

An emergency Mars mission is planned with a Hohmann transfer to Mars and some type of capture into a LMO (low-Mars orbit). Due to the alignment issues, we need to make a decision by next Tuesday on whether to go with an aerobraking approach or to use propulsion to put the spacecraft into its Mars orbit. The purpose of this project is for each functional division to investigate, as a team, the tradeoff between aerobraking and the use of propulsion to achieve the desired orbit. *This problem is open-ended.* You do not have time to develop a complete solution to the problem, but you do have time to make some engineering estimates and make a decision about which approach should be taken into the next design phase.

The gravitational parameter for Mars is $\mu = 42,828.3 \text{ km}^3/\text{s}^2$.

The spacecraft mass, not including the propellant or thermal shielding required for aerobraking is 1000 kg.

The desired final orbit is a circular polar orbit with altitude of 400 km.

You will need your patched conics toolbox to figure out how fast the spacecraft will be coming into Mars.

You will need your propulsion toolbox to determine how much propellant would be required to obtain the same Δv as aerobraking can provide.

You will need your radiation and conduction toolbox to estimate how thick shielding would have to be to protect the spacecraft from the heating due to aerobraking.

You will need to find appropriate technical references on aerobraking to help you make sure you're getting all the technical issues.

By class on Tuesday September 18, 2005, each functional division needs to provide me with a technical report making a specific recommendation and supporting that recommendation with some basic calculations. The report should include references to appropriate books, articles, and perhaps websites.