

May 1, 2003

TO: G. Burke  
FROM: S. Lineaweaver  
SUBJECT: Deep Impact Microlensing Explorer Extended Mission Loading Study

The Resource Allocation Planning and Scheduling Office (RAPSO) performed a preliminary loading study to determine the effects of proposed Deep Impact Microlensing Explorer extended mission tracking requirements on Deep Space Network (DSN) resources and the ability to support those requests.

RAPSO received instructions for the loading study by email on April 8, 2003 whereby the Project considers dropping the frequency of DSN contacts in certain periods to 1 scheduled contact per week if the probability is high that unscheduled DSN time might be obtained on short notice once or twice per month.

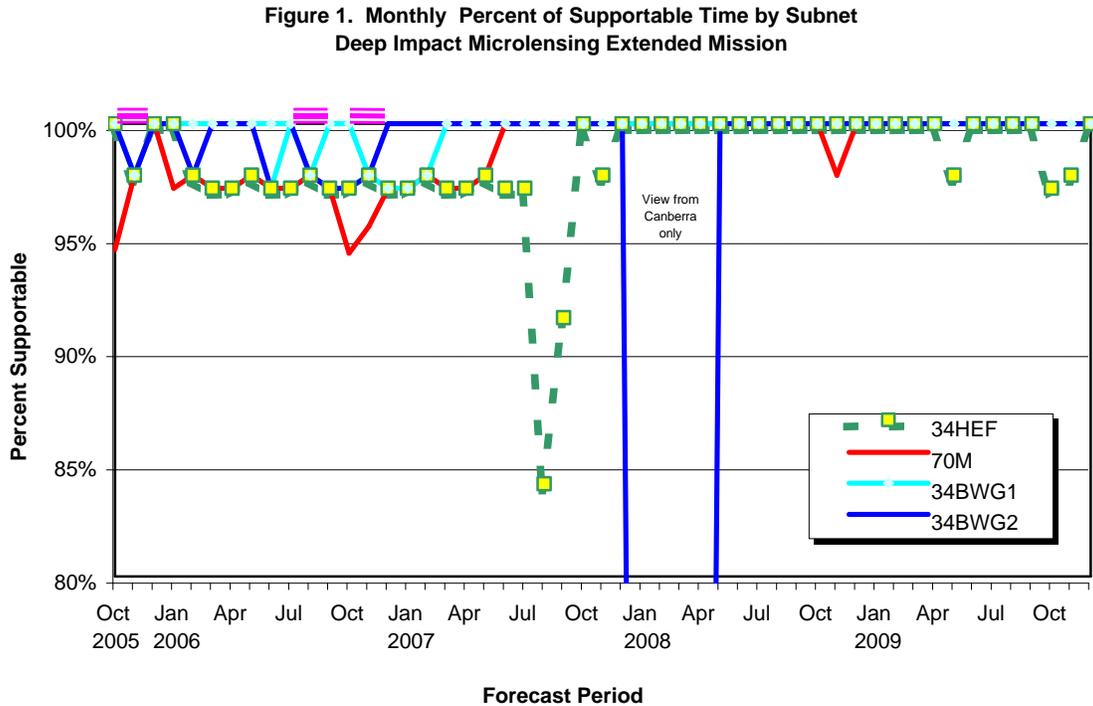
Analysis was accomplished using the FASTER (Forecasting And Scheduling Tool for Earth-based Resources) forecasting system and the updated mission set database from the February 2003 Resource Allocation Review Board (RARB).

#### Assumptions

1. The study interval is from October 2005 through December 2009.
2. A contact is defined as 8 hours of DSN tracking time with 30-minute set up and 15-minute tear down times used for each contact.
3. "Short notice" is assumed to be within the RAPSO Mid-range Scheduling process where project support is negotiated 8 weeks to 18 months into the future.
4. The study model included the current mission set database requirements with the Microlensing Explorer request for 1 contact per week added at each of the DSN 70- and 34-meter Subnets (or 4 times the base request with 1 contact requested on each of 4 subnets).
5. During periods of approved antenna downtime in 2005 and 2006 a subnet request is assumed satisfied on the subnet antennas that remain in service.
6. When Deep Impact is viewable solely from the DSN Canberra Complex, in December 2007 through April 2008, subnet requests are assumed satisfied on SPC-40 antennas only.
7. The 70-meter (70M) and 34-meter high efficiency (34HEF) life extension downtimes planned for placement in the years 2005 through 2008 are not considered in this evaluation.
8. Requirements for the new Rosetta mission are not considered in this evaluation.

