

February 3, 2005

TO: G. Burke
FROM: N. Satterlee/A. Andujo
SUBJECT: Special Request for Tracking Data and Relay Satellite System (TDRSS) to Use DSS-46 from March 2005 through March 2006

The Resource Allocation Team has completed a special study to analyze the ability of the DSN to provide the TDRSS Project with 24-hour per day support on DSS-46.

Background

Tracking and Data Relay Satellite System (TDRSS) is inquiring on the feasibility of 24-hour per day support on DSS-46, for a period of thirteen months from March 2005 through April 2006, in order to ensure continuous coverage during the relocation of TDRSS geosynchronous satellites.

This study focuses on determining the feasibility of providing 24-hour per day DSN support at DSS-46 for the TDRSS Project, during this period.

Summary

A review of supports currently scheduled at DSS-46 in the mid-range schedule was conducted and this report asserts that based on currently scheduled activities, DSS-46 would only be able to provide TDRSS with an average of 2.4 supports per day, with an average track length of 3.36 hours, for a total of 6.72 hours per day if no adjustments are made..

Additionally, an approximation of future schedules was also made, based on current User Loading Profiles (ULP) for all active missions. These findings confirm that TDRSS would not be able to obtain requested DSN support without severely impacting other missions.

Assumptions

- DSS-34 (34BWG) down for X/X-Ka Band, USC installation, and Azimuth Idler Bearing in Weeks 07 – 16 of 2005
- DSS-43 (70M) down for Antenna controller replacement/USC installation and Hydrostatic bearing in Weeks 29 – 52 of 2005

Supports displaced as a result of antenna downtimes are often redirected to DSS-46. During the DSS-43 downtime, both DSS-34 and DSS-45 will be extensively used to support missions unable to use it and that will make it nearly impossible for missions to move from DSS- 46 to one of these antennas. Additionally, during the DSS-34 downtime DSS-46 will accommodate supports which could use it and are unable to utilize DSS- 45 and DSS- 43.

Current Key Mission Requirements

- The apogee of orbit for both the POLAR satellite and the Imager for Magnetopause-to-Aurora Global Exploration (IMAG) satellite occur over the southern hemisphere. Due to this occurrence, DSS-34 and DSS-46 are the primary DSN resources utilized by these missions in order to meet their mission requirements.
- The Advanced Composition Explorer (ACE), CLUSTER II, Geotail (GTL), and SOHO missions all utilize the 26 meter subnet in order to meet their mission requirements
- 80% of CLUSTER II's Wide-Band Data (WBD) Opportunities are in the southern hemisphere and require simultaneous tracking support from three to four apertures
- NOAA-N is scheduled to launch on 19 March 2005, DSS-46 support required for launch and initial acquisition
- SOHO will be in their Keyhole period in –
 - Weeks 09 through 13 of 2005
 - Weeks 17 through 19 of 2005 (Mini Keyhole)
 - Weeks 22 through 25 of 2005
 - Weeks 35 through 38 of 2005
 - Weeks 42 through 44 of 2005 (Mini Keyhole)
 - Weeks 48 through 51 of 2005
- SOHO is in Helio Seismology Observation Continuous Coverage in Weeks 25 through 34 of 2005
- GOES-N is scheduled to launch no earlier than 4 May 2005, DSS-46 support required for launch, initial acquisition, and early operations support for approximately 21 days
- Mars Reconnaissance Orbiter (MRO) is scheduled to launch on 10 August 2005, DSS-46 support required for launch and initial acquisition
- Stardust (SDU) Earth Reentry 15 January 2006
- New Horizon (NHPC) is scheduled to launch on 10 January 2006, DSS-46 support required for launch and initial acquisition

- Stereo Ahead (A) and Behind (B) are scheduled to launch 11 February 2006, DSS-46 support required for launch and initial acquisition
- Space Technology-5 (ST-5) and its three spacecraft are scheduled to launch on 28 February 2006, DSS-46 support required for launch and initial acquisition and maneuver support.

Current mission requirements dictate the specific use of DSS-46, for both nominal activities and critical events. As a result of the heavy loading across the network, specifically on the 26 meter subnet, 26 meter subnet users may be able to offload support to the 34 meter or 70 meter subnet. However, not all missions have this option and offloading creates further contention that the 34 and 70 meter subnets would not be able to absorb without a marked increase in unsupportable time.

Other major events and downtimes occurring during the study period are listed in the supporting data attached at the end of this study.

Analysis

Analysis was accomplished using the Tracking Integrated Ground Resource Allocation System (TIGRAS) scheduling tool, the updated mission set database from the August 2004 Resource Allocation Review Board (RARB), and currently developed schedules from the DSN Mid-Range process.

TIGRAS was used to analyze current network loading on DSS-46 in Weeks 09 – 32, 2005. This interval represents approximately 40% of the time requested by TDRSS. It was determined that of the 619 gaps available during this time period, only 401 gaps with an average track length of 3.36 hours could be considered viable support time for possible utilization by TDRSS.

