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TO: Distribution

FROM: David Morris

SUBJECT: February 2008 Deep Space Network Customer Forum (DSNCF) Minutes

The following are the Minutes of the NASA/JPL Deep Space Network Customer Forum (DSNCF) Meeting held at JPL on February 11, 2008. The purpose of this forum is to bring together current and future customers of Deep Space Network (DSN) with DSN Managers to communicate current and future plans and share concerns.

These minutes do not attempt to replicate the presentation material. The presentations in the bound handout book given at the DSNCF Meeting have been posted on the RAPS February 2008 DSNCF webpage at the following URL: http://rapweb.jpl.nasa.gov/RAR-RedFeb2008.html Corrections or updated versions of the presenters' materials are incorporated in the DSNCF presentations document. The minutes attempt to reflect discussions and any action items identified during the meeting.

The Resource Allocation Forecast portion of the meeting is responsible for reviewing new or changed requirements, adopting recommendations to reduce periods of heavy contention, and for controlling changes to mission and asset requirements. It addressed updated project support requirements and proposed antenna downtime in 2008, 2009, and 2010. Specific periods of oversubscription are addressed with recommended changes to support. The presentation attachment is identical to what was presented.

Final Agenda

1. Welcome and Introduction.....D. Morris
2. DSN Program Plans .....M. Rodrigues
3. DSN Development Operations and Service Office .....A.Bhanji/W. Sible
   a. Antenna Front End, Facilities and Infrastructure.....P. Hames
   b. Project Interface.....S. Kurtik
4. Break
5. New or Modified Project Requirements
   a. EPOXI and NEXT Missions .....T. Duxbury
   b. Mars Program Support for Phoenix Entry, Descent, & Landing and
   And Mars Program Relay Operations .....C. Edwards
   c. Ulysses Update .....E. Massey/B. Brymer
6. Space Link Standards.....Y. Shen/P. Shames
7. Past Action Items .....D. Morris
8. DSN Resource Allocation Forecast 2008-2010
   a. Analysis & Recommendation .....A. Andujo

b. Projects Responses.....Projects
c. Discussion / Decisions.....All

9. New Action Items & Summary.....D. Morris

Customer Forum Representatives

D. Morris introduced Customer Forum representatives and thanked the mission representatives and schedulers for attending the INCF. The following Customer Forum members or their representatives attended:

D. Abraham	T. Duxbury	D. Holmes	C. Page
A. Andujo	C. Edwards	A. Kniepkamp	E. Pereira
D. Balke	L. Efron	S. Kurtik	M. Rodrigues
A. Berman	L. Fairly	S. Lee	N. Sartwell
R. Best	D. Finnerty	A. Levine	F. Schackart
P. Beyer	M. Garcia	E. Luers	J. Scott
C. Bitenman	D. Gates	E. Martinez	P. Shames
B. Brymer	S. Greatorex	G. Martinez	W. Sible
E. Burke	P. Hames	E. Massey	J. Statman
W. Casiano	C. Hernandez	M. Medina	C. Ward
S. Chhan	A. Hewitt	A. Nakata	K. Yetter
J. Cucchissi	W. Hodgin	S. Ostro	K. Zamora
D. Dillard	M. Holdridge	C. Owen	

DSN Program Plans – M. Rodrigues

M. Rodrigues welcomed the Customer Forum attendees and all the mission representatives to the DSNCF. The topics discussed were the current state of the DSN, Program environment, DSN programmatic plan, and SCaN strategic Objectives. Further details of the topics are as follows:

- State of DSN
  Exceeding commitment to three dozen missions, increasing challenges, and plans are in place to maintain current services, reliably over the next decades.
- Program Environment
  Plan for wholesale replacement of infrastructure with arrays orders of magnitude in performance, maintain existing services for the next 10 years with existing performance while managing risk, reduce recurring cost of operations and reprogram funds saved to modernize and increase capabilities.
- DSN Programmatic Plan
  Meet current documented mission commitments, will work with SCaN to integrate the DSN into the Network of Networks', DSN scheduling streamlined and automated, streamline and automate 'operations'

DSN Development Operations and Services Office – A. Bhanji / W. Sible

Topics discussed were Facility & Organizational changes since we last met, how we do work, and Today's DDOSO speakers: Antenna & Facilities and Project Interface Changes. Also IND Organization chart was addressed, and the DDOSO Organization were mentioned.

