

## Attitude Determination and Control System Characterization

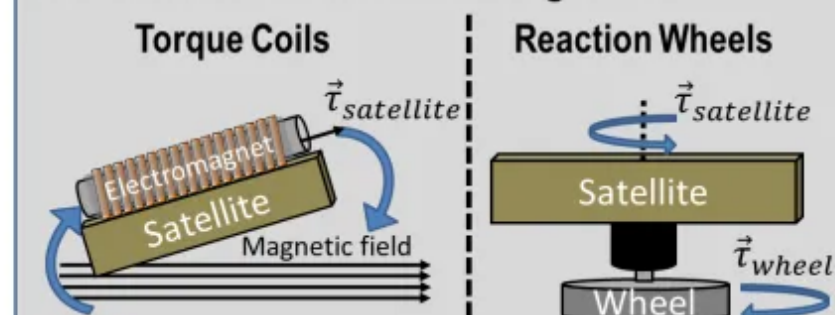


### Attitude Determination and Control System Characterization

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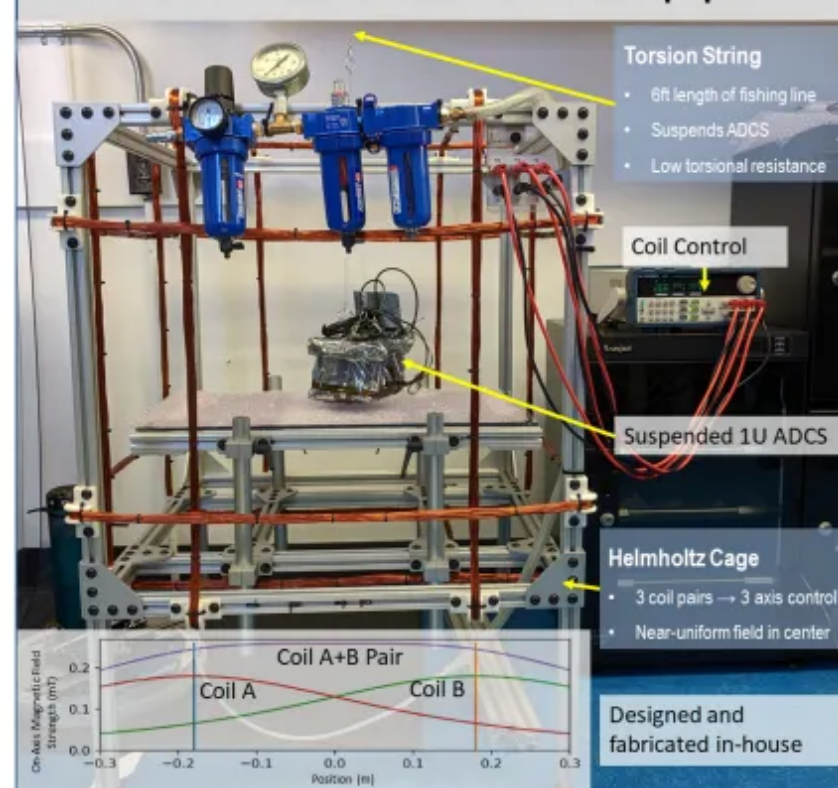
**Objective:** Simulate space environment on the ground to characterize nanosatellite Attitude Determination & Control Systems (ADCS)

#### Satellite Attitude Control Background



- Energizing a torque coil (electromagnet) produces a torque on the satellite based on local magnetic field
- Accelerating a reaction wheel produces a torque on the satellite to control attitude
- Often 3 (or more) of each are used to achieve 3-axis control
- Torques produced by torque coils and reaction wheels are small in magnitude and challenging to observe on earth due to air currents, magnetic field, and friction

#### NIWC Pacific ADCS Characterization Equipment



- Torsion string has a low enough torsional resistance to observe reaction wheel and torque coil induced rotation about the torsion string axis
- Three pairs of Helmholtz-spaced square coils enable 3-axes of magnetic field control to cancel out nominal magnetic field and create custom test scenarios



#### Test Setup Results and Conclusions

- Can produce magnetic fields ~3x greater than the nominal magnetic field in each axis
- Field uniformity was sufficient for a 1U, but larger coils & cage would be required for larger systems
- Even though torsion string enabled observation of rotations from torque coils, it was more difficult to observe than the reaction wheels
- Could only observe relative rotation magnitudes
- Evaluated polarity of reaction wheels & torque coils
- Verified software assignments for each reaction wheel and torque coil

#### Acknowledgments

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## Acknowledgements

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