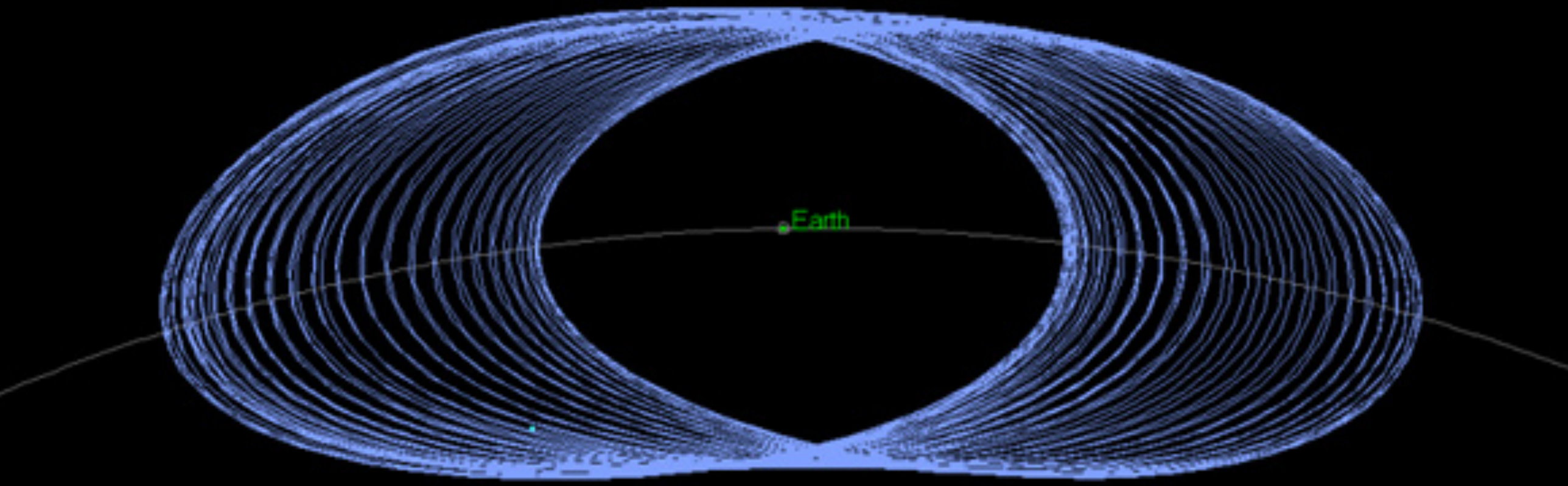
Student Competition

for the 2017 Astrodynamics Specialist Conference

Spacecraft and mission design to Asteroid (469219) 2016 HO3

Earth's newly discovered "quasi-satellite" moon



Courtesy of Paul Chodas, JPL

Sponsored by:

PLANETARY RESOURCES®

Student Competition for the 2017 Astrodynamics Specialist Conference

Mission and spacecraft design to Asteroid (469219) 2016 HO3

Sponsored by Planetary Resources:
Monetary prizes for the 1st ($1500), 2nd ($1000) and 3rd ($500) place teams given to home educational institutions to defray travel costs.

Background:
Asteroid (469219) 2016 HO3 is a recently discovered asteroid that lies in a quasi-orbit about the Earth, following the Earth about the sun for the next several hundred years at least. It is up to 100 meters in size, although particulars about this body are not well understood.

The existence of this asteroid in close proximity to Earth is a prime opportunity for scientific investigation, hazard characterization and resource utilization.

The competition is to design a space mission to investigate this asteroid, providing additional details that will enable future, more in-depth missions to this body. There are a number of challenges and goals for such a mission design and development, and the competition is designed to expose new ideas that can satisfy these constraints in innovative ways. For example, teams are free to propose a reasonable launch scenario as a secondary payload or on a low-cost small launch vehicle.

Constraints and Guidelines:

Launch $C_3 < 0$
Launch mass < 140 kg per vehicle
Common bus up to an ESPA ring or equivalent
Multiple satellite solutions are encouraged, but not required
Rendezvous is encouraged, but not required
Launch date open but should be optimized for the mission

Scientific / Mapping Goals (not all need to be met):

Measure mass to an accuracy of 10%
Measure volume to an accuracy of 10% across a decameter resolution
Develop global shape model to 5 m accuracy
Map lit surface at 1 m^2 resolution
Map at least one 10 m^2 regions at 1 cm^2 resolution
Characterize the strength of the asteroid surface at one site
Measure spectral properties of surface at a few decameter resolution

Asteroid assumptions:

Orbit defined by JPL Horizons (note, 2-body approximations not accurate enough)
Assumed asteroid dimensions: 100 m x 50 m x 40 m
Assumed asteroid density: 2 g / cm^3
Assumed asteroid spin period: < 6 hours
Assumed asteroid spectral type: S or Q

Rules of the competition:

- Teams should consist solely of graduate and undergraduate students at accredited universities — cross-university teaming is allowed as are multiple teams from a single university
- Non-student mentors or advisors are allowed but must be explicitly acknowledged, along with their contributions, and will be considered in the judgement criterion

- Final design will consist of:
  - A < 25 page document, not including references, budget information or equipment lists (MEL)
  - Up to 2 posters presenting the spacecraft design and proposed mission operations
  - A 20 minute presentation of the concept
  - Additional mock-ups, simulations or tactile presentations are allowed

Procedure for the competition:

- Student teams should declare their intent to participate by the paper abstract due date by submitting an abstract, nominal list of team members and commitment for at least one team member to attend the conference.
- The final design documents are due to the competition organizers 2 weeks in advance of the conference.
- Outside reviewers and judges will be used to rank the submissions.
- Student presentations will occur at the conference on Monday afternoon as part of the conference poster session.
- Final selection of winning concepts will be announced on Wednesday evening at the conference banquet

For more information please check the conference web-page or email Dan Scheeres at scheeres@colorado.edu