Antenna Front End, Facilities and Infrastructure – C. Owen for P. Hames

The topics discussed were DSN major downtimes, Maintenance plans, Depot level maintenance,

26M subnet plans, key DSN upgrades (completed tasks vs. ongoing tasks).

Maintenance plan, Depot level maintenance:

- The DSN is following a concept where "Depot Level Maintenance" (DLM) tasks are performed on a non-interference-basis (NIB) to major tasks during antenna downtimes.
- The three 70m antennas are all in need of lots of maintenance efforts and this is going to require extended downtimes.
  - At DSS-14, it is intended to perform Hydrostatic Bearing Rehabilitation (of runner, reservoir wall, and grout) at DLM.

26 Meter subnet plans:

- As other DSN assets are available to replace the unique capabilities of the 26m antennas, they are being decommissioned, to save operating, maintenance and personnel costs.
- DSS-16 at Goldstone was decommissioned in early FY08, S-band uplink replaced with DSS-27, Acquisition Aid replaced with DSS-24.
- DSS-66 at Madrid is scheduled to be decommissioned at the end of FY08, S-band uplink replaced by DSS-65 with 250w U/L and Acquisition Aid by DSS-54 with new Acquisition Aid (when complete).
- DSS-46 at Canberra is scheduled to be decommissioned at the end of FY09, S-band uplink replaced by DSS-45 after 250w U/L and Acquisition Aid by DSS-34 with new Acquisition Aid (when complete).

Key DSN upgrades:

- Completed Tasks
  - 70m Hydrostatic Bearing Hydraulics Upgrade
  - 70m & 34m HEF Antenna Controller Replacement
  - 34m HEF Drive Cabinet Upgrade
- Ongoing Tasks
  - 250-watt S-Band Uplink
  - X-Band Acquisition Aid
  - 26GHz Downlink
  - MDSCC Commercial Power

Project Interfaces* – *S. Kurtik

S. Kurtik discussed the following topics: SSAS overview, Implementation plan and delivery schedule, Changes to mission user interface, and Mission transition for SSAS D2 development.

- SSAS will provide the resource allocation, planning, and scheduling function for the Deep Space Network (DSN), including:
  - Long-range load forecasting produces high level schedules, based on mission requirements with constraints and guidelines, and "what if" analysis
  - Mid-range scheduling produces conflict-free schedules with support for the conflict identification and resolution process
  - Short-range scheduling produces schedules for use in network operations, with support for contingencies, real-time changes and conflict checking
  - SSAS will have one Master Schedule Database and an integrated process to cover all ranges (long/mid/short) of the DSN scheduling Process

- SSAS will replace the following with new mission interfaces:
  - ULP Spreadsheet
  - 'Paper' mission requirements and scheduling guidelines
  - Custom, manually-generated reports
  - RAP TIGRAS/MADB and FASTER
  - RAPWEB web interface
  - Schedules will be viewed online at SSAS web portal
  - SPS TIGRAS/DRAGON (in Delivery D4)
- SSAS high level delivery overview:

D1 Prototype	January 2008 (DONE)
D2 Long/Mid-Range Schedules in SSAS	2009
D3 User Collaborative Environment	2009
D4 Short-Range Schedules in SSAS	2010

  Integrated scheduling process with single SSAS Master Database for long, mid, and short-range periods

- SSAS D2 transition overview:
  - D1 prototype available for user feedback, full functionality not available
  - D1 data will be deleted when D2 is installed
- D2 Development
  - Any mission which plans schedule requests in the RAP mid-range scheduling process will need to participate in SSAS D2 Project Interface Testing (PITs)
    - Will not include Emergency missions (not in mid-range)
  - PITs are conducted towards end of Acceptance Test Period (between TRR and DDR Reviews)
  - PIT procedures are still under consideration, will include scenario testing with project user participation (will not include actual tracking pass, since only mid-range scheduling in D2)
  - Soak will need to extend beyond traditional 30 days to allow SSAS schedules to move forward for real passes at week 8

D2 Mission transition schedule (tentative)

- Review SPS/SSAS plans with Missions — Feb 2008
- Monthly DSN-Mission SSAS Working Group Begin — Feb 2008
- SSAS D2 PITs — Nov 2008
- SSAS D2 Delivery Review — NET Nov 25, 2008
- SSAS D2 Mission Transition Begins — NET Dec 01, 2008
  - SSAS Master Schedule wiped clean

