Mission Services Customer Forum

February 21, 2002

Goddard Space Flight Center
Greenbelt, Maryland

Agenda

- **Welcome**
- **Enterprise Plans Status Update**
  - Earth Science
  - Space Science
  - Human Spaceflight
- **Space Network**
- **Ground Network**
- **Featured Topics**
  - NISN
  - DSN
- **Launch Status**
  - Documentation Readiness (Code 450 CCB/CSOC Customer Services)
  - Loading/Resource Issues
- **Action Item Review**

Welcome

A. Levine
Service Planning and Analysis Manager
Goddard Space Flight Center, Code 451

Earth Science

Space Science

Human Spaceflight

T. Sobchak
NASA Network Director for Human Spaceflight
Mission Services Program Office

Agenda

- Space Shuttle Manifest
- Space Shuttle Programmatic Changes
- ISS Programmatic Changes
- Significant Network Changes

Space Shuttle Manifest

Mission	Payload	Launch	Landing
STS-109	Hubble Space Telescope (servicing)	February 28, 2002	March 11, 2002
STS-110 First Solid State Recorder (SSR)	ISS thirteenth flight (8A)/Integrated Truss Structure S0, Mobile Transporter	April 4, 2002	April 15, 2002
STS-111	ISS fourteenth flight (UF2)/ Multipurpose Logistics Module (MPLM), Mobile Base System, crew rotation	May 5, 2002	May 16, 2002
STS-107	Research Mission, Freestar	July 11, 2002	July 27, 2002
STS-112 SSR	ISS fifteenth flight (9A), 1st Starboard Truss Segment, S1	August 1, 2002	August 12, 2002
STS-113	ISS sixteenth flight (11A), 1st Port Truss P1, crew rotation	September 6, 2002	September 16, 2002
STS-114 SSR	ISS seventeenth flight (ULF1)/MPLM, crew rotation	January 16, 2003	January 26, 2003
STS-115 SSR	ISS eighteenth flight (12A), 2nd Port Truss P3/P4, Cooling Arrays	April 10, 2003	April 20, 2003

Space Shuttle Manifest (continued)

- **STS-107 FREESTAR**
  - The FREESTAR is a HitchHiker payload that includes 6 separate experiments
  - One experiment, CANDOS, is a communication technology demonstration that will use Network resources including the SN, MIL, WPS, and DFRC
  - The CANDOS will receive GPS satellite signals for spacecraft navigation support and provide both forward and return communication links with Ground Stations and TDRSS
  - CANDOS experiments include GPS Nav. IP communication, Mobile IP, and Space Based Range Safety concepts
  - The system will simultaneously support GPS, TDRS mode and GN mode signals
    - One experiment will use TDRS and a ground site in TDRS mode

Space Shuttle Programmatic Changes

- **Space Shuttle use of Air Force Satellite Control Network (AFSCN) Remote Tracking Stations (RTS)**
  - Status
    - On February 14, NASA HQ sent a memo to the 50 Space Wing informing them that NASA has no requirements for AFSCN RTS after September 30, 2002
    - Any future NASA requirements for RTS support (from SAFB) will be negotiated on a mission by mission basis

Space Shuttle Programmatic Changes (continued)

- **Network Plan to Support Shuttle Ops Recorder management**
  - JSC will use the TDRS Ku-band for most on-orbit ops recorder dumps
    - Drives need to minimize TDRS scheduling outages
  - Once Ku-band is stowed, it will not be redeployed due to value of asset
  - WPS, MILA, and DFRC on-orbit support will increase. Will support 1024 kbps Shuttle dumps after payload door closure until Weight on Wheels (WOW)
    - 12 hour on range coverage with these sites
  - HSF Team is also investigating the use of the JPL DSN sites (Canberra and Madrid) to support 1024 kbps dumps from K-band stow to WOW
  - Plan to “move” existing line from current RTS interface to DFRC in order to allow for 1024 kbps throughput to JSC
  - Plan in place to “play” whole mission for STS-112 like the RTS is not available and fine tune support
  - STS-113 (September 2002) will be the last mission with RTS available for backup

Space Shuttle Programmatic Changes (continued)

- **Modular Memory Unit (MMU)/Solid State Recorder Replacement (SSR)**
  - SSR will replace the current Ops tape recorders
  - SSR has a capability to provide playback rates up to 2048 kbps
    - Current Front End Processor at JSC cannot handle rates above 1024 kbps
    - Ground testing at JSC indicates that orbiter SSR implementation will not support GN stations at 2048 Kbps
  - On orbit testing with MIL will be performed to evaluate performance at 2048 kbps rate
  - SN ready to support higher rate
  - First mission support is STS-110 in April 2002
  - Series of test passes planned with MIL, DFRC, and WPS plus on orbit support via TDRSS

Space Shuttle Programmatic Changes (continued)

- **Space Shuttle K-band Upgrade/Replacement**
  - Plan to replace current K-band system with new TDRS standard user system has been cancelled
  - Space Shuttle Program has identified higher priority projects to fund
  - Existing set of K-band hardware will be repaired as needed and as able
    - Existing operational support is already provided by moving HW as needed from orbiter to orbiter
  - There have been two recent Ku-band system failure missions (STS-91, -92)
  - A K-band mission failure will drive the need for minimal TDRS outages and more Ops Recorder dumps to ground sites

Space Shuttle Programmatic Changes (continued)

- **Space Shuttle External Tank (ET) Observation Camera**
  - Description
    - MILA, PDL, WPS - Downlink S-band video from ET camera for retransmission to KSC
      - Rented TV vans and commercial satellite time is used to relay PDL and WPS
    - JDIF and TEL-4 will receive and record for post flight analysis
    - Camera is active from T-9 minutes to Launch + 15 minutes
  - Current Status
    - Installation complete at ground stations
    - Shuttle requirements document updated
    - Manifested for STS-112
    - A test with all sites is planned for late May or early June

ISS Programmatic Changes

- **ISS Second S-band Antenna String**
  - Description
    - A second ISS S-band String (String 1) will be installed during the STS-112 (9A) mission. Placing the second S-band string in warm backup will minimize the transition time between strings if an S-band failure occurs
  - Network Plan of Support
    - JSC has a plan to test new string, including swap function between strings
    - New S-band system, String 1, will be prime string for a period of 4 weeks
      - String 2 will be powered off. (Section B of same Flight Rule B11-1)
    - Keep String 1 as Prime for a period of 4 weeks
    - After 4-week period, coverage between String 1 and String 2 will be evaluated

ISS Programmatic Changes (continued)

- **ISS FDF Orbit Determination (OD)**
  - Description
    - FDF analysts determined that the ISS oscillator was stable enough for use in accurate ISS OD based on TDRS 1-way Doppler tracking data
    - Proposal made to ISS TOPOs that FDF orbit solutions be used for Space Network acquisition data generation. TOPOs agreed to examine the issue and work toward a joint study/verification phase
  - Network Plan of Support
    - Verification test occurred in September 2001 - verified that FDF orbit solutions are adequate for SN acquisition data generation
    - Test results were presented to ISS Flight Directors, the TDRS Network Director, and management
    - SN acquisition data update procedures were agreed to by FDF and TOPO personnel
      - Procedures are very similar to FDF support for other spacecraft
    - New process in place. FDF has been performing OD for ISS since February 11

Significant Network Changes

- **MILA Installation/Upgrade of PTPs for Science Spacecraft TT&C**
  - Description
    - MILA is installing/upgrading additional PTPs to allow the station the capability of providing TT&C support for scientific spacecraft
    - New capability allows an additional resource for scientific spacecraft support
    - The new capability will also provide the site with the ability to stay proficient in between Space Shuttle launch operations
  - Network Plan of Support
    - One PTP has been upgraded; the second PTP will be upgraded after the TDRS I launch

Summary

- The next 9 months is a period that contains a number of changes for Network support to the Space Shuttle and ISS programs

- Operational changes are being worked closely with JSC, and support plans are in place

Space Network

Ground Network

L. Myers
Mission and Data Services
Goddard Space Flight Center, Code 453

GSFC Ground Network Project

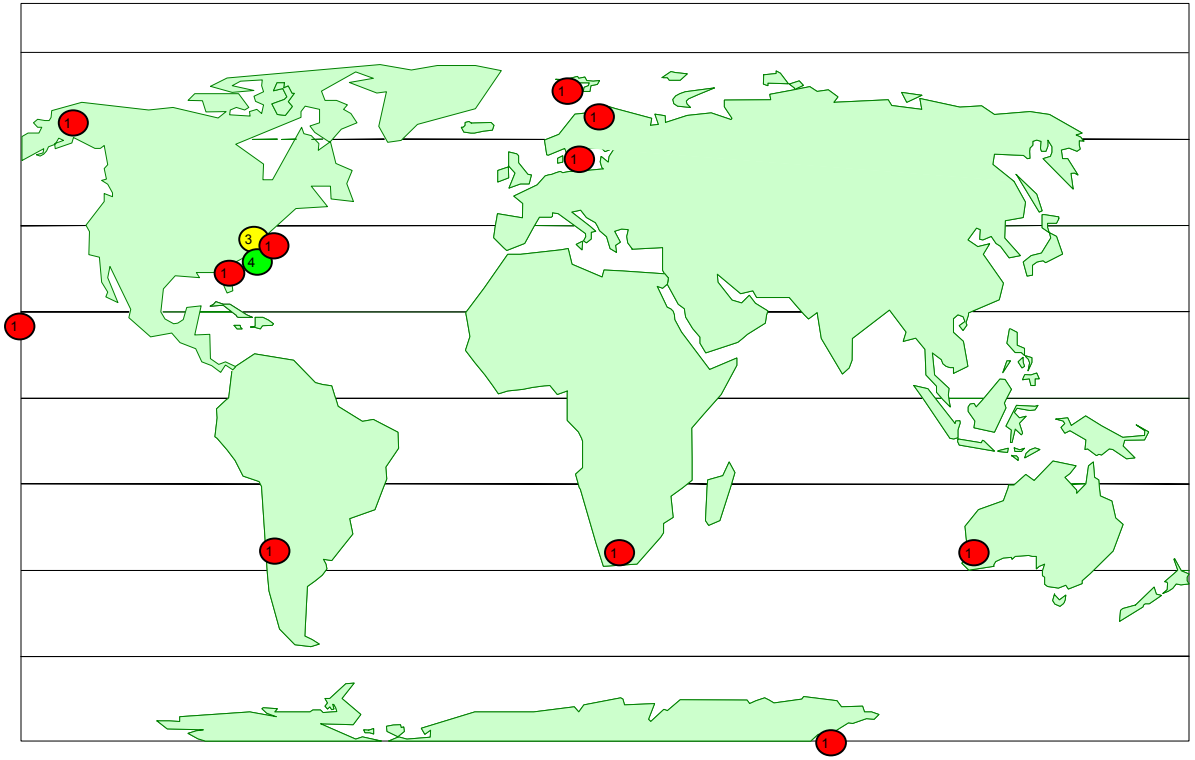
Agenda

- Introduction
- Ground Network Components
- Ground Network Services
- Range Components
- Technology and Upgrades
- Customers
- Next Steps - Coming Attractions
- Summary

