JET PROPULSION LABORATORY INTEROFFICE MEMORANDUM

February 6, 2008

TO: D. Morris

FROM: J Valencia

SUBJECT: Ulysses Extended Mission Supportability Study

The Resource Analysis Team has conducted a special study to determine the ability of the DSN to support Ulysses during the extended mission phase from April 2008 through September 2010. The study determines supportable hours and identifies periods of potential contention with other DSN resources users during Ulysses extended mission.

Assumptions

The analysis is based on requested hours for support input by User Loading Profiles updated for the February 2008 Resource Allocation Review Board (RARB) conference. The scheduled 34 meter and 70 meter antenna downtimes referenced in the Major DSN Antenna Downtimes forecast is included in the study.

Analysis

This study covers the Ulysses extended support period from April 2008 to September 2010. The analysis used the updated 2008, 2009 and 2010 User Loading Profiles (ULPS) as data input and the database created for the February 2008 DSN Customer Forum's Resource Allocation Review. DSN antenna downtimes, launches and other significant events planned during the requested time period were included in the study.

Antenna maintenance downtimes are planned in 2008, 2009, and 2010 and Ulysses supports are off loaded to other assets. The 34 meter BWG1 and the 70 meter antennas at Canberra have scheduled maintenance downtime in 2008 and 2009, but do not impact Ulysses extended mission support.

Week 25/2008 – 39/2008 DSS-34 Azimuth Replacement/Ka-Band tasks

- DSS-34 antenna downtime for Azimuth Replacement/Ka-Band work is from week 25 through week 39, 2008. Southern hemisphere view of Ulysses begins again from week 036, 2008. Commensurate with link margin, supports over Canberra view could be off loaded to DSS-43, or preferably Goldstone. During this downtime period there is no view period overlap between Madrid and Canberra; view period duration over Madrid or Goldstone is at least 16 hours and at most 24 hours and view period duration over Canberra is at least 1 hour and at most 3.5 hours during this downtime period.

Week 39/2008 - 13/2009 DSS-43 Life Extension Task

- DSS-43 antenna downtime for Life Extension work is from week 39, 2008 through week 13, 2009. Southern hemisphere view of Ulysses is from week 036, 2008 through week 04, 2009. Commensurate with link margin, supports over the Canberra view can be off loaded to DSS-34, or preferably Goldstone. During this

downtime period there is no view period overlap between Madrid and Canberra; view period duration over Madrid and Goldstone is at least 15 hours and at most 17 hours and view period duration over Canberra is at least 3.5 hours and at most 4.8 hours.

The 34 meter HEF antenna at Madrid and the 70 meter antennas at Madrid and Goldstone have scheduled maintenance downtime in 2009 and 2010, but do not impact Ulysses extended mission support.

Week 14/2009 – 39/2009 DSS-63 Life Extension Task

- DSS-63 antenna downtime for Life Extension work is from week 14 through week 39, 2009. Southern hemisphere view of Ulysses is from week 16 and extends through 2009 permitting offloading selected supports from Goldstone to Canberra during the downtime period. Supports over the Madrid view can be off loaded to DSS-54. During this downtime period view period overlap between Madrid and Canberra is 1 hour or less; view period duration over Madrid and Goldstone is at least 13.2 hours and at most 18.9 hours and view period duration over Canberra is at least 1.9 hours and at most 8.3 hours.

Week 40/2009 – 48/2009 DSS-65 Life Extension Elevation Task

- DSS-65 antenna downtime for life extension elevation work is from week 40 through week 48, 2009. Southern hemisphere view of Ulysses is from week 16 and extends through 2009 permitting offloading selected supports from Goldstone to Canberra during this downtime period. Madrid and Goldstone have high percentage overlapping views permitting offloading supports to Goldstone. Supports over the Madrid view should be supported by DSS-54 and DSS-63. During this downtime period view period overlap between Madrid and Canberra is 1 hour or less; view period duration over Canberra is at least 8.4 hours and at most 8.6 hours and view period duration over Madrid and Goldstone is at least 12.8 hours and at most 13.5 hours

Week 40/2009 –12/2010 DSS-14 Life Extension Task

- DSS-14 antenna downtime for Life Extension work is from week 40, 2009 through week 12, 2010. Southern hemisphere view of Ulysses extends through 2010 permitting offloading supports from Goldstone to Canberra during this downtime period. Goldstone and Madrid have high percentage overlapping views permitting offloading supports to Madrid. Support over the Goldstone view can also be off loaded to DSS-24. During this downtime period view period overlap between Madrid and Canberra is 1 hour or less; view period duration over Canberra is at least 8.4 hours and at most 8.8 hours and view period duration over Madrid and Goldstone is at least 12.9 hours and at most 13.7 hours

Summary of Results

Analysis results show the requested hours of support has minimal impact on the DSN network loading. There are no missions that place a significant threat to Ulysses during its extended mission. The user should receive greater than 95% of requested hours for

support as shown in figures 1, 2 and 3. In 2008/2009 during DSS-34 and DSS-43 antenna downtime supports can be supported by Goldstone or Madrid. In 2009/2010 during DSS-14 and DSS-65 antenna downtime period supports can be off loaded to DSS-24, DSS-54, DSS-63 or Canberra. Based on the high percentage of supportability of requirements there is high probability that the mission will receive one pass each day without contention, but the second pass will have high contention caused by the separation requirement of 12-13 hours between passes. This pass separation requirement causes high percentage of view period overlap with other missions.