- Mission Users input mission requirements to SSAS Dec 2008
- SSAS initial generation of Master Schedule NET Jan 4, 2009
    - SSAS Master Schedule for > T0 + 16 weeks
    - RAP Master Schedule for < T0 + 16 weeks
    - SPS Master Schedule for < T0 + 8 weeks
    - *Transfer of one-week schedule to SPS always occurs at T0 + 8 weeks (SPS adds pass numbers)*
- SSAS pipeline will replace RAP in 8 weeks March 2009
    - RAP Master Schedule decommitted after SSAS D2 out of soak

EPOXI and NEXT Mission Update – T. Duxbury

(There is no presentation material as this was an ad hoc update to the mission)
EPOXI has been retargeted from Comet Boethin to Comet Hartley 2 which will necessitate a longer mission. Both Deep Impact (EPOXI) and Stardust (NEXT) spacecraft are healthy and appreciate all of the great support from the DSN.

Mars Program Support for Phoenix Entry, Descent, and Landing – C. Edwards

Key DSN Support Issues:

- Cruise - now until end of March (thru week 13)
    - Final payload checkouts/calibrations
    - Possible DSN testing of rapid station swap
    - Possible DSN testing of ODY downlink data rate change (for EDL support)
- Approach, Entry, Descent & Landing (AEDL) - April/May
    - Flight software updates - week 14
    - Four (4) TCMs
        - Delta-DOR tracking for accurate B-plane targeting
    - Final engineering checkouts including flight computer cold reset (week 17)
    - Redundant station and complex allocation during critical events (week 21)
    - UHF-only communications after Cruise Stage Separation
    - Robust, minimum latency return of EDL critical event data
- Surface Characterization - first 10 sols (weeks 22-23)
    - PHX requires continuous uplink/downlink capability for ODY & MRO
        - Numerous short relay passes to monitor PHX status and characterize UHF link
        - Contingency relay passes scheduled in event of surface anomalies
    - MEX available and validated as backup
- Surface Science - prime mission 90 sols (thru week 35)
    - PHX requires continuous uplink/downlink capability for ODY & MRO
        - Minimum end-to-end latency to support in situ operations

Summary:

- X-band communications and navigation during final Mars approach
- UHF-only communications after Cruise Stage Separation
- Critical event coverage via multiple relay orbiters for EDL
- Enhanced MRO/ODY relay coverage for characterization phase
- Reliable MRO/ODY command and telemetry relay services for PHX surface operations

<u>Ulysses Update</u> – E. Massey / B. Brymer

Why is Ulysses in S-Band?

- Electronic Power Converter/Traveling Wave Tube Amplifier (#2) failed in 2003
- EPC/TWTA (#1) failed to initialize following testing of that unit on DOY 015

S-Band Limitations

- The lowest science data rate of 128 BPS is possible only until the beginning of March on 34m BWG antenna
- The lowest science/playback data rate of 1024 BPS is possible only until the end of March on 70m antenna
- Expectation of frozen hydrazine in mid-March (S-Band fails to provide heat at critical plumbing position)

Suspected impact upon the DSN

- Beginning the first of March Ulysses would require 70m coverage, one 7-hour track daily until end of mission (unless the X-Band re-animation is successful)
- A balanced track to gap ratio is desired

<u>Space Link Standards</u> – Y. Shen / P. Shames

Discussion covered CCSDS standards and what the DSN has implemented, Benefits to missions, Successful use cases, and Efforts toward standards adoption.

Typical Standards Benefits:

- Cross-support
  - Ground assets (e.g. DSN)
  - Space assets (e.g. Mars relay)
- Interoperability
  - Multi-agency support agreements
  - Multi-mission support arrangements
- Reduce costs
  - Shared (expensive, scarce) resources
  - S/W and H/W reuse
  - Commercial implementations
- Increase reliability / reduce risks
  - Through use of well tested local and commercial implementations

Successful Use Cases:

- CCSDS Link, Coding, Modulation & Ranging
  - Almost 400 international missions use them
  - All JPL missions since Galileo
  - DSN has fully implemented all of these standards
  - CxP has selected the newest, Low Density Parity Check (LDPC)
- Proximity-1 in situ links
  - ODY, MRO, MER, MEX, Beagle, Phoenix, MSL
- CCSDS File Delivery Protocol
  - DI & Messenger (reliable mode uplink), MRO, Electra, MSL
  - DSN has full implementation and flight qualified S/W available
  - Prox-1 and CFDP are relay operations enablers