Introduction
GSFC Ground Network Project - Code 453

- **NASA's Ground Network is comprised of operational components**
  - Orbital and sub-orbital operations
  - Tracking, data services (command and telemetry), and communications services
- **Supporting services include:**
  - Advanced mission planning - compatibility and feasibility studies
  - Mission and End-to-End test support
- **Additional activities include:**
  - Engineering, maintenance, logistics, training, documentation, and administration
  - Security Requirements Compliance
  - Upgrade and Technology efforts
- **Organizationally attached to HQ Code Y - Earth Sciences**

Ground Network Facility Location Overview



Key	Facility Description	Location
1	GN Ground Stations	Alaska, Antarctica, Australia, Chile, Florida, Hawaii, Maryland, Norway, South Africa, Sweden, Virginia
3	Goddard Space Flight Center	Maryland
4	Wallops Test Range	Virginia

Ground Network

- **Commercial Services purchased through the Consolidated Space Operations Contract (CSOC) from:**
  - DataLynx Services, Poker Flat, Alaska
    - 11-meter S- and X-band antenna system
  - Space Data Services (SDS), Archipelago of Svalbard, Island of Sptizbergen, Town of Longyearbyen, Norway
    - 11-meter S- and X-band antenna systems (2)
  - Santiago Tracking Station - Santiago, Chile
    - 9-meter S-band antenna system
    - SATAN VHF
    - 12-meter/7-meter S-band antenna system
- **Commercial Services available through CSOC from:**
  - Universal Space Network
    - North Pole, Alaska: Hawaii: Perth, Australia
  - Satellite Applications Centre, Hartebeestock, South Africa
  - Applied Physic Lab/John Hopkins University, Columbia, Maryland, USA

Ground Network

- **NASA facilities include:**
  - Alaska Ground Station - Poker Flat, Alaska
    - 11-meter S-and X-band antenna systems
    - 5-meter S-band Low Earth Orbiter Terminal (LEO-T)
    - 8-meter S-Band Transportable Orbital Tracking System (TOTS)
  - Merritt Island Launch Annex
    - 9-meter S-band (2)
    - Space Shuttle UHF air-to-ground voice
  - Ponce de Leon - Ponce de Leon, Florida
    - 4.3-meter S-band antenna system
    - Space Shuttle UHF air-to-ground
  - McMurdo Ground Station - McMurdo, Antarctica
    - 10-meter S- and X-band antenna systems
    - 10-meter TDRS Relay System (MTRS)

Ground Network

- **NASA facilities include (continued):**
  - Alaska Synthetic Aperture Radar Facility - Fairbanks, Alaska
    - 10-meter S- and X-band antenna systems
    - 11-meter S- and X-band Antenna systems
  - Wallops Ground Station - Wallops Island, Virginia
    - 11-meter S- and X-band antenna systems
    - 5-meter S-band Low Earth Orbiter Terminal (LEO-T)
    - 8-meter S-band Transportable Orbital Tracking System (TOTS)
    - 6-meter/7.3-meter S- and L-band antenna systems
    - SATAN VHF
    - Space Shuttle UHF air-to-ground voice system
- **Communications and Data Services rely on the NISN-managed mission networks (a.k.a Closed and Open IONet)**

Ground Network Service Description

Ground Network Location Attributes															
Location	Telemetry/Receive						Command/Transmit					Tracking			
	UHF	VHF	L-band	S-band	X-band	K-band	UHF	VHF	S-band	X-band	K-band	Doppler	Range	Angle	C-band Radar
Alaska				S	X				S			D		A	C
Antarctica				S	X				S						
Australia				S	X				S			D		A	
Chile				S					S			D		A	
Florida				S					S			D	R	A	
Hawaii				S	X				S			D		A	
Maryland			L	S	X			L	S						
Norway				S	X				S						
South Africa				S					S						
Sweden				S	X				S					A	
Virginia	U	V	L	S	X		U	V	S	X		D	R	A	C
Mobile Ground Assets	U	V	L	S			U		S			D		A	C

Range Components

- **Wallops Telecommunications Instrumentation**
  - Local telemetry apertures
  - Mobile support group
  - Timing and communications (command destruct, intercoms, frequency monitoring, data)
- **Wallops Radar Instrumentation**
  - Fixed precision radars (UHF, C- and S-bands)
  - Mobile and transportable C-band
  - Surveillance radar (air and surface)
- **Wallops Control Center Facility**
  - Launch control monitoring
  - Range safety -- command destruct capability
- **Ancillary Systems**
  - Optical, Photographic, and Video facilities (fixed and mobile cameras)
  - Meteorological Services (surface observations and weather forecasting)
  - Other Support Elements (sustaining engineering, logistics)

Technology and Upgrades

- **Ground Network**
  - Upgrades for Aqua at Wallops
  - Ka-band Ground System Demonstration
- **Range**
  - Autonomous Flight Termination System
  - GPS/Iridium based Wind Weighting
  - Flight Modem
  - Expendable Launch Vehicle Transceiver
  - STARS and CANDOS
  - Advanced Surveillance System

Customers

Ground Network Customers

- Space Transportation System (STS)
- QuikSCAT
- Jason
- EO-1
- ERBS
- FAST
- Landsat-7
- METEOSAT
- SAMPEX
- SNOE
- SWAS
- TRACE
- Launch and Early Orbit:
  - Hessi
  - Ariane
  - Titan
  - Sage III

Range Customers

- Kodiak Star
- GSFC Sounding Rockets
- Langley Research Center (LaRC) Aeronautical Research
- GSFC Ground-Based LASER
- Navy VANDAL and BQM
- Air Force F-18 E/F and Missile Exercise
- Army Gun Tests

Coming Attractions

- Complete commercialization of NASA resources at Poker Flat, Alaska
- Complete the Ka-band ground system demonstration
- Explore commercialization/consolidation options for MILA/PDL
- Explore options for replacement of the Ground Network scheduling system
- Strongly encourage customers to utilize existing services and avoid costly and complex-to-operate unique equipment
- Work to become compliant with GSFC and NISN security requirements. Work with customers to achieve compliance
- Strive to improve the overall level of proficiency

Summary

GN Project Manager: Roger Clason

301-286-7431 roger.clason@gsfc.nasa.gov

GN Deputy Project Manager; Steve Currier

757-824-1646 Stephen.F.Currier.1@gsfc.nasa.gov

GN Business Manager: Christine Hinkle

301-286-5098 christine.hinkle@gsfc.nasa.gov

Earth Sciences Mission Commitment Manager: Steve Kremer

757-824-1114 steven.kremer@gsfc.nasa.gov

Visit the Mission Services Program Website at: http://msp.gsfc.nasa.gov/mainindex.htm

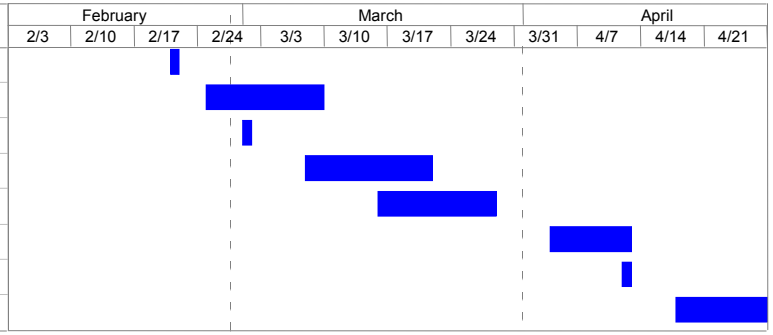
Flight Dynamics Facility (FDF) Status

T. Thompson
Flight Dynamics Facility
Consolidated Space Operations Contract

Upcoming Missions Supported by FDF

- Atlas/Echostar VII (February 21)
- STS-109/HST Servicing Mission (February 28)
- Envisat (March 1)
- Atlas/TDRS-I (March 8)
- Grace (March 16)
- STS-110/ISS (April 4) Spot-5 (April 12)
- Delta/Aqua (April 18)

ID	Task Name
1	Atlas/Echostar
2	STS-109/HST Servicing Mission
3	Envisat
4	Atlas/TDRS-I
5	Grace
6	STS-110/ISS
7	Spot-5
8	Delta/Aqua



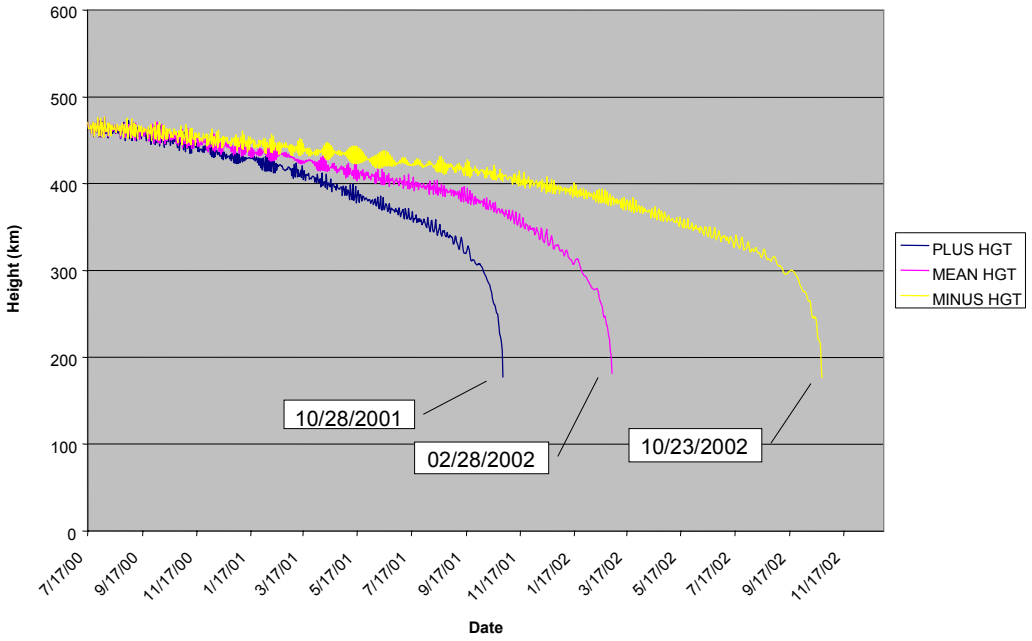
New Services
Automated Orbit Determination/Ephemeris Generation

- **Aqua requires daily deliveries of precision definitive ephemerides**
  - 20-meter 3σ accuracy
- **The RTOD™ orbit determination system has demonstrated it can meet this requirement**
  - RTOD™ is a Kalman filter that simultaneously solves for an entire constellation of spacecraft, using TDRS and GN tracking to improve the solutions
  - Ephemerides are generated by the RTOD™ system
- **Scripts will automate the QA and delivery process**

