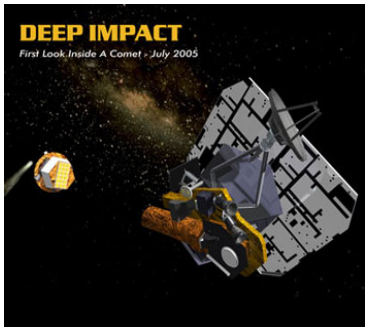

Deep Impact Comet Modeling

Created for Deep Impact Mission, A NASA Discovery Mission
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Modeling is an important part of any space mission and begins earlier than most people think. Before any piece of hardware is built or software is designed, in fact, before anyone begins to make calculations for the size and shape of the spacecraft, intensive research must be done and certain questions must be asked.

- What do we want to find out?
- Where should we go in space to find this information?
- In the case of the Deep Impact mission, what do we know about Comet Tempel 1?
- Learn more about the Deep Impact mission.

Obviously, it isn't possible to visit Tempel 1 to get all the information we need in order to design a mission so scientists and engineers perform exercises to "model" our comet. They ask themselves questions like:

- What other comets do we have information on?
- What has that information told us?
- If we build a model for a comet we know better, will it tell us what we need to know about the one we will visit?

The Deep Impact mission has used images of Halley's comet as well as the more recently collected images of comet Borrelly and Wild 2. Using what we know about those comets, and combining that information with images of Comet Tempel 1 taken from Earth, the Deep Impact team has created models for researching the following challenges:

- How fast is our comet rotating and is that rotation slow enough to allow us to see the crater we make?
- When sunlight falls unevenly on the comet, can we design software that will help our impactor find the best lit area to target?
- Based on what we know about cometary dust environments, will our impactor and spacecraft arrive safely to impact? How large a dust particle can the twin spacecraft survive before the images they are collecting are blurred or the spacecraft themselves are damaged?

Questions for students: If you were building a model of a comet out of odds and ends around the house, what two characteristics about a comet would you choose to show and

what materials would you find to build it? If you were designing a mission, how would you use your comet model to test some of your challenges and bring them to solutions?