- Space Link Extension
  - Built into DSN forward link processing
  - Used for international cross support, Rosetta, Muses-C, others
  - DSN has implemented SLE F-CLTU, R-AF, R-CF
- Navigation Data Exchange
  - Orbit Data Message (ODM) in use now for DSN tracking

Efforts Towards Standards Adoption

- CCSDS standards typically are adopted by ISO and become NASA Preferred Standards
  - See NASA Office of Chief Engineer (OCE) web site
- JPL Design Principles requires use of standards (D-43913)
  - 4.1.2 Design Standards - The flight system design shall adhere to all applicable standards adopted by JPL.
    - Note: Adopted standards applicable to JPL flight systems are as identified herein, and as invoked by other institutional directive type documents, e.g. the Flight Project Practices. See the JPL Office of Chief Engineer (OCE) web site at http://oce/standards.html#NASA_Standards for the standards applicable to flight designs.
    - Rationale: Leverages the existing infrastructure that is consistent with the adopted standards; is cost-effective; and provides for interoperability and re-use, e.g. of common software and spare hardware.
  - JPL OCE sites lists all major current CCSDS standards

Past Action Items* – *D. Morris

#	Action Item	Period	Assigned to	Date Assigned	Due Date	Complete	Solution
1	Coordinate GDSCC Electrical Power Work	Nov-Dec 2007	DD	9/20/2007	10/5/2007	Yes	Week 48-49
2	Coordinate 5-7 day Grouting task at DSS-14	Nov-Dec 2007	DD	9/20/2007	10/5/2007	Yes	Week 48-49
3	DSS-14 January D/T	Jan-08	AA	9/20/2007	10/5/2007	Yes	Coordinated With Cassini
4	Madrid Power Conversion D/T	Mar-Apr 2008	DD	9/20/2007	12/5/2007	Yes	Final negotiation completed January 23, 2008.
5	Phoenix Approach Overload (especially Week 21)	May-08	NS	9/20/2007	1/15/2008	Partial	Schedule week of Entry, Descent and Landing is ready for negotiation.
6	Phoenix Surface Ops Overload (Relay Ops)	Jun-Oct 2008	AA	9/20/2007	12/14/2007	Yes	Accelerated Mid-Range Schedule Generation will Facilate De-Conflictirg these weeks in a timely manner
7	DSS-66 and 46 Downtime Clarified	Oct-08	DM	9/20/2007	10/31/2007	Yes	DSS-46 Closure 1 August 2009 DSS-66 Closure 29 September 2003
8	Post Phoenix Support Mars Mission Requirements	Nov-08 plus	AA	9/20/2007	11/30/2007	Yes	Accelerated Mid-Range Schedule Generation will Facilate De-Conflictirg these weeks in a timely manner. In addition, the February 2008 RAR will look at these months again.
9	Messenger Mercury Flyby #3 - 70M Support	Sep-09	AA	9/20/2007	10/31/2007	Yes	Delay DSS-14 D/T ~1 Week
10	Kepler use of Narabri during MSL Approach	May-Jul 2010	AA	9/20/2007	11/15/2007	Yes	This recommendation will be reevaluated in the February RAR.

Resource Contention Summary* – *A. Andujo

The Events, Recommendations, and Analysis were presented to the attendees for approval of the proposed downtimes with recommendations listed below:

2008 Weeks

40 – 44 (October)

All recommendations were approved including DSS-54 proposed downtime for Acquisition Aid Installation in weeks 42 and 43 and DSS-55 proposed downtime for Paint Repair & Depot Level

Maintenance in weeks 36 – 41.

45-48 (November)
All recommendations were approved.

49-52 (December)
No recommendations

2009 Weeks

01-05 (January)
All recommendations were approved with the exception of a partial recommendation for MRO to MSPA 6 of 10 passes with M01O at the 34 meter subnet and allowing M01O to uplink. Also not approved was a recommendation for DSS Maintenance to delete 1 of 2 supports at DSS-63 in week 05.

06-09 (February)
All recommendations were approved with the exception of a partial recommendation for MRO to MSPA 6 of 10 passes with M01O at the 34 meter subnet and allowing M01O to uplink.

10-13 (March)
All recommendations were approved with the exception of a partial recommendation for MRO to MSPA 6 of 10 passes with M01O at the 34 meter subnet and allowing M01O to uplink.

14-18 (April)
All recommendations were approved.