Special Services
Lifetime Studies/Reentry Predictions

- **FDF mission lifetime studies can include:**
  - Fuel usage due to orbit maintenance maneuvers
  - Schatten predictions of long-term solar activity
  - NOAA predictions of short-term solar activity

EUVE Decay Prediction
July 2000



New Technologies

- **FDF used Virtual Network Computing (VNC) to export STK displays for STS-108 STS/Hitchhiker Support**
- **VNC allows near real-time export of a display from a workstation to another workstation to any customer within the Code 290 firewall**
- **Displays can be viewed on any PC using an Internet browser**
  - Eliminates cost of dedicated CCTV hardware
- **FDF plans to apply this technology to other exported displays**

Future Plans

- FDF continues to plan the move from building 28 to buildings 13 and 25
- Move will be phased with move of building 13 functions to WSC
- Move completion planned for May 2003

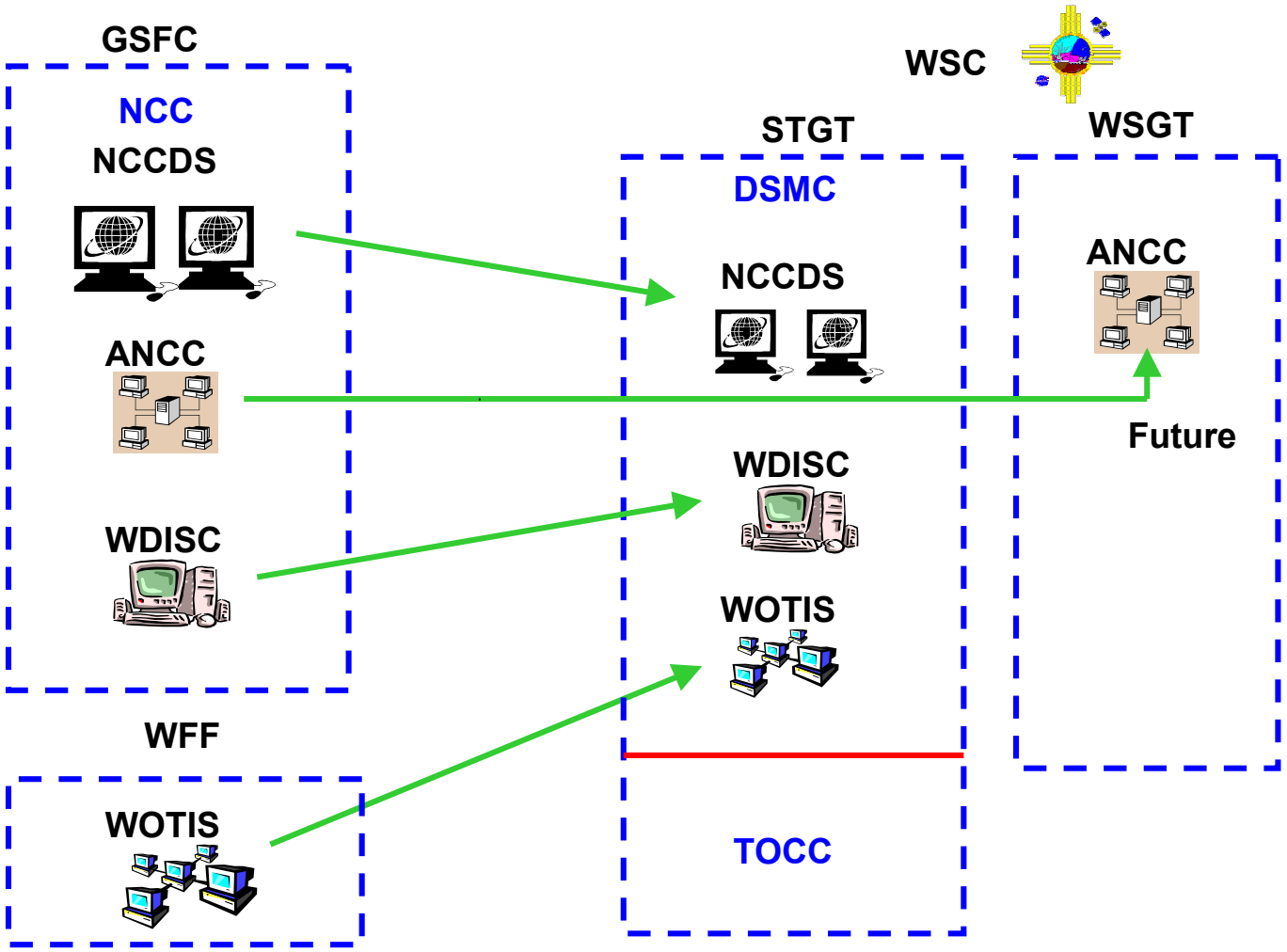
Data Services Management Center (DSMC) Status

C. Barclay
DSMC Project Manager
Consolidated Space Operations Contract

Introduction

- **The DSMC was initially approved as a CSOC Integrated Operations Architecture initiative in November 1999**
  - DSMC PCD Rev G – September 28, 2001
  - http://csoc-ddcs.csoconline.com
- **The PCD outlines a plan to consolidate SN and GN data services network management thereby achieving cost savings in operations and sustaining activities**
- **These functions are being consolidated at the White Sands Complex and systems are being relocated from the NCC and Wallops to the DSMC**

DSMC Functional Migration



GN Transition

- **The Wallops Orbital Tracking Information Information System (WOTIS) supports GN scheduling and has been relocated to the DSMC. It has been installed, tested, and is operational**
- **The GN scheduling transitions have been phased**
  - GN Legacy Scheduling – Transitioned October 25, 2001
    - Antennae: LEO-T, TOTS, 7.3M
    - Customers: FAST, SWAS, SAMPEX, WIRE, TRACE, SNOE, Meteosat, FUSE, TOMS-EP, SOLAR, Seawifs, IRS-P3. JASON to transition March 3
  - GN Automated Scheduling – Transition planned for July 2002
    - Thanks to customers for participating in interface tests
    - Testing with automated sites in progress
  - GN STS, 9M and Emergency/Contingency Customer – Planned for Post STS-109 and 110 Missions
    - Refined ground rules for parallel operations
  - SASR to be utilized to generate STDN Daily Report Input beginning February 25

SN Transitions

- **The NCC and WDISC systems support SN network management functions and are being relocated to the DSMC at WSC**
- **The NCC includes the following suites of equipment that will be transitioned to the DSMC:**
  - Network Control Center Data System (NCCDS)
  - Auxiliary Network Control Center (ANCC)
  - NCCDS Test & Training (T&T) in the Software Management Test Facility (SMTF)
- **An NCCDS suite has been relocated to the DSMC, is now in operations evaluation testing through February**
  - Thanks to customers and element participation in engineering interface tests this is nearing completion
  - Using a remote interface workstation, we are working to transition some operations activities in the coming weeks (e.g., daily vector transmissions, BRTS scheduling)
- **The NCCDS operations transition was planned for April 8, but with STS-110 now planning to be flying this is under review**
- **WDISC will now transition coincident with the NCCDS**

Beyond the DSMC Transition Project

- **Waivers requested for initial DSMC IONet access will be addressed**
  - Coordination with customers in process to implement WOTIS/customer interface password updates by March 31
  - NCCDS and WOTIS implementation allowing initiation of connections from open to closed to be assessed
- **WOTIS Replacement**
  - Activity in progress to generate operations concept and initial requirements. Lead: Richard Nguyen/CSOC, 301-805-3194
  - Funding issues mean replacement may not be able to occur until 2005-6
  - Push for CCSDS SLE standards definition
- **Anticipate continued streamlining of SN and GN network management processes as DSMC operations mature and evolve**

NISN Services Supporting Mission Customers

S. Douglas
NISN Network Services Group Co-Lead
Goddard Space Flight Center

Agenda

- Overview of Current Services Supporting Mission Customers
- Current Plans
- Open Issues for Discussion

Overview of Current Services Supporting Mission Customers

- 4800-Bit Block Encapsulation
- Real-Time Critical Routed Data
- Mission-Critical Routed Data
- Mission Voice

Overview of Current Services (continued)

- **4800-Bit Block Encapsulation**
  - All problems should be reported to the Comm Manager at GSFC
  - NISN manages and maintains 162 conversion devices throughout the Network
  - NISN manages the Nascom LAN Interface Cards (NLIC) in the MDMs at JSC and WSC
  - Encapsulated 4800-bit blocks are transported over the Multicast portion of Closed IONet predominantly at a real-time critical service level
  - Conversion devices and multicast addresses are managed by the CD Manager at GSFC
  - IONet is managed by the IP NOC at GSFC

Overview of Current Services (continued)

- **Real-Time Critical Routed Data Service**
  - IP Routed Data Service that meets the following performance requirements
    - Availability 99.98%
    - Time to restore service < 1 minute
    - Coverage period 24x7
    - Acceptable packet loss 0.001%
    - Round trip packet time < 120 msec
  - Provided with the IONet

Overview of Current Services (continued)

- **Mission Critical Routed Data Service**
  - IP Routed Data Service that meets the following Performance Requirements
    - Availability 99.95%
    - Time to restore service 2 hours
    - Coverage period 24x7
    - Acceptable packet loss 0.001%
    - Round trip packet time < 120 msec
  - Provided with the IONet

Overview of Current Services (continued)

- **Mission Voice Service**
  - Dedicated voice circuits working in conjunction with a switching and conferencing system to create voice loops
  - Availability 99.95%
  - Time to restore service 2 hours
  - Priority restoration < 5 min available for designated circuits

Current Plans

- Mission Network Modernization (MNM)
- Mission Voice System Replacement (MVS)

Current Plans

- **Mission Network Modernization**
  - Project designed to replace current T1-based infrastructure with a more flexible backbone infrastructure capable of supporting higher bandwidth requirements
  - Critical Driver:
    - The customer premise equipment used in the current infrastructure is obsolete and cannot be maintained by the carrier
  - Time line:
    - Design review April 2002
    - Implementation start June 2002
    - Transition completion February 2004
- **Mission Voice System Replacement**
  - CSOC Project intended to replace the NISN Voice Switching System and Center Voice Switches with an integrated set of Voice Switches at six NASA Centers
  - NISN will support the Mission Voice System Replacement Project as it progresses

Open Issues for Discussion

- NLIC Sparing
- Correcting NISN PSLAs for 4800-Bit Block Encapsulation Requirements
- Migrating away from 4800-Bit Block Encapsulation

Open Issues

- **NLIC Sparing**
  - Issue: Insufficient spare NLICs
    - Lockheed Martin originally developed NLICs
    - Orders for additional spares have died
    - Cost of producing spares is rapidly increasing due to parts obsolescence
  - Mitigation:
    - CSOC build more spares NOW
    - Convert NLICs in WSC 10 channel systems to spares
    - Migrate away from MDMs at JSC and WSC

Open Issues (continued)

- **Correcting NISN PSLAs for 4800-Bit Block Encapsulation Requirements**
  - Issue: Most customers list 4800-bit block encapsulation requirements as mission critical in PSLAs
    - Experience has shown that Real-Time Critical Service is the real requirement for encapsulated 4800-bit block services
  - Mitigation:
    - Require customers to document Real-Time Critical Requirement for 4800-bit block encapsulation starting in FY04 PSLA
    - Migrate away from encapsulated 4800-bit block services to native IP services

Open Issues (continued)

- **Migrating away from 4800-Bit Block Encapsulation**
  - Issue: NISN cannot drive a migration away from 4800-bit block encapsulation
    - Primary interface to the SN Network is the MDM NLICs at WSC which only support 4800-bit block encapsulation
    - Many legacy control center front ends require 4800-bit blocks
  - Mitigation:????
    - WDISC?
    - A NASA/CSOC Team recommended a migration to CCSDS but how do we implement?

