

NOVEL TECHNIQUES FOR MISSIONS TO ASTEROIDS AND THE MARTIAN MOONS

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Outline



1. Personal Background
2. Description of the Project
3. Research Undertaken
4. Research Ideas

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PERSONAL BACKGROUND



Personal Background

- **GMV Aerospace and Defence, S. A., Spain**
 - Novel techniques for missions to asteroids and the Martian moons.
- **Astronautical Engineering Ph.D. Thesis:** *"Trajectory Mission Design and Navigation for a Space Weather Forecast"*
 - University Of Southern California, USA
- **Astrophysics M.S. Thesis:** *"Spectral Synthesis of Gamma Ray Bursts Afterglows"*
 - University of Oklahoma at Norman, USA
- **B.S. Physics**
 - Universitat de València, Spain

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DESCRIPTION OF THE PROJECT



Description of the Project

- **Novel techniques for proximity, descending/landing and sampling (PLS) operations**
 - Descend and Landing (D&L)
 - Self-Stabilized Terminator Orbits (SSTO)
 - Far Station-Keeping (FSK)
- **GNC techniques for different phases: D&L, SSTO, FSK**
 - Single and binary asteroids
 - *Phobos and Deimos*
- ***Stability of orbits around binary systems***
- ***Orbits around Phobos and Deimos***
- ***Design and Optimization of transfer and descent trajectories***

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RESEARCH UNDERTAKEN



Research Undertaken

- **NEO GNC tool upgrade with:**
 - Binary system in the target ephemerides
 - Binary asteroid force and torque model
 - Target and shape model of binary asteroid

- ***Sensitivity Analysis of the D&L phase:***

- Marco Polo R mission
- OSIRIS-Rex mission

Target Asteroid	
1996 FG3	2008 EV5
1999 RQ36	

- **Preliminary Analysis for SSTO using the Three-Body Problem**

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RESEARCH IDEAS



Research Ideas

- ***Sensitivity Analysis for SSTO and FSK phases***
 - Marco Polo R mission

- ***Sensitivity Analysis for D&L, SSTO and FSK phases***
 - Phobos and Deimos

- ***Design and Optimization of transfer and descent trajectories for***
 - Selected target asteroids
 - Phobos and Deimos

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Thank you

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