

Development of an Attitude Control System Testbed for Small Satellites

KIM WHALEY

UNDERGRADUATE STUDENT AT NORTH DAKOTA STATE UNIVERSITY

Wallops Flight Facility

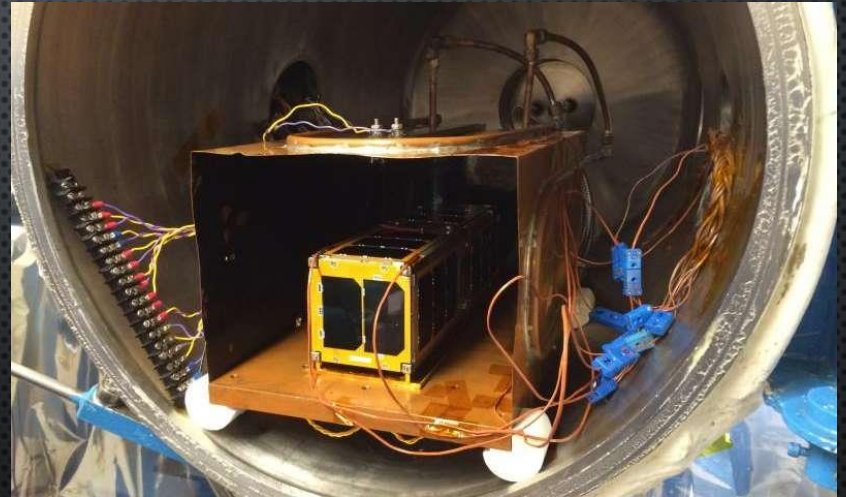


Primary Focuses

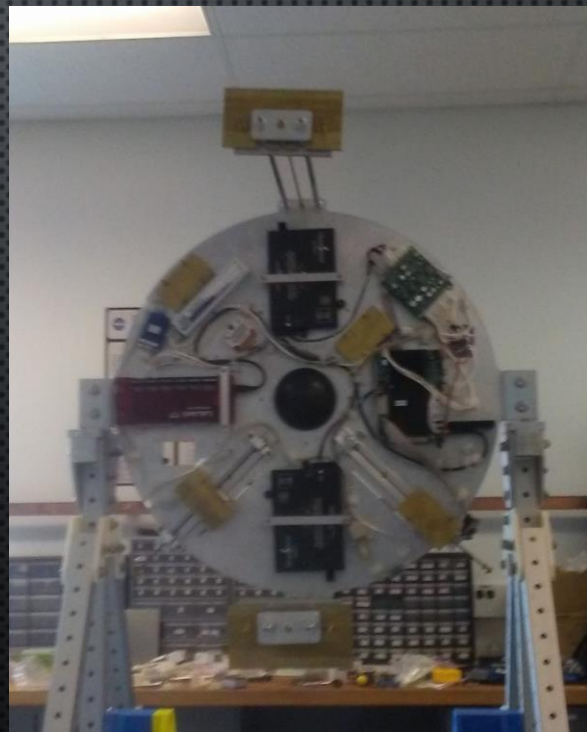
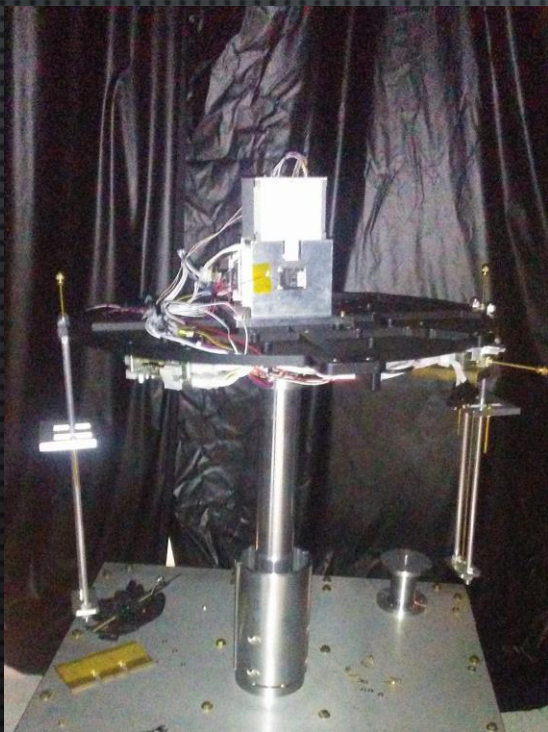


How are Satellites Tested?