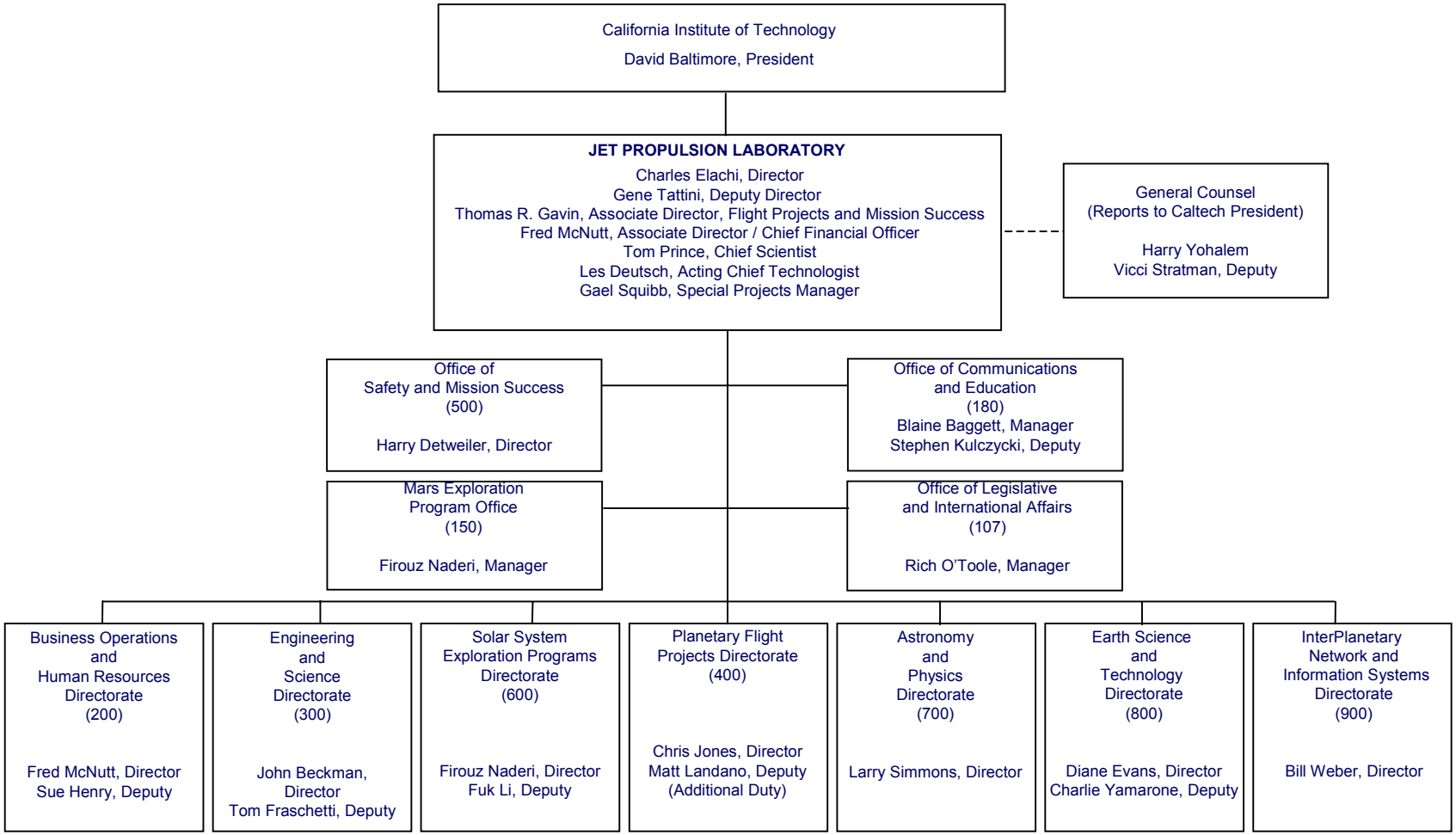
Resource Allocation Planning and Scheduling Process

