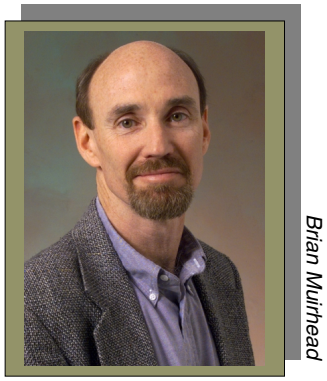
NASA's Deep Impact Mission: Decision Making

Clarifying the Issues

SUMMARY INTERVIEW SHEET

Question: Please tell us about your involvement with the Deep Impact mission and your thoughts about optimizing the data being received during the impact of Comet 9P/Tempel 1 in July of 2005.

Interview of: Brian Muirhead
Job Title: Deep Impact Project Manager
Institution: Jet Propulsion Laboratory
Interviewer: John Ristvey
Date: June 26, 2001
Conducted by phone at Jet Propulsion Laboratory in Pasadena, California



Brian Muirhead

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Deep Impact Project Manager

As project manager for Deep Impact, I am responsible for the development of the spacecraft and the design and operation of the mission. Together with the principal investigator, I am responsible for the overall success of the mission. I also manage the work that is done at the Jet Propulsion Laboratory (JPL) and Ball Aerospace so that the mission is on time and on budget. The most critical time of this mission is at the time of encounter with comet 9P/Tempel 1 on July 4, 2005. The quality of all our decisions will be measured then.

The Deep Impact mission is the first of its kind; impacting a comet has never been done before. I like working with people who get excited about these seemingly impossible mission projects. Deep Impact represents the most daring comet mission the United States has ever done.

One of the challenges of a deep space mission is returning data from the spacecraft to Earth. We have special radios onboard the spacecraft that transmit data at various data rates back to Earth. The Deep Space Network (DSN) antennas that are located around the world pick up the signal. We want to get as many pictures down from the spacecraft as fast as we can. A big challenge is that there may be only one chance to get these data after impact. With Deep Impact there is only one opportunity to send down data. If the Deep Impact spacecraft is hit with comet particles, we may not have the opportunity to send it down again.

Because it is so important for us to get this information down in a very short and critical time frame, we want to have two of our Deep Space Network stations able to receive data from Deep Impact. This will give us two chances to receive the data in the event that an electrical, mechanical, or weather problem occurs on one of the receivers. This is why at the time of impact and shortly thereafter, we are planning on having the spacecraft visible from two DSN stations.

Making a decision on which DSN stations and Earth-based observatories to use needs to be based on data about the location of the spacecraft and the location of the facilities on the ground. Mission planners take into consideration the past weather statistics for each location. Like many decisions, there is no crystal-clear answer; there are always conflicting factors. What we have to do is pick the optimal solution. The decision to use two DSN stations would limit some of the best Earth-based astronomical observatories. The principal investigator and I have determined at that at this time that having two ground stations is more important than having the most optimum Earth-based observatories. This decision is not final. We could change our strategy based on new evidence that would suggest that our initial decision was not the best.

The value of using the Hubble Space Telescope is that it can observe the impact without the problem of clouds or atmosphere. The quality of the cameras on board Hubble is outstanding, but I don't know how the resolution of Hubble compares with the best Earth-based observatories. One consideration for using orbiting telescopes is that scientists will have to make a proposal for access to Hubble that includes the object to be viewed, the viewing time, and the justification of the science objectives. There is no doubt that the science objectives of the Deep Impact mission would meet the requirements for using Hubble.

It is important to note that, as a result of the decisions we make here about timing the mission to get optimal data from the impact, there will be other decisions that will need to be made throughout this mission. There will be decisions made about what pictures, of what type, and how many of each we want to best meet our science objectives.