## Assessment

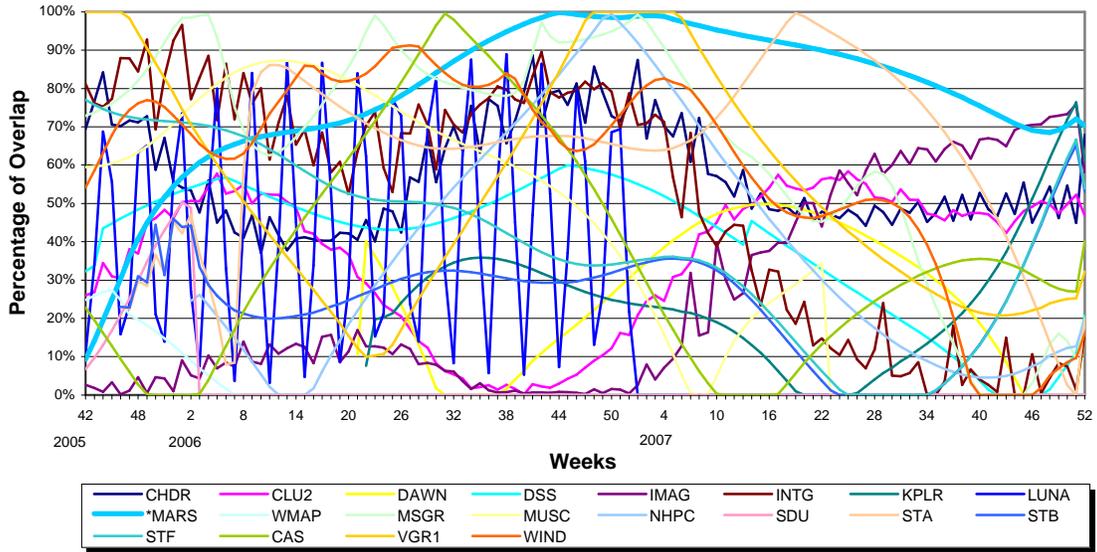
The Microlensing Explorer request for one contact per week is forecast above 95% supportable. Figure 1 shows the monthly percentage of supportable time forecast at each of four DSN Subnets for the duration of the extended mission. At the top of Figure 1 pink triple bars identify only three months when unsupportable time is forecast at all four subnets. It is not however unreasonable to expect some degree of increased unsupportable time in the future given the immaturity of the requirements database, especially in 2008 and 2009 and the loading on DSN resources that the 70M and 34HEF life extension downtime may cause.



Figures 2 through 4 show the percentage of viewperiod overlap other DSN users have with the Deep Impact view period from 2005 through 2007. All missions have the potential to affect the ability to schedule tracks as view periods overlap.

The most significant element that can be determined from the figures is that the Mars view period overlap is significant. This is especially true from March 2006 through the end of 2007 when the overlap at Goldstone and Madrid exceeds 70%. Requirements supporting Mars Express (MEX), Mars Global Surveyor (MGS), Mars Odyssey (M01O), Mars Reconnaissance Orbiter (MRO), and the Mars 2007 Scout mission are likely to limit the number of unscheduled hours in Deep Impact's view period.