E. S. Burke
RAPSO Manager
Jet Propulsion Laboratory

Agenda

- Organization
- Responsibility
- Process
- DSN Configuration
- Mission Sets

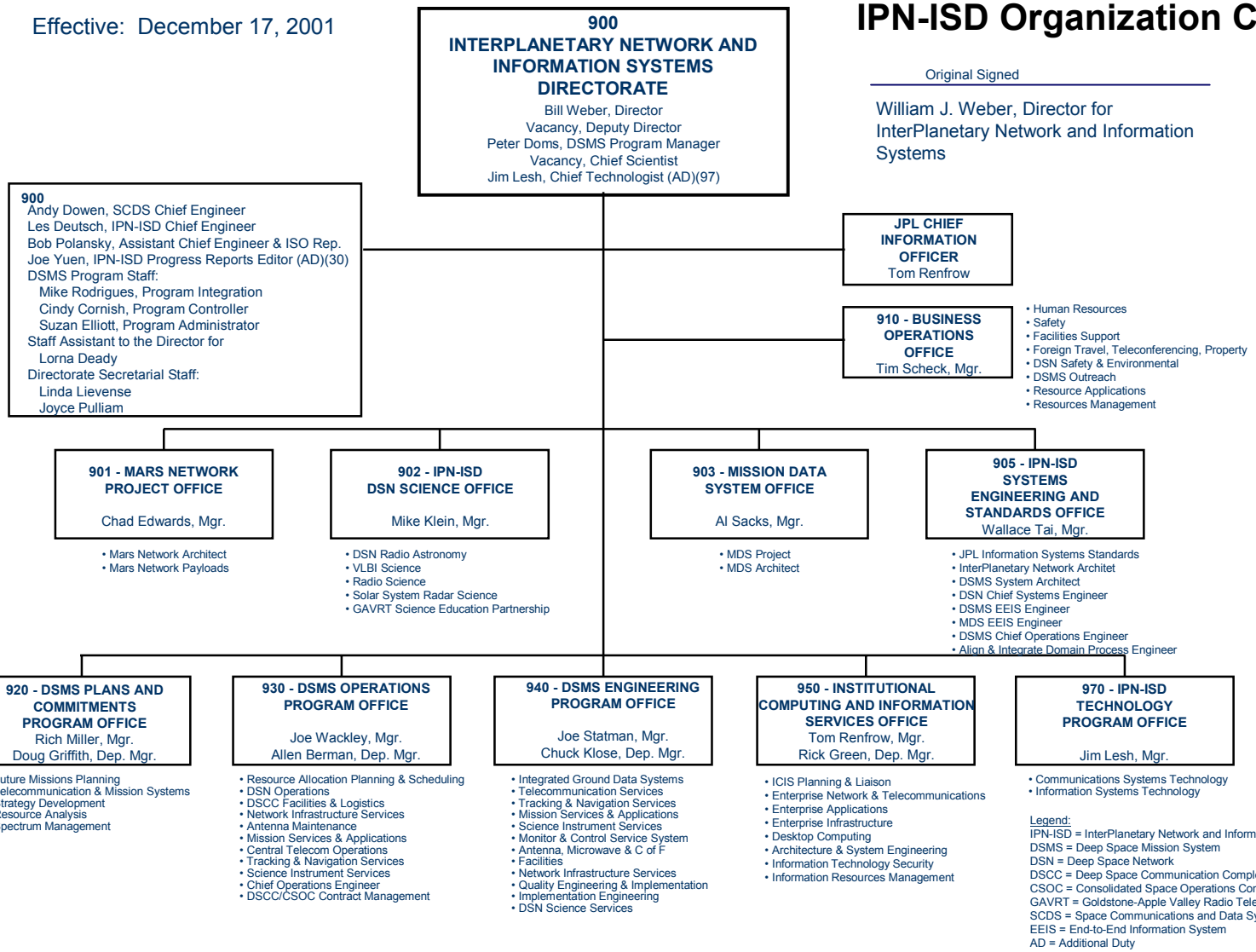
Composite Laboratory



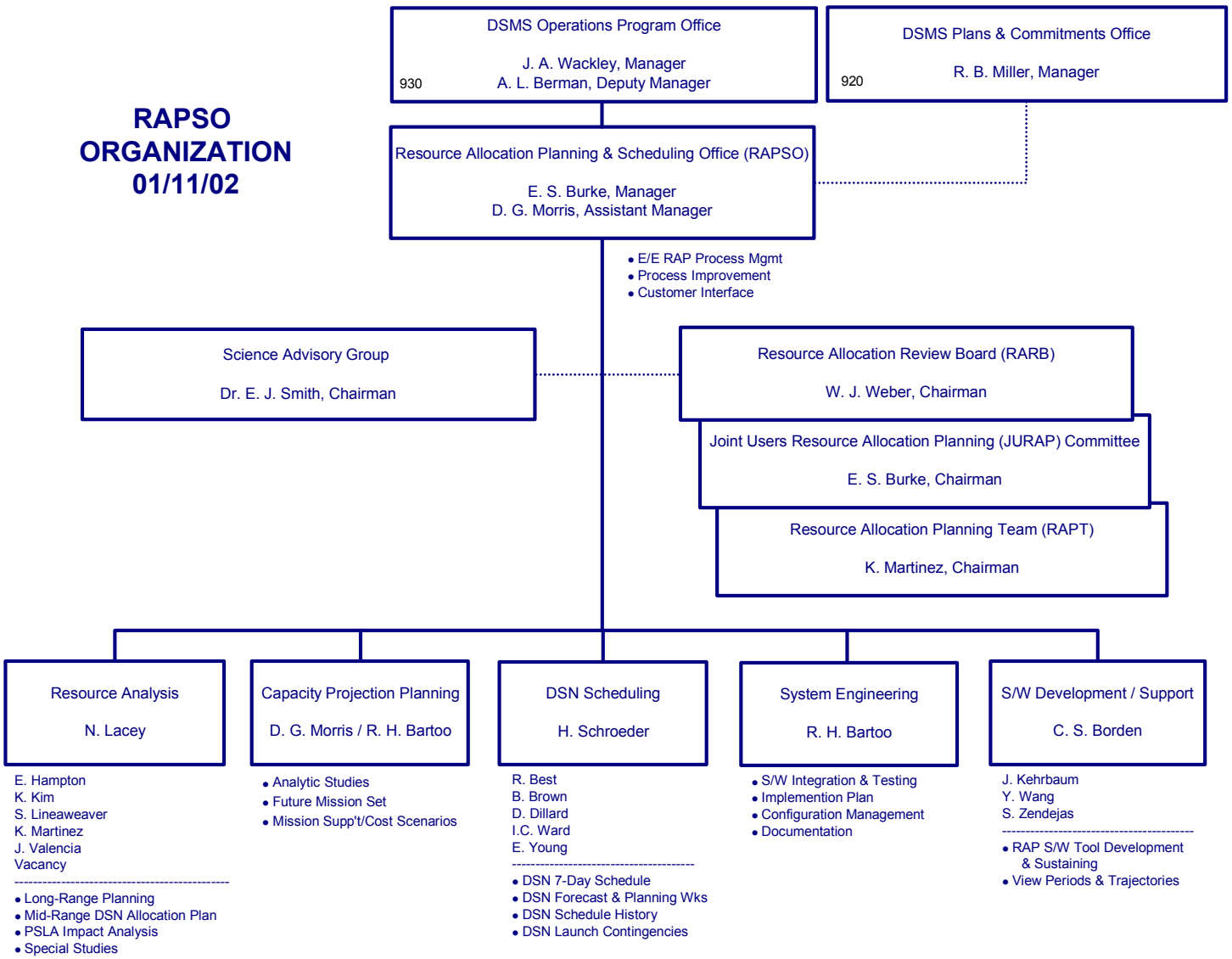
19 November 2001

IPN-ISD Organization Chart

Effective: December 17, 2001



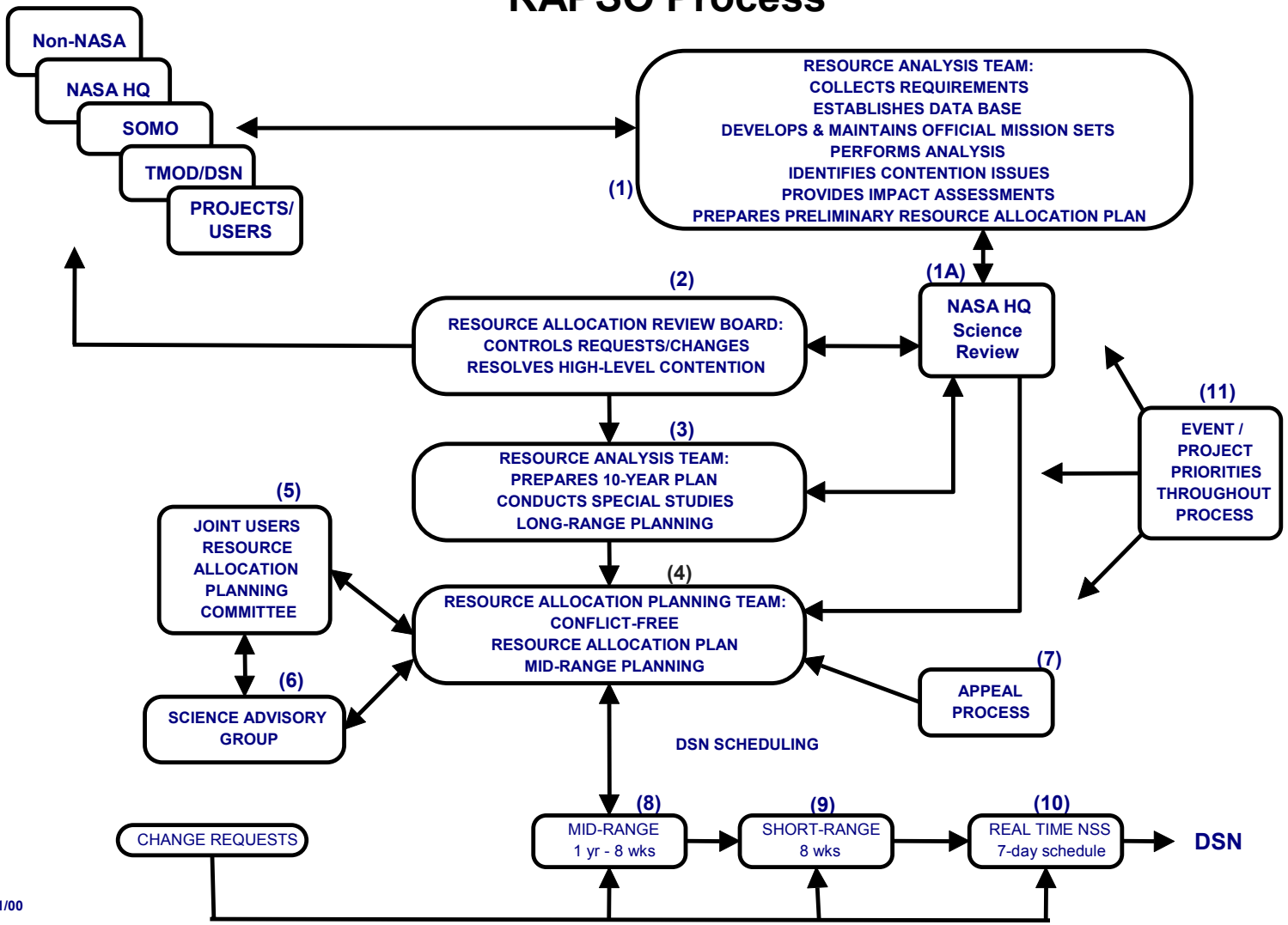
RAPSO ORGANIZATION 01/11/02



Responsibility

- **RAPSO is responsible for managing the process that:**
  - Interfaces directly with NASA Headquarters and Project management on spacecraft tracking requirements and commitments.
  - Plans and schedules the assignment of Deep Space Network (DSN) ground data systems in support of customer programs and projects
  - Conducts conflict resolution reviews and meetings
  - Performs DSN impact analyses and special studies
  - Maintains and disseminates official JPL mission sets
  - Produces periodic plans, forecasts, and detailed schedules for DSN operational support
  - Develops and maintains the associated software tools and databases

RAPSO Process



Rev. 05/01/00

RAPSO Process Description

- **(1) & (3) Resource Analysis Team**
  - Project Service Level Agreement (PSLA) analysis
  - Special Studies and Impact Assessments
  - DSN Resource Allocation Plans
- **(1A) NASA Headquarters Code S Science Review**
  - Meets before Resource Allocation Review Board (RARB)
  - Provides science mission priorities for use in resolving contention, if needed
- **(2) Resource Allocation Review Board (RARB)**
  - Held in February and August to resolve 26m/34m/70m antenna contentions
  - Participation by all affected Project Managers and Project Scientists, or their representatives
  - DSN users currently updating requirements
  - Next RARB will be held August 13, 2002

RAPSO Process Description (continued)

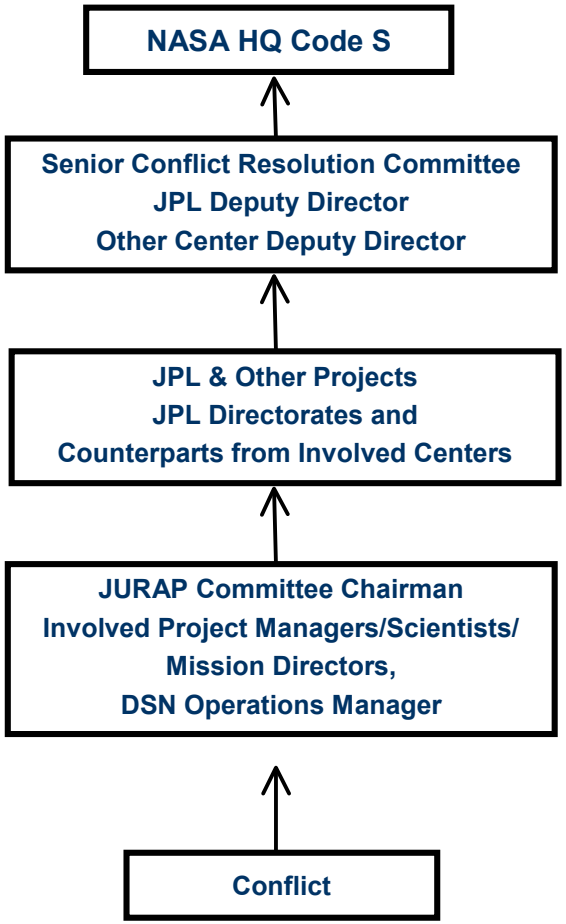
- **(4) Resource Allocation Planning Team (RAPT)**
  - Meets weekly
  - Project and DSN scheduling representatives
  - Produces conflict-free plan by consensus
  - Appeal route available, if necessary
- **(5) Joint User Resource Allocation Planning (JURAP) Committee**
  - Meets monthly
  - Project Mission Operations Managers and DSN Operations Manager
  - RARB action item follow-up/discussion
  - Identify future requirements and conflicts
  - Interim RARB sets priorities

RAPSO Process Description (continued)

- **(6) Science Advisory Group**
  - Standing group, activated and chaired by Dr. E. J. Smith, RAP Science Advisor, to address conflicts involving science data requirements or specific science events

RAPSO Process Description (continued)

- (7) Appeal Process:



RAPSO Process Description (continued)

- **(8) Mid-Range: 1 year - 8 weeks**
  - "RAP Book" on RAP server, for User evaluation
  - Updated 2 - 3-week intervals
  - Contains requested DSN activity
  - Identifies conflicts
  - Used by RAPT to negotiate Short-Range Plan
- **(9) Short-Range: 8 weeks**
  - Conflict-free
  - Released to DSN electronically every 4 weeks
- **(10) Real Time Network Support Subsystem (NSS): 7-day schedule**
  - Changed as required
  - Executed by Ops Chief