Currently the missions listed in Table 1 utilize DSS-46 to meet both nominal and critical event mission requirements. The table below identifies the total tracks and hours scheduled at DSS-46 in Weeks 09 – 32, 2005. As shown, DSS-46 is presently scheduled to support on average about 65% of the available antenna time.

Table 2 identifies available time on other DSN resources located at the Canberra station. Due to the high utilization of DSS-34, DSS-43, and DSS-45, these DSN resources would be unable to accommodate offloading from DSS-46 in Weeks 09 – 32, 2005.

**Table-1: Scheduled Tracks and Hours by User
at DSS-46 in weeks 09 - 32**

User	Tracks	Hours
ACE	85	155.7
CHDR	30	84.0
CLU1	10	23.3
CLU2	5	8.5
CLU3	5	10.2
CLU4	50	122.9
DSN	1	1.0
DSS	49	285.9
GTL	152	256.3
IMAG	150	279.6
NOAA-N	23	30.8
POLR	329	674.0
SOHO	114	680.2
Total	1003	2612.4
Average Per Week	42	108.9

**Table-2: Utilization of DSN Canberra Antennas
in weeks 09 - 32 of 2005**

	DSS-34	DSS-43	DSS-45
Total Gap Hours Available	729.0	241.2	745.7
Total Utilization Hours	3303.0	3790.8	3286.3
Average Utilization per Week	137.6	158.0	136.9
Average Utilization % per Week	81.9%	94.0%	81.5%

Negotiations for part of the study period under consideration are still in progress within the Mid-range process. Upon completion of successful launch activities for NOAA-N and GOES-N, nominal supports will be restricted to the 26 meter subnet.

During analysis several factors were considered:

- DSN resources down during the requested time period
- Scheduled supports already negotiated through Week 32, 2005
- Identified gaps would not meet 24-hour support request
- NOAA-N Launch scheduled for 19 March 2005
 - NOAA-N will utilize DSS-46 launch and early orbit support
- GOES-N Launch scheduled for 4 May 2005
 - GOES-N will utilize DSS-46 for launch and early operations support for an approximate 21-day period
- DSS-46 standard maintenance and receiver phasing schedule

During analysis several factors were not considered:

- RADARSAT will schedule from 2-4 passes per month at DSS-46.
- DSN provides emergency support that may preempt or interrupt supports scheduled for network users

Conclusion

Based on current schedules built, through Week 32/2005 and an approximation of future schedules which will be built based on the current User Loading Profiles (ULPs) for all active missions, DSN will be unable to provide TDRSS with the requested 24-hour support on DSS-46.

TDRSS cannot obtain 24-hour per day coverage at DSS-46 during the requested time period without adversely affecting loading at other DSN sites. Other Canberra antennas are unable to support even partial offloading. This is due to a high percentage of project view period overlaps and high utilization of the DSN's only southern hemisphere resources.

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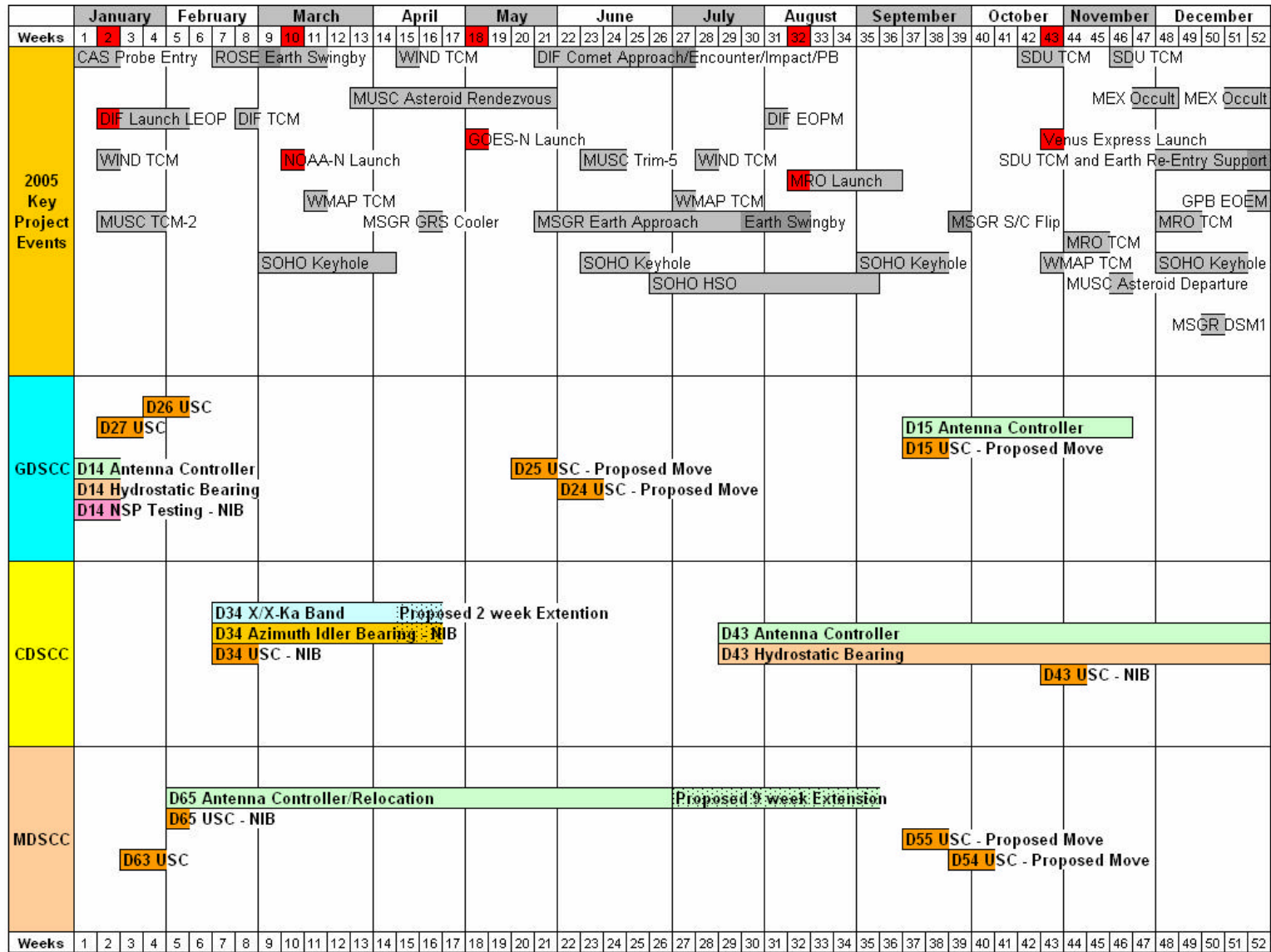
Supporting Data