**Figure 2. Goldstone 2005-2007 Mission Set Viewperiod Overlap with Deep Impact Viewperiod**



**Figure 3. Canberra 2005-2007 Mission Set Viewperiod Overlap with Deep Impact Viewperiod**

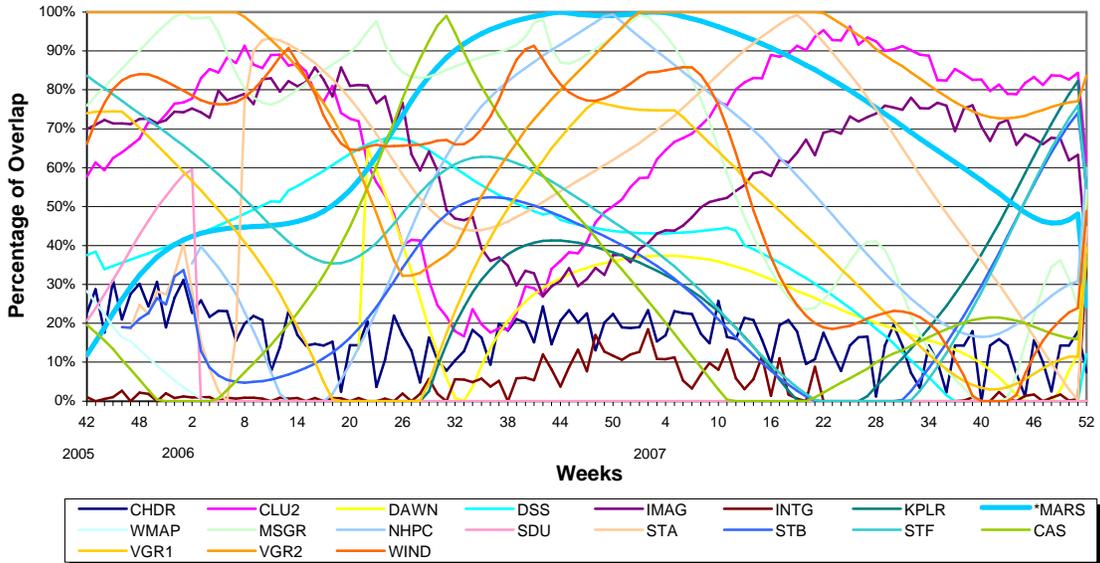
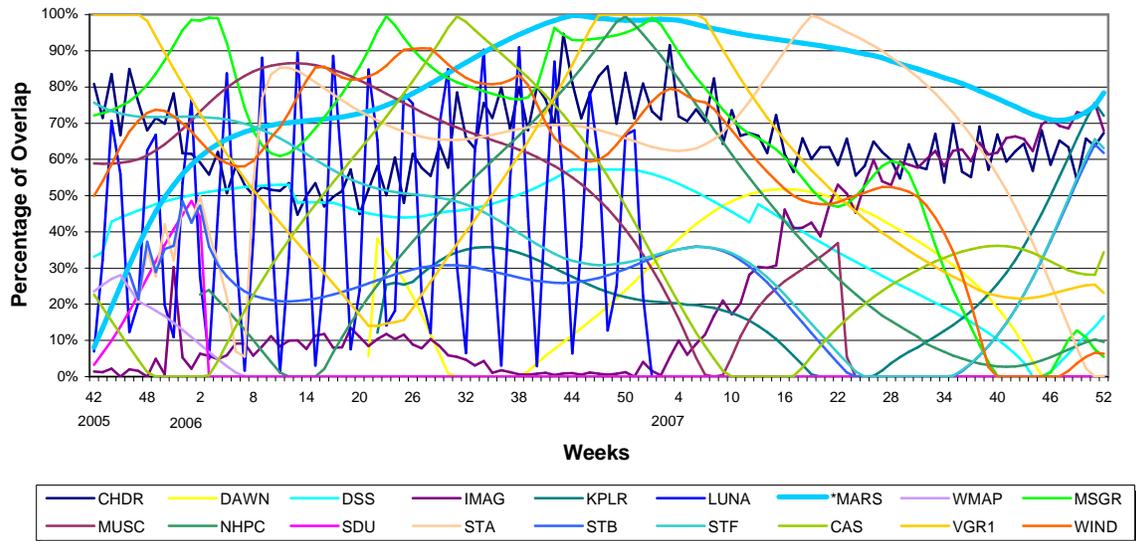


Figure 4. Madrid 2005-2007 Mission Set Viewperiod Overlap with Deep Impact Viewperiod



### Summary

Deep Impact is forecast to receive nearly all of the time requested but the percentage of unsupportable time is expected to increase as requirements for planned missions are input and updated and periods of antenna downtime are approved.

The probable number of hours available to Deep Impact on short notice may be limited during periods of high activity in the Mars view period. Additionally, adding support in mid-range planning may prove more problematic than in the past, due to early sequence development for missions like Cassini and the labor required in changing the sequences at the last minute. Any specific day may be fully subscribed and a late request for a track would be denied. Yet overall loading indicates that there will be time available on the network within any given week.

For these reasons planning for the additional support in the long term through the RAPSO process would eliminate possible risks and would allow the additional requirements to be considered in future planning and analysis.

As always, we will continue to work with Deep Impact and other users of the DSN to maximize the time available for each individual user.

cc:

- A. Andujo
- B. Arroyo
- R. Bartoo
- E. Hampton
- K. Kim
- N. Lacey
- D. Morris