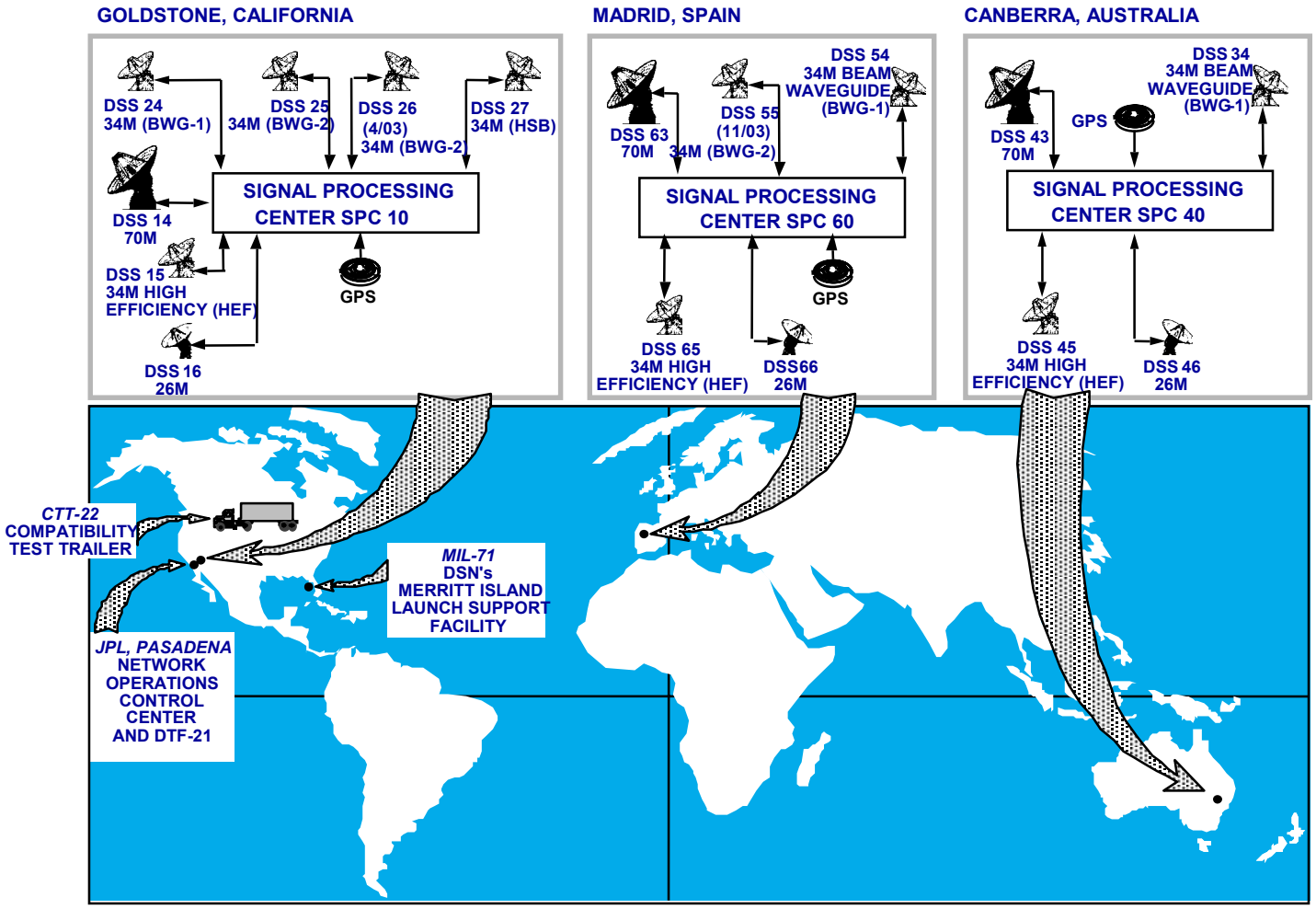
RAPSO Process Description (continued)

- **(11) Event priorities:**

Priority	Activity Period & Priority Criteria	Examples
1	Spacecraft emergency	Determined in real time
2	Mandatory for achievement of primary objectives. Support essential to spacecraft survival	Periodic uplink to reset critical systems; launch; planetary obit insertion; some TCMs
3	Major, unique, scientific event. Time critical	Planetary encounter; major unforeseen scientific event (e.g., CME, supernova)
4	Minimum DSS maintenance, minimum support to maintain science validity	Critical maintenance; short spans of data acquisition to assure date continuity
5	Mandatory for achievement of primary objectives. Not time critical	Some TCMs; includes spacecraft health and condition monitoring, and planetary astronomy
6	Time critical events not essential to primary mission objectives	Include radio astronomy
7	Repeated scientific opportunities. Not time critical	Improvement upon minimum science return; includes host country radio sciences

* Trajectory Correction Maneuvers (TCM) are considered to fall into two categories: (1) TCMs that are constrained to a particular time may be considered Priority 2, e.g., injection into planetary orbit; (2) TCMs that offer more flexibility in planning are considered Priority 5. The projects are expected to make every effort to avoid conflicts by coordinating their plans with the other users

DSN Configuration



- **DSN User/Mission Planning Set**
- **DSN 26M LEO User/Mission Planning Set**
- **DSN User/Future Mission Planning Set**
- **Major DSN Downtimes by Site by Year**

You may view the most current version of these documents at this web page:

http://rapweb.jpl.nasa.gov/planning.htm

DSN User / Mission Planning Set
2002 - 2012

ONGOING/PLANNED PROJECTS				
Project	Acronym	Launch or Start	EOPM	EOEM
DSN VLBI Clock Sync and Catalog M&E	DSN	--	--	--
DSS Maintenance	DSS	--	--	--
European VLBI Network	EVN	--	--	--
Ground Based Radio Astronomy	GBRA	--	--	--
Space Geodyssey	SGP	--	--	--
Voyager 2	VGR2	08/20/77	10/15/89	12/31/05
Voyager 1	VGR1	09/05/77	12/31/80	12/31/05
Goldstone Solar System Radar	GSSR	04/01/85	--	--
Galileo	GLLO	10/18/89	12/07/97	09/21/03
Ulysses	ULYS	10/06/90	09/11/95	09/30/04
ISTP - Geotail	GTL	07/24/92	07/24/95	09/30/05
ISTP - Wind	WIND	11/01/94	11/01/97	09/30/05
Mission Enhancement by Ground-based Astronomy	SVLB	02/01/95	12/31/03	- - -
ISTP - SOHO	SOHO	12/02/95	05/02/98	12/30/05
ISTP - Polar	POLR	02/22/96	08/23/97	09/30/05
Gravity Probe B	GPB	06/01/96	01/01/05	TBD
Mars Global Surveyor	MGS	11/07/96	02/01/01	08/01/04
Highly Advanced Laboratory for Communications and Astronomy	VSOP	02/12/97	09/30/01	02/28/02
Advance Composition Explorer	ACE	08/25/97	02/01/01	01/31/05
Cassini	CAS	10/15/97	06/30/08	06/30/10
Nozomi (Planet-B)	NOZO	07/03/98	12/31/05	TBD
Stardust	SDU	02/07/99	01/14/06	- - -
Chandra X-ray Observatory	CHDR	07/23/99	07/24/09	07/24/14
Imager for Magnetopause-to-Aurora Global Exploration	IMAG	03/25/00	05/30/02	05/30/04
Cluster 2 - S/C #2 (Samba)	CLU2	07/16/00	02/15/03	09/19/05
Cluster 2 - S/C #3 (Rumba)	CLU3	07/16/00	02/15/03	09/19/05
Cluster 2 - S/C #1 (Salsa)	CLU1	08/09/00	02/15/03	09/19/05
Cluster 2 - S/C #4 (Tango)	CLU4	08/09/00	02/15/03	09/19/05
2001 Mars Odyssey	M01O	04/07/01	08/01/04	09/19/07
Microwave Anisotropy Probe	MAP	06/30/01	10/01/03	10/01/06
Genesis	GNS	08/08/01	09/08/04	- - -
Comet Nucleus Tour (CONTOUR)	CNTR	07/01/02	09/05/08	TBD
Space Infrared Telescope Facility	SRTF	01/09/03	04/19/08	- - -
International Gamma Ray Astrophysics Lab	INTG	10/17/02	12/18/04	12/18/07
MUSES - C	MUSC	12/14/02	06/05/07	- - -
Rosetta	ROSE	01/13/03	07/10/13	- - -
Mars Express Orbiter	MEX	05/23/03	02/11/06	08/03/08
Mars Exploration Rover - A	MERA	05/30/03	04/06/04	05/11/04
Mars Exploration Rover - B	MERB	06/25/03	04/27/04	06/15/04
Deep Impact	DEEP	01/02/04	08/05/05	- - -
Messenger	MSGR	03/10/04	04/06/10	- - -
RadioAstron*	RADA	06/15/05	06/15/10	TBD

* Planning dates

DSN User / Mission Planning Set
2002 - 2012

ADVANCED PLANNING PROJECTS				
Project	Acronym	Launch or Start	EOPM	EOEM
Lunar - A	LUNA	08/09/03	07/18/04	- - -
Selene	SELN	07/04/05	09/30/06	- - -
Mars Reconnaissance Orbiter	MRO	08/08/05	11/26/08	12/31/10
Stereo Ahead	STA	11/15/05	02/18/08	02/15/11
Stereo Behind	STB	11/15/05	02/18/08	02/15/11
New Horizons	NHRZ	01/10/06	01/12/17	01/10/23
Dawn	DAWN	05/27/06	07/26/15	TBD
StarLight	SL	06/06/06	11/30/06	- - -
Kepler	KPLR	10/15/06	10/14/10	TBD
Mars Smart Lander 2007	M07L	09/04/07	08/19/10	TBD
Mars Competed Scout 2007	M07S	09/04/07	11/19/08	TBD
Mars CNES Orbiter 2007	M07O	09/09/07	08/11/08	08/12/10
Mars ASI/NASA Telecommunications Orbiter 2007	M07T	09/09/07	08/09/18	TBD
ARISE	ARSE	06/15/10	06/15/15	- - -
Highly Advanced Laboratory for Communications and Astronomy	VSP2	06/15/10	06/15/15	- - -
Europa Orbiter	EURO	03/15/08	03/10/12	TBD
Mars ASI/NASA Science Orbiter 2009	M09O	10/04/09	08/29/12	TBD
Solar Probe	SOLP	05/01/10	02/14/14	TBD
Mars CNES MSR Lander 2011	M11L	10/30/11	09/10/14	TBD
Mars CNES MSR Orbiter 2011	M11O	10/30/11	07/22/14	TBD

