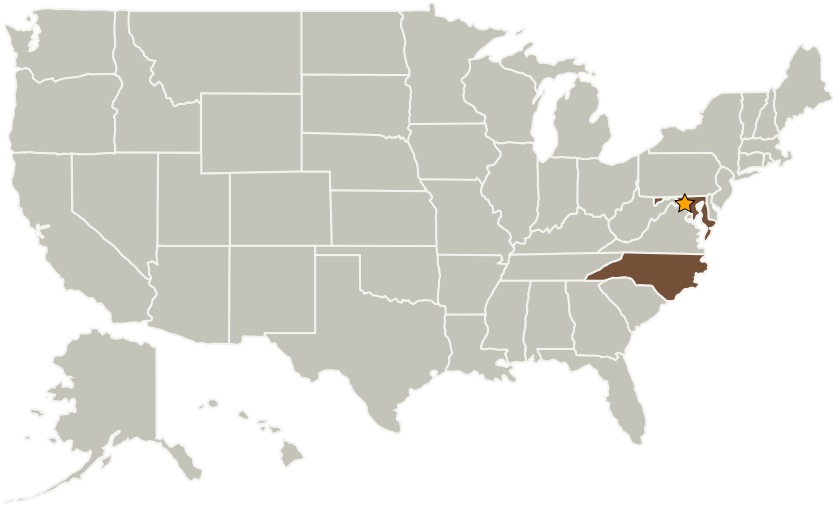
Reaction Wheel Disturbance Model Extraction Software, Phase I

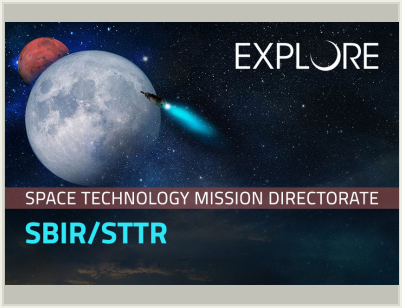
Completed Technology Project (2007 - 2007)

Project Introduction

Reaction wheel disturbances are some of the largest sources of noise on sensitive telescopes. Such wheel-induced mechanical noises are not well characterized. Disturbances can be amplified by wheel and other structural dynamics (for example, isolator modes), that are coupled to gyroscopic effects and therefore are wheel speed dependent. Tonal disturbances and wheel structural modes thus sweep across a frequency band. When one or more tones crosses the frequency of an observatory mode, a large jitter response will result. These higher harmonic effects have not been very significant in the past, for larger spacecraft having looser pointing requirements. However, many current and planned missions have much tighter pointing requirements than past missions. The higher harmonic wheel disturbances are being found to interact with structural modes to cause jitter exceedances. The lack of knowledge of higher harmonic wheel disturbance behavior forces engineers to carry more conservatism in the observatory design, resulting in potentially higher costs. The proposed innovation is a modeling tool that will create a hybrid physical/empirical wheel disturbance model from reaction wheel Induced Vibration data, suitable for high-confidence on-orbit jitter prediction.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Nightsky Systems, Inc.	Supporting Organization	Industry	Raleigh, North Carolina

Primary U.S. Work Locations	
Maryland	North Carolina

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX04 Robotic Systems
  └ TX04.2 Mobility
    └ TX04.2.5 Robot Navigation and Path Planning