attached to base for external verification. Base strapped to chair rails. Free flyer latched to base for takeoff and landing



## Technology Maturation

- The current TRL level is 4. In order to achieve TRL6 the vehicle must be documented to perform in agreement with analytical predictions. The manipulator is currently a high fidelity unit in the final configuration and scale.
- To mature the payload, the vehicle must fly in a relevant environment: microgravity.
- This should be accomplished before Fall 2014.

## Objective of Proposed Experiment

- Investigate the coupled dynamics between a dexterous manipulator and the associated spacecraft for an approximately 50 kg system
- External motion tracking for ground truth and onboard inertial measurement system for gathering flight data