DSN 26M LEO User / Mission Planning Set 2002 - 2011

ONGOING/PLANNED PROJECTS					
Project	Acronym	Support	Launch or Start	Commit End of Support	Potential End of Support
TDRS-1	TDR1	E	04/04/83	09/30/01	09/30/02
LANDSAT 5	LAN5	E	03/01/84	01/01/04	
EARTH RADIATION BUDGET SAT	ERBS	E	10/05/84	09/30/98	09/03/02
TDRS-3	TDR3	E	09/29/88	09/30/01	09/30/04
TDRS-4	TDR4	E	03/13/89	09/30/01	09/30/04
HUBBLE SPACE TELESCOPE	HST	E	04/24/90	04/24/10	
TDRS-5	TDR5	E	08/02/91	08/02/01	09/30/06
YOHKOH *	SOLA	ROUTINE	08/29/91	09/30/02	
TOPEX/POSEIDON	TOPX	E	08/10/92	12/30/02	
TDRS-6	TDR6	E	01/13/93	01/13/03	12/31/08
GOES-8	GO08	E	04/13/94	09/30/02	
GOES-9	GO09	E	05/22/95	09/30/02	
TDRS-7	TDR7	E	07/13/95	07/12/05	12/31/15
RADARSAT-1	RSAT	C	11/04/95	04/01/01	04/01/04
ROSSI X-RAY TIMING EXPLORER	XTE	E	12/30/95	09/30/04	
FAST	FAST	E	08/21/96	12/30/01	09/20/03
GOES-10	GO10	E	04/25/97	05/22/03	09/30/05
TRMM	TRMM	E	11/27/97	12/31/04	
TRACE	TRCE	E	04/02/98	04/30/04	
SWAS	SWAS	E	12/06/98	01/07/01	09/30/02
GOES-11	GO11	E	05/03/00	05/03/05	05/03/07
TDRS-8	TDR8	E	06/30/00	09/30/10	09/30/14
GOES-12	GO12	E	07/24/01	07/01/06	07/01/08
TDRS-I	TDR9	LEOP/E	03/08/02	10/30/12	10/30/16
NOAA-M	NO17	LEOP	06/25/02	06/24/04	06/25/07
ProSEDS	PSDS	LEOP	07/25/02	08/15/02	08/25/02
DRTS-W	DRTW	LEOP/R	08/01/02	08/04/02	
TDRS-J	TDR10	LEOP/E	11/09/02	07/01/14	07/01/18
GOES-N	GO13	LEOP	02/25/04	02/24/09	
NOAA-N	NO18	LEOP	06/01/04	06/01/06	06/01/09
ASTRO-E-II	ASTE	?	02/01/05	12/01/08	
GOES-O	GO14	LEOP	04/01/05	04/01/10	

leom.xls 1 of 2 Updated 02/11/2002

DSN 26M LEO User / Mission Planning Set 2002 - 2011

ONGOING/PLANNED PROJECTS					
Project	Acronym	Support	Launch or Start	Commit End of Support	Potential End of Support
GOES-P	GO15	LEOP	04/01/07	03/31/12	
NOAA-N'	NO19	LEOP/E	03/01/08	03/01/10	03/01/13
GOES-Q	GO16	LEOP	04/01/08	04/01/13	
TRIANA	TRNA	LEOP	05/01/08	05/31/08	

NOTES

ROUTINE: Provides normal scheduled daily operations.

LEOP: Launch and Early Orbit Operations

E or C: Emergency or Contingency Support

?: Support Requirements in question

B: Back-up support

R: Reimbursable support

* Missions transfered to alternate NASA and/or Institutional facilities that may require additional support to meet mission requirements

Shaded entries have been updated

leom.xls 2 of 2 Updated 02/11/2002

TMOD Resource Implementation Planning Matrix

Station	Subnet	Delivery Date	S-Band Down	S-Band Up	X-Band Down	X-Band Up	*20kW X-Band*	Ka-Band Down	Ka-Band Up	*NSP*
DSS-14	70M	XXXX	XXXX	XXXX	XXXX	XXXX	***XXXX***	TBD	N/A	***09/28/02***
DSS-15	34HEF	XXXX	XXXX	N/A	XXXX	XXXX	***XXXX***	TBD	N/A	***05/02/03***
DSS-16	26M	XXXX	XXXX	XXXX	N/A	N/A	***N/A***	N/A	N/A	***N/A***
DSS-24	34B1	XXXX	XXXX	XXXX	XXXX	***12/13/02***	***12/13/02***	10/01/05	N/A	***12/13/02***
DSS-25	34B2	XXXX	N/A	N/A	XXXX	XXXX	***04/07/03***	XXXX	XXXX	***04/07/03***
DSS-26	34B2	04/02/03	N/A	N/A	04/02/03	04/02/03	***04/02/03***	04/02/03	N/A	***04/02/03***
DSS-27	34HSB	XXXX	XXXX	XXXX	N/A	N/A	***N/A***	N/A	N/A	***N/A***
DSS-34	34B1	XXXX	XXXX	XXXX	XXXX	XXXX	***04/07/03***	01/01/05	N/A	***04/07/03***
DSS-43	70M	XXXX	XXXX	XXXX	XXXX	XXXX	***XXXX***	TBD	N/A	***02/10/03***
DSS-45	34HEF	XXXX	XXXX	N/A	XXXX	XXXX	***XXXX***	TBD	N/A	***11/23/02***
DSS-46	26M	XXXX	XXXX	XXXX	N/A	N/A	***N/A***	N/A	N/A	***N/A***
DSS-54	34B1	XXXX	XXXX	XXXX	XXXX	XXXX	***09/01/03***	08/01/06	N/A	***11/23/02***
DSS-55	34B2	11/01/03	N/A	N/A	11/01/03	11/01/03	***11/01/03***	11/01/03	N/A	***11/01/03***
DSS-63	70M	XXXX	XXXX	XXXX	***XXXX***	XXXX	***XXXX***	TBD	N/A	***04/07/03***
DSS-65	34HEF	XXXX	XXXX	N/A	XXXX	XXXX	***XXXX***	TBD	N/A	***02/10/03***
DSS-66	26M	XXXX	XXXX	XXXX	N/A	N/A	***N/A***	N/A	N/A	***N/A***

XXXX = Capability Currently Exists

N/A = Capability Not Planned

Note: DSS-33 and DSS-53 closed on 02/07/2002

02/05/02

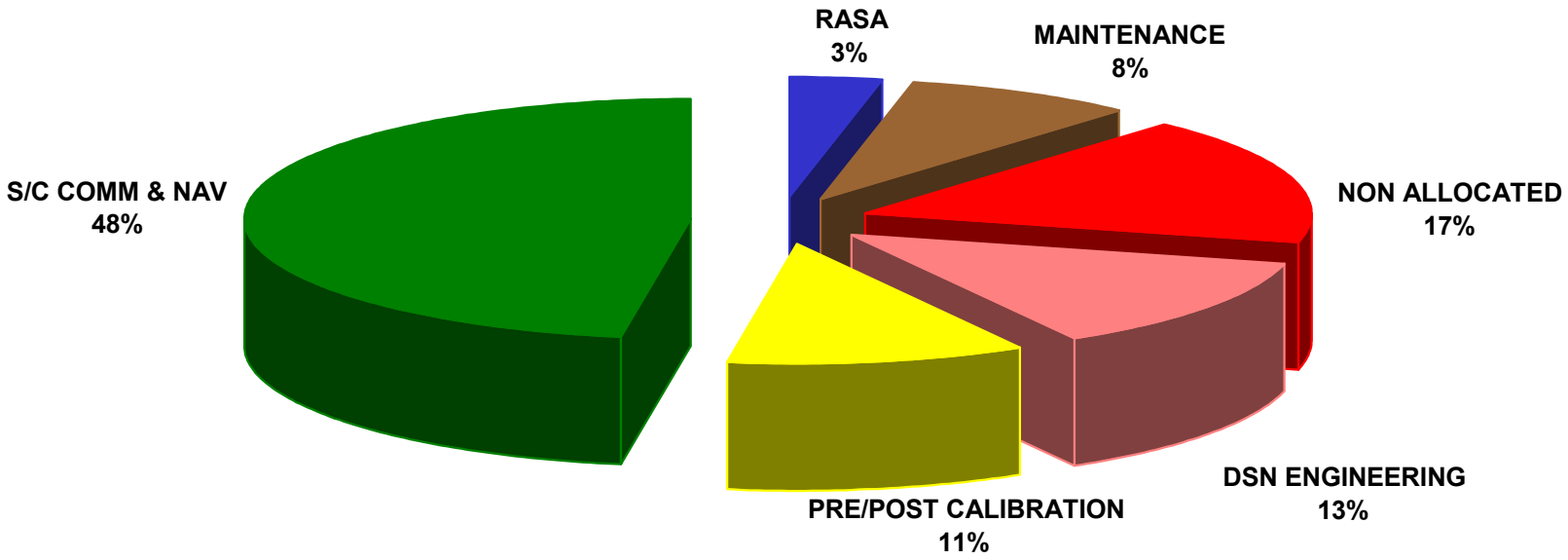
(For the most current version of this chart, go to: *http://rapweb.jpl.nasa.gov/planning.htm* the fourth item on that web page)