19-22) (May)
All recommendations were approved.

23-26 (June)
All recommendations were approved with the exception of a recommendation for DSS Maintenance to delete 1 support at DSS-14 per week.

27-31 (July)
All recommendations were approved with the exception of a recommendation for DSS Maintenance to delete 1 support at DSS-14 per week.

32-35 (August)
All recommendations were approved with the exception of a recommendation for DSS Maintenance to delete 1 support at DSS-14 per week.

36-39 (September)
All recommendations were approved with the exception of a recommendation for DSS Maintenance to delete 1 support at DSS-14 per week.

40-44 (October)
All recommendations were approved with the exception of a recommendation for DSS

Maintenance to delete one 6-hour support at DSS-63 per week. Also not accepted was the recommendation to MSL TCM (L+15 days) accept up to 4 hour 70M gap in continuous coverage on TCM day due to overlapping view during MESSENGER Mercury Flyby 3.

45-48 (November)
All recommendations were approved with the exception of a recommendation for DSS Maintenance to delete one 6-hour support at DSS-63 per week.

49-53 (December)
All recommendations were approved with the exception of a recommendation for DSS Maintenance to delete one 6-hour support at DSS-63 per week.

2010 Weeks

01-04 (January)
All recommendations were approved.

05-08 (February)
All recommendations were approved.

09-12 (March)
All recommendations were approved.

13-17 (April)
All recommendations were approved.

18-21 (May)
All recommendations were approved with the exception of a recommendation for KEPL to utilize Narrabri to supplement DSN coverage during continuous Quarterly Roll/Monthly Science supports due to MSL Approach phase requirements.

22-25 (June)
All recommendations were approved with the exception of a recommendation for KEPL to utilize Narrabri to supplement DSN coverage during continuous Monthly Science supports due to MSL Approach phase requirements

26-30 (July)
All recommendations were approved with the exception of a recommendation for MSL Approach Accommodate STF 70M requirements in weeks 26 and 27

31-34 (August)
All recommendations were approved.

35-39 (September)
All recommendations were approved.

40-43 (October)
All recommendations were approved.

44-47 (November)
All recommendations were approved.

48-52 (December)
All recommendations were approved.

New Action Items & Summary* – *D. Morris

#	Action	Period	Assigned to	Date Assigned	Due Date	Completed	Solution
1	DSS-45 and 65 S-band U/L Operational Date	2008	P. Hames	2/11/2008	3/15/2008	No	Estimate is 3-4 months for new filters - W. Hodgins
2	Delete 2nd Day Maintenance in week - DSS-63	Jan-09	P. Hames	2/11/2008	3/15/2008	No	Week 05 only
3	Delete 2nd Day Maintenance in week - DSS-14	Jun-Sep 2009	P. Hames	2/11/2008	3/15/2008	No	Prior to their six month DLM
4	MRO increase MSPA w/o meeting U/L requirement	Jan-Mar 2009	C. Hernandez	2/11/2008	3/15/2008	No	May propose to work this in mid-range
5	MSL TCM-1 conflict with Messenger Mercury Flyby-3 on 70M	Oct-09	AA	2/11/2008	3/15/2008	No	MSL wants to coordinate this to define their needs and the perceived support.
6	Kepler use of Narrabri during MSL Approach	May-Jun 2010	AA	2/11/2008	3/15/2008	No	Kepler rejects the recommendation to use Narabri due to Ops Fee and unable to meet X-band Uplink and Downlink Requirements
7	MSL Approach and STF contention of their 70M requirements	Jul-10	AA	2/11/2008	3/15/2008	No	MSL wants to coordinate this to define their needs and understand what Spitzer would take as support.

Closing Remarks – D. Morris

D. Morris thanked everyone for his or her participation and cooperation; announced that the next scheduled DSNCF meeting will be scheduled for February 3, 2009.

All Resource Analysis and Planning Team (RAPT) Recommendations for the above proposed downtimes and contention were accepted during and subsequent to the February 11, 2008 DSNCF. *Please refer to the final DSNCF Redbook Final V2.0 located on the RAPweb**

Final INCF REDBOOK Version 2.0

The February 2008 DSNCF REDBOOK Final Version 2.0 has been modified to reflect the recommendations that were accepted and rejected by the Projects/Users:
http://rapweb.jpl.nasa.gov/RAR-RedFeb2008.html

Note: Only the recommendation colored "GREEN" will be implemented in the RAP database.