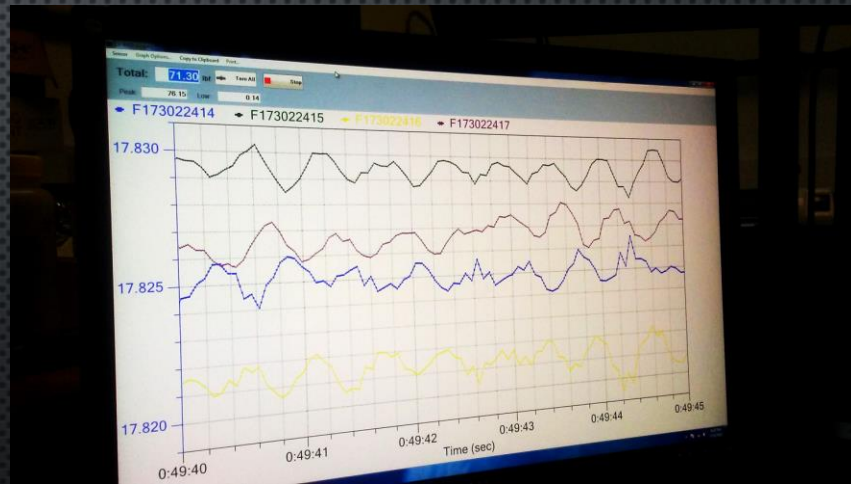
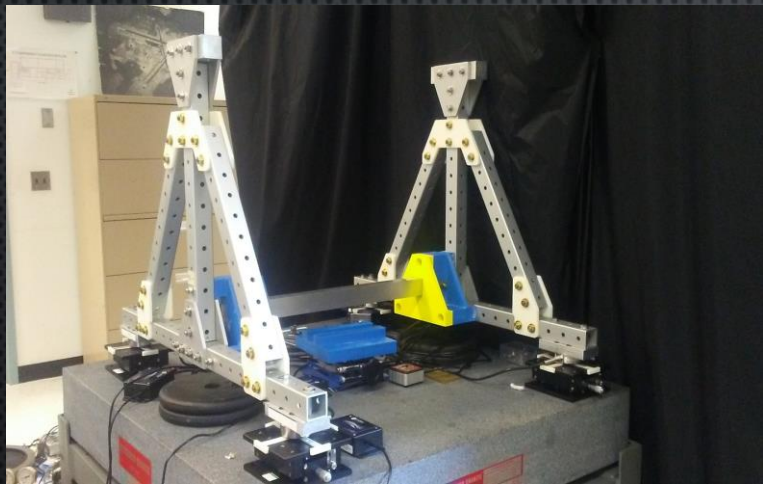
- THERMAL VACUUM TESTING
- VIBRATION TESTING
- ATTITUDE CONTROL TESTING