Table-3: Gaps Available in Current Schedule for a Sample Time Period

The sample presented below was selected from the current mid-range schedule in order to denote available gaps at DSS-46 during a period of nominal and high level activity. NOAA-N pre-launch and launch supports are scheduled to occur during the selected timeframe. Additionally, the use of DSS-46 by the POLAR and IMAG projects for nominal supports during this timeframe is a major contributing factor to heavy loading experienced at DSS-46.

DSS	Start Date	Start Time	End Date	End Time	Gap Length (Hrs)
DSS-46	3/7/2005	1:15	3/7/2005	2:30	1.25
DSS-46	3/7/2005	4:10	3/7/2005	7:55	3.75
DSS-46	3/7/2005	13:25	3/7/2005	16:15	2.83
DSS-46	3/8/2005	13:15	3/8/2005	15:00	1.75
DSS-46	3/9/2005	15:25	3/9/2005	19:10	3.75
DSS-46	3/10/2005	4:10	3/10/2005	5:10	1
DSS-46	3/10/2005	16:35	3/10/2005	18:15	1.67
DSS-46	3/10/2005	19:55	3/10/2005	21:20	1.42
DSS-46	3/10/2005	23:10	3/11/2005	0:35	1.42
DSS-46	3/11/2005	7:55	3/11/2005	15:30	7.58
DSS-46	3/12/2005	11:10	3/12/2005	13:00	1.83
DSS-46	3/13/2005	3:30	3/13/2005	9:05	5.58
DSS-46	3/13/2005	12:45	3/13/2005	14:30	1.75
DSS-46	3/13/2005	16:20	3/13/2005	21:55	5.58
DSS-46	3/14/2005	9:25	3/14/2005	13:35	4.17
DSS-46	3/14/2005	17:15	3/14/2005	21:00	3.75
DSS-46	3/14/2005	22:50	3/15/2005	1:30	2.67
DSS-46	3/15/2005	22:50	3/15/2005	16:25	1.5
DSS-46	3/15/2005	18:05	3/15/2005	19:10	1.08
DSS-46	3/16/2005	7:50	3/16/2005	9:00	1.17
DSS-46	3/16/2005	23:05	3/17/2005	0:10	1.08
DSS-46	3/17/2005	3:40	3/17/2005	5:10	1.5
DSS-46	3/17/2005	8:40	3/17/2005	12:20	3.67
DSS-46	3/17/2005	14:10	3/17/2005	15:35	1.42
DSS-46	3/17/2005	23:55	3/18/2005	1:20	1.42
DSS-46	3/18/2005	14:10	3/18/2005	17:00	2.83
DSS-46	3/19/2005	10:35	3/19/2005	11:50	1.25
DSS-46	3/20/2005	6:12	3/20/2005	7:35	1.38
DSS-46	3/20/2005	9:30	3/20/2005	11:05	1.58
DSS-46	3/20/2005	14:35	3/20/2005	16:25	1.83

MAJOR DSN EVENTS AND DOWNTIMES FOR 2005



Revised: February 2, 2005

