

Hochschule Bremen
City University of Applied Sciences



Atmospheric re-entry

Project Work

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Project Work

- An atmospheric re-entry project will be conducted in groups during the four guided work sessions
- After the end of the project on May 16 the students have to hand-in their project work for evaluation
- In the first guided work session on April 21 the following tasks have to be conducted
 - Split-up in groups of 3-4 students
 - Select one of the three projects offered
 - Define selection criteria for the shape of vehicle to be used
 - Select the shape and size of the re-entry vehicle based on the required features and your selection criteria
 - Research the aerodynamic data for your vehicle configuration
 - Program a Matlab® function providing the Lift coefficients, drag coefficients and Lift/Drag ratio of the vehicle as a function of Mach number and angle of attack

Project 1: Return from Space Station

- Investigate the re-entry of a manned return vehicle from the International Space Station (ISS) to Earth surface

The vehicle shall have the following features:

- Initial mass at Space Station of 7000 kg
- The propulsion system for the re-entry burn is part of the capsule and has a specific impulse of 3300 m/s and a thrust of 1600 N
- Maximum acceleration of the re-entry vehicle must be limited to 5g

Project 2: Aerobraking from GEO to LEO

- Investigate an unmanned orbit transfer vehicle going from Geostationary Orbit (GEO) to a 300 km altitude Low Earth Orbit (LEO) using aerobraking in the atmosphere to minimize the necessary ΔV for the mission

The vehicle shall have the following features:

- Initial mass in GEO of 10000 kg
- The propulsion system for the vehicle has a specific impulse of 3800 m/s and provides an initial acceleration of 5 m/s²
- A change of the trajectory orbital plane inclination of 30° shall be part of the aerobraking manoeuvre

Project 3: Mars probe atmospheric entry

- Investigate the entry of a probe from a low Mars orbit (500 km altitude) to Mars surface

The vehicle shall have the following features:

- Initial mass in Mars orbit of 1500 kg
- The wetted surface of the vehicle shall not exceed 35 m²
- The propulsion system for the re-entry burn is part of the vehicle and provides a specific impulse of 3000 m/s and a thrust of 400 N