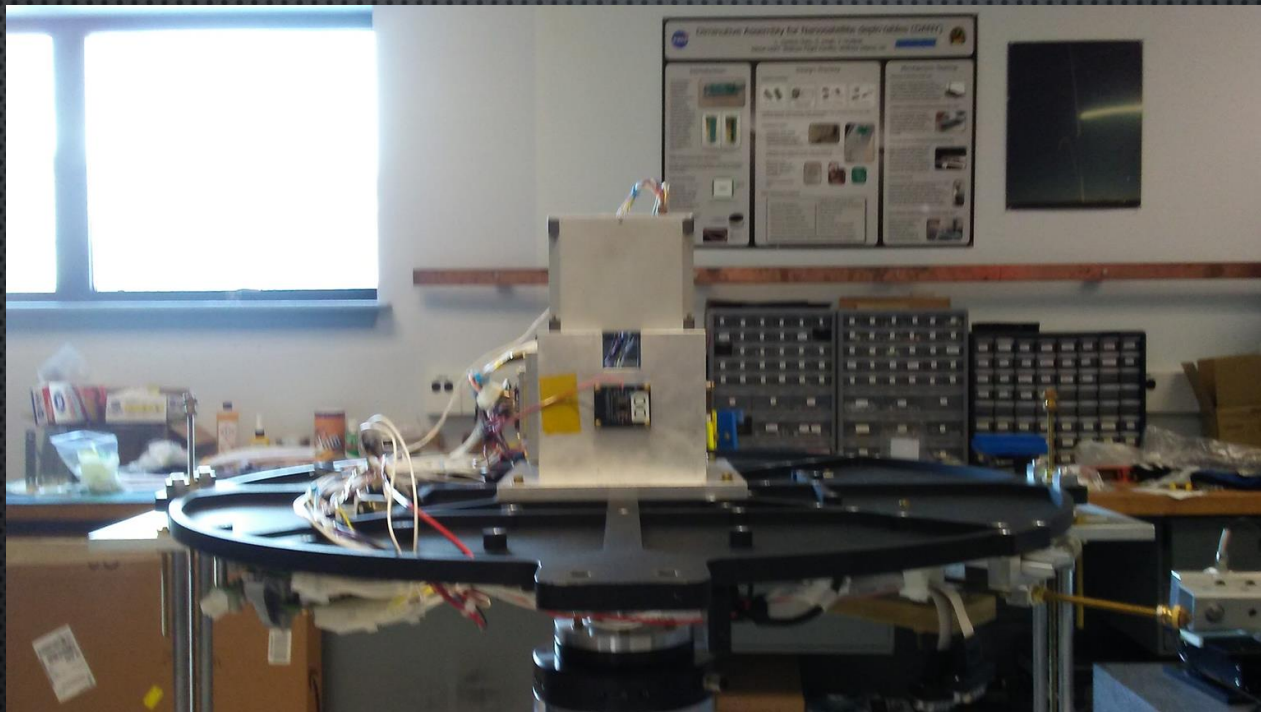


ACS Testbed



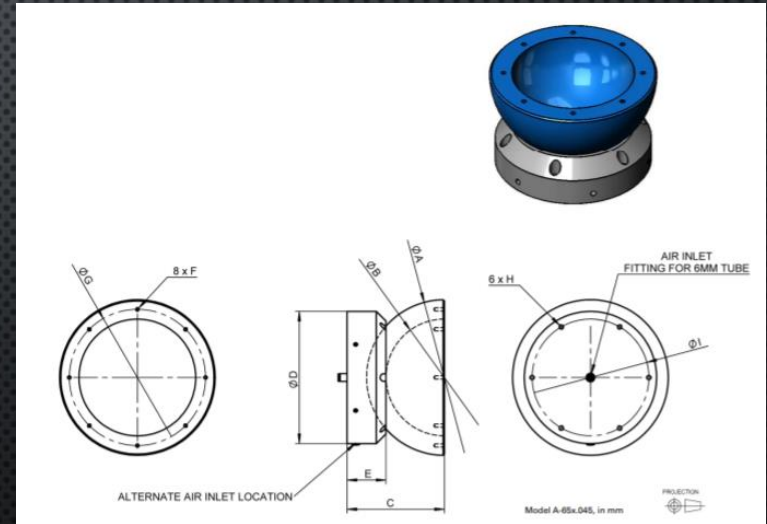
Balancing the Testbed





Vortex Torque

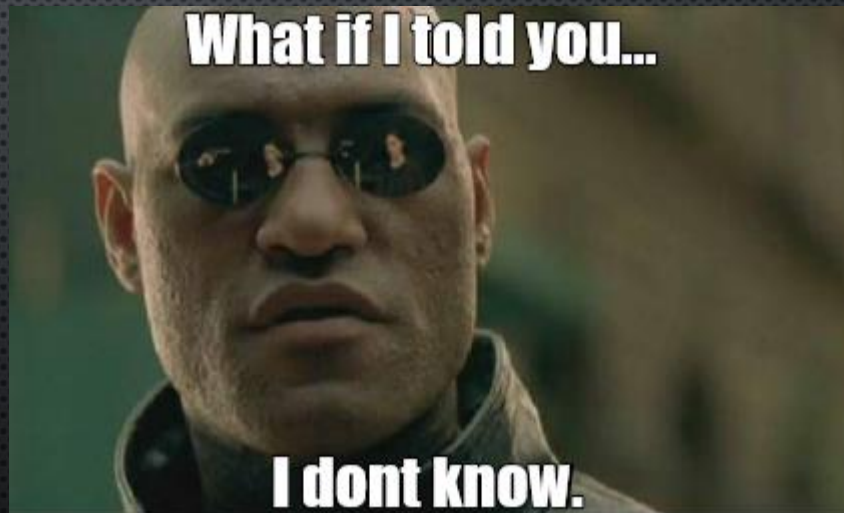
- CAUSED BY IMPERFECTIONS IN BEARING SURFACE
- CREATES AN INTERFERENCE TORQUE



Future of Project

- CONTINUE DEVELOPING ACS TESTBED
- SET UP THE FULL CUBESAT TESTING LAB
- FUTURE TESTING SITE FOR NASA MISSIONS

My Future Projects



Thanks

- NORTH DAKOTA SPACE GRANT CONSORTIUM

- NASA

- JOHN HUDECK AND VICTOR EYO

- ALL OF YOU!