Conclusion

The study shows the DSN can provide greater that 95% of the requested hours of track time. There are no missions that place a significant threat to Ulysses during its extended mission ending September 2010.

Figure-1

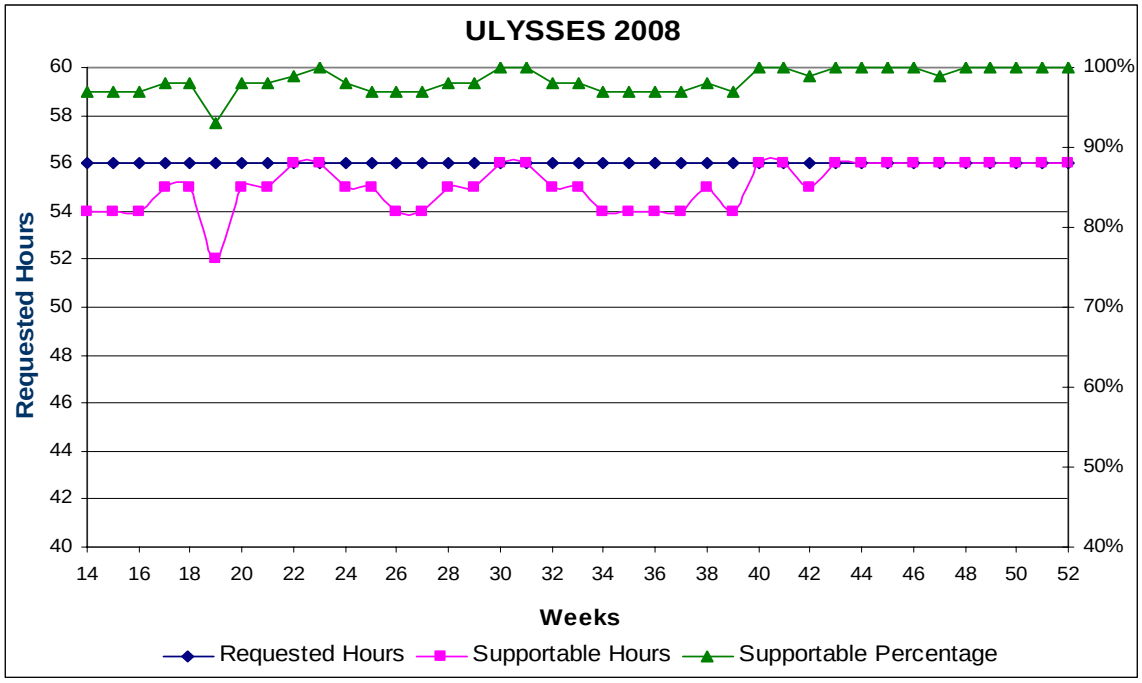

Figure-2

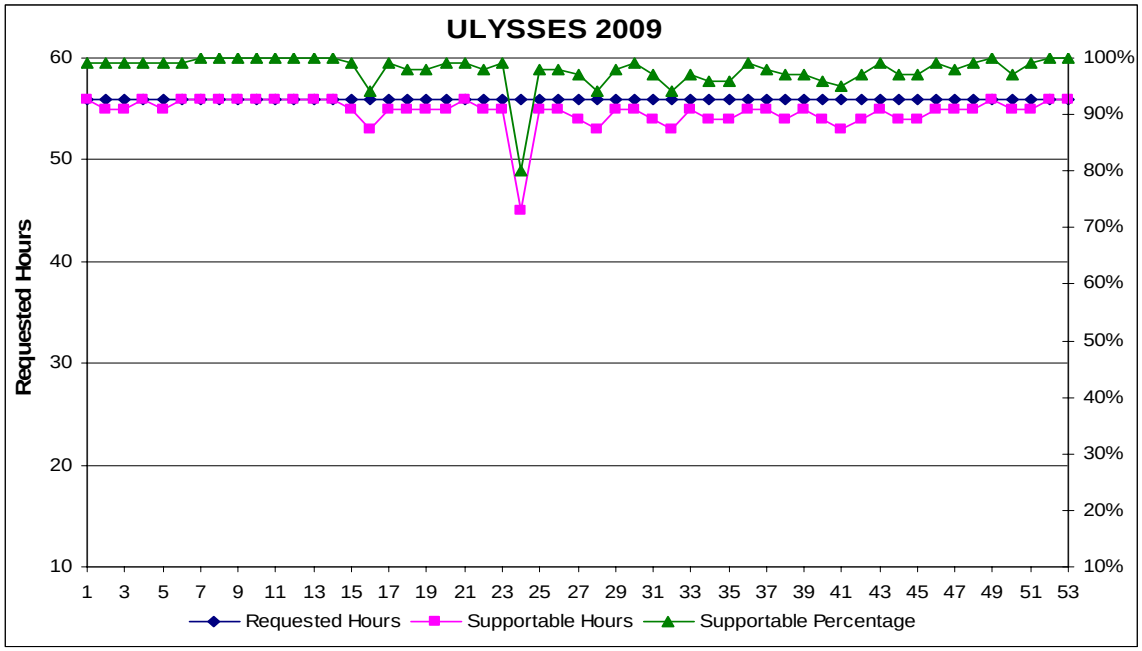

Figure-3