Questions?

[HTTP://WWW.WEATHERBOY.COM/TAG/ORBITAL-ATK/](http://www.weatherboy.com/tag/orbital-atk/)

[HTTP://WWW.DELMARVALIFE.COM/DELMARVALIFE/SUPER-PRESSURE-BALLOON-TESTING-AT-NASA-WALLOPS-FLIGHT-FACILITY/](http://www.delmarvalife.com/delmarvalife/super-pressure-balloon-testing-at-nasa-wallops-flight-facility/)

[HTTPS://COMMONS.WIKIMEDIA.ORG/WIKI/FILE:MID-ATLANTIC REGIONAL SPACEPORT IN JUNE 2012.JPG](https://commons.wikimedia.org/wiki/File:Mid-Atlantic_Regional_Spaceport_in_June_2012.JPG)

[HTTPS://INDIANEXPRESS.COM/ARTICLE/TECHNOLOGY/SCIENCE/NASAS-ICECUBE-SATELLITE-MAPS-GLOBAL-DISTRIBUTION-OF-ATMOSPHERIC-ICE-5047997/](https://indianexpress.com/article/technology/science/nasas-icecube-satellite-maps-global-distribution-of-atmospheric-ice-5047997/)

[HTTPS://WWW.VASPACE.ORG/INDEX.PHP/LOCATION](https://www.vaspace.org/index.php/location)

[HTTPS://PHYS.ORG/NEWS/2015-08-CUBESATS-REVOLUTIONIZING-RADIO-SCIENCE.HTML](https://phys.org/news/2015-08-cubesats-revolutionizing-radio-science.html)

[HTTP://WWW.FUTEK.COM/APPLICATION/TORQUE-SENSOR/SATELLITE-REACTION-WHEEL-TORQUE](http://www.futek.com/application/torque-sensor/satellite-reaction-wheel-torque)

[HTTPS://WWW.PI-](https://www.pi-usa.us/fileadmin/user_upload/pi_us/files/product_datasheets/pi_glide_hb_spherical_air_bearing.pdf)

[USA.US/FILEADMIN/USER_UPLOAD/PI_US/FILES/PRODUCT DATASHEETS/PIGLIDE HB SPHERICAL AIR BEARING.PDF](https://www.pi-usa.us/fileadmin/user_upload/pi_us/files/product_datasheets/pi_glide_hb_spherical_air_bearing.pdf)

[HTTPS://AC.ELS-CDN.COM/S1000936111600113/1-s2.0-S1000936111600113-MAIN.PDF?_TID=A799498C-217F-493A-ABFB-32878C84E72C&ACDNAT=1553097614_8C075A0B40045AAD37F7C2A5F9AC531C](https://ac.els-cdn.com/S1000936111600113/1-s2.0-S1000936111600113-main.pdf?_tid=A799498C-217F-493A-ABFB-32878C84E72C&acdnat=1553097614_8C075A0B40045AAD37F7C2A5F9AC531C)

[HTTPS://WWW.DEFENSEMEDIANETWORK.COM/STORIES/NASA-LANGLEY-RESEARCH-CENTER-100TH-ANNIVERSARY-DIGITAL-MAGAZINE/](https://www.defensemmedianetwork.com/stories/nasa-langley-research-center-100th-anniversary-digital-magazine/)

[HTTPS://WWW.NASA.GOV/PRESS-RELEASE/VICE-PRESIDENT-PENCE-TO-VISIT-NASA-S-MARSHALL-SPACE-FLIGHT-CENTER-FOR-UPDATE-ON-21ST](https://www.nasa.gov/press-release/vice-president-pence-to-visit-nasa-s-marshall-space-flight-center-for-update-on-21st)

What is ACS?

ACS: ATTITUDE CONTROL SYSTEM

COMMON METHODS:

- THRUSTERS
- MAGNETIC TORQUERS
- REACTION WHEELS