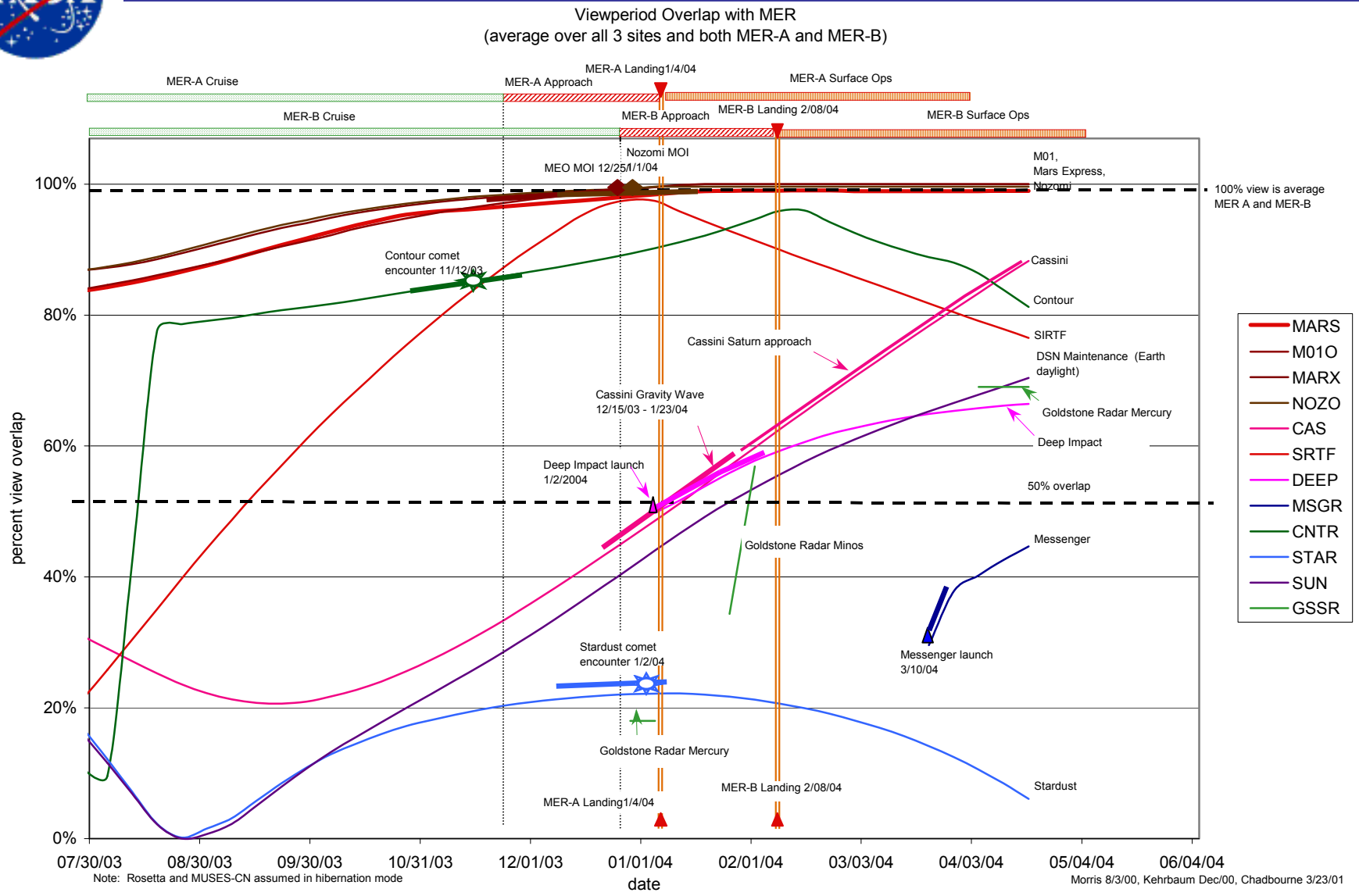
Mission Events Bulletin Board

AS OF FEBRUARY 12, 2002

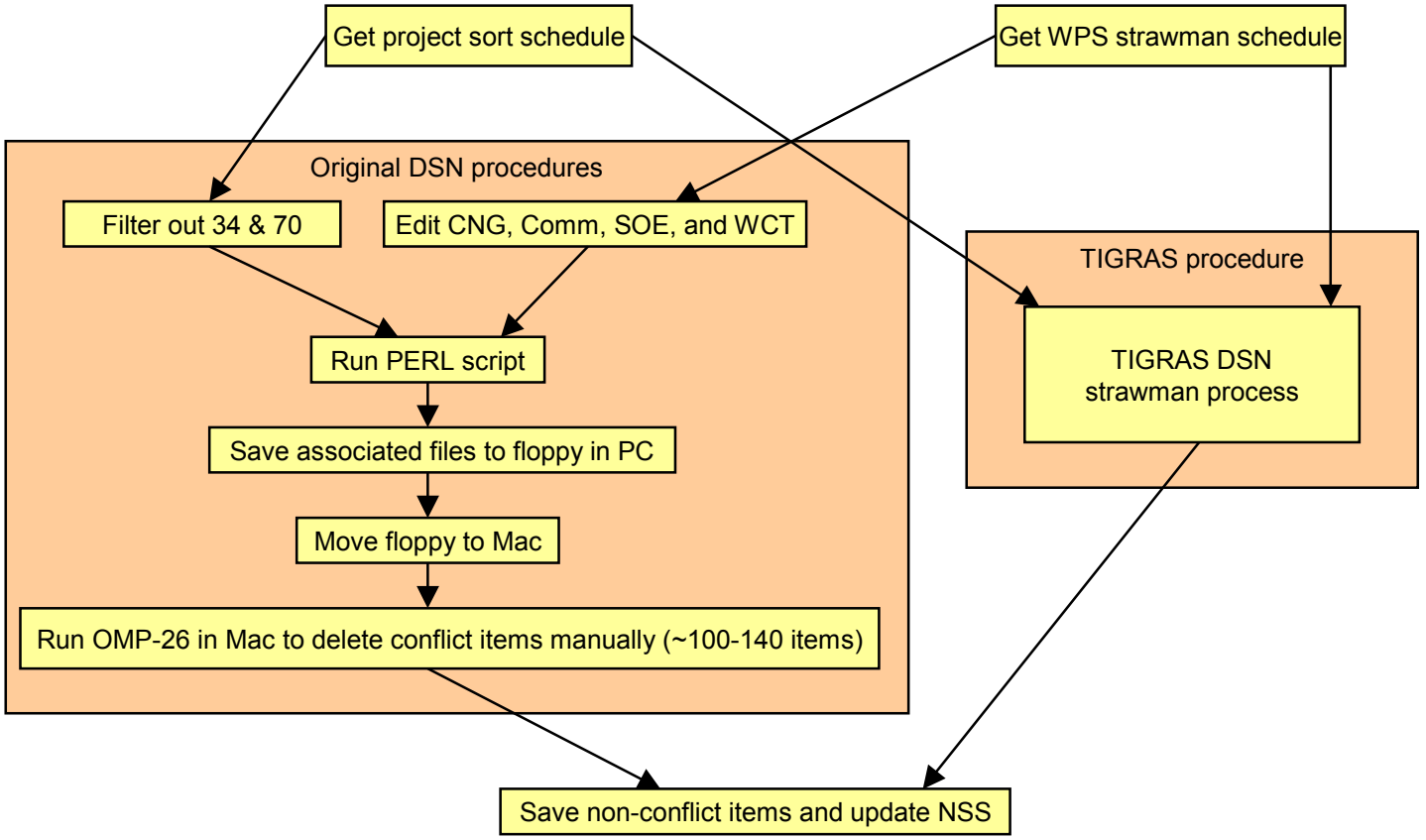
Mission	Start MCC	End MCC	Event	Calendar	DOY / TIME UTC	Support
TDRS-I	3-Mar	18-Mar	LAUNCH	NET 8-Mar	DOY 067 / 2239 UTC	DSS 16,24,34,46,54,66
MAP	None	None	S/C MNVR	8-May	TBD	TBD
NOAA-M	TBD	TBD	LAUNCH	NET 26-Jun	TBD	TBD
CONTOUR	TBD	TBD	LAUNCH	1-Jul	TBD	TBD
ProSEDS	TBD	TBD	LAUNCH	25-Jul	TBD	DSS 16, 46, 66
DRTS	TBD	TBD	LAUNCH	1-Aug	TBD	DSS 16, 24, 27, 34, 46, 54, 67
MAP	None	None	S/C MNVR	28-Aug	TBD	TBD
INTEGRAL	TBD	TBD	LAUNCH	17-Oct	TBD	DSS 16, 24
MUSES-C	TBD	TBD	LAUNCH	NET Nov	TBD	TBD
MAP	None	None	S/C MNVR	18-Dec	TBD	TBD
SIRTF	TBD	TBD	LAUNCH	9-Jan.2003	TBD	TBD
ROSETTA	TBD	TBD	LAUNCH	12-Jan.2003	TBD	TBD
GOES-N	TBD	TBD	LAUNCH	25-Feb.2004	TBD	TBD
Note: All Launch / Event dates are subject to change. Submit all updates changes to R. Gugel						
Honeywell Technology Solutions, Inc.						
	Added			Change		

DSN Utilization for January 2002 Entire Network

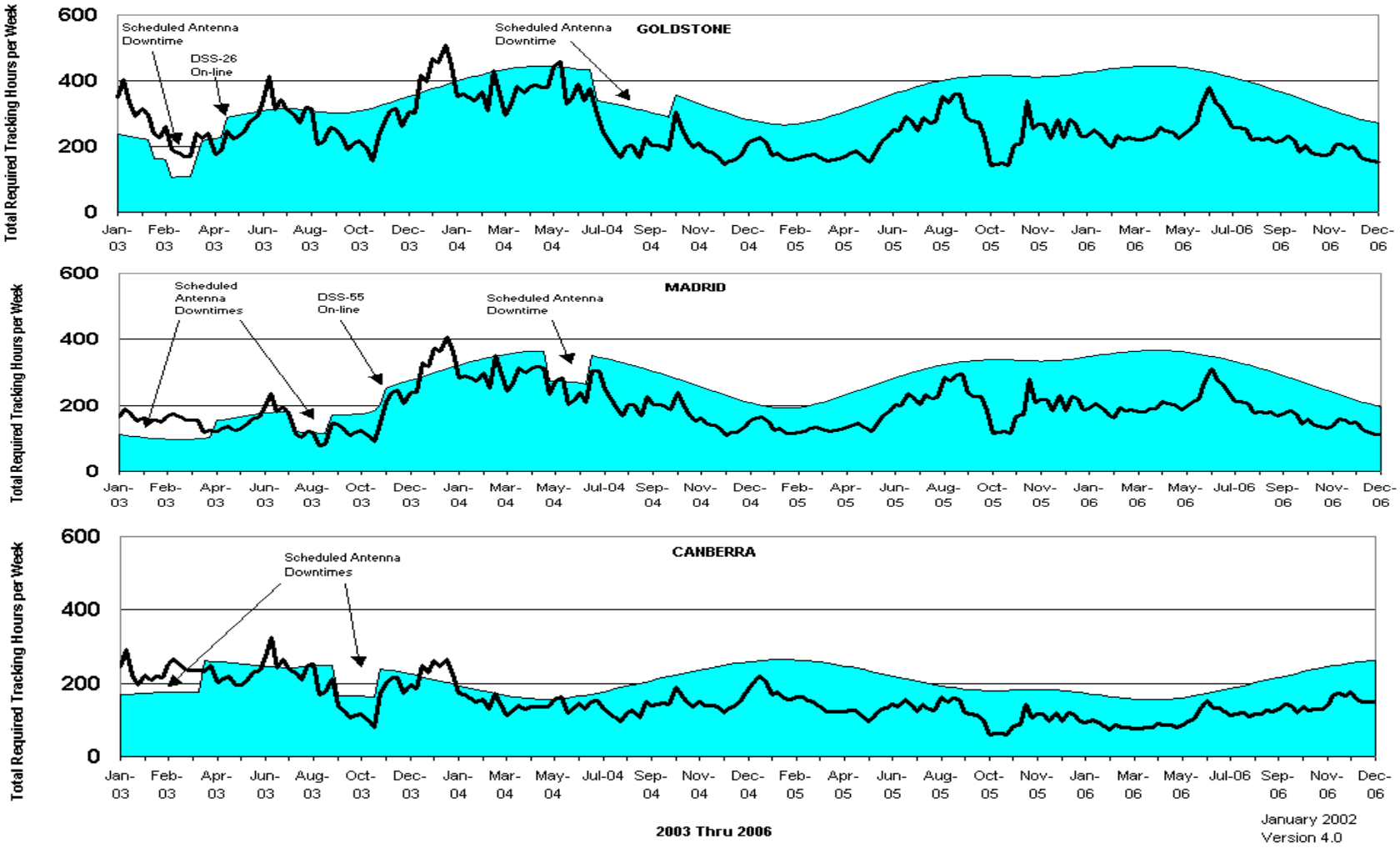



Viewperiod Overlap with MER
(average over all 3 sites and both MER-A and MER-B)
MER-A Cruise
MER-A Approach
MER-A Landing1/4/04
MER-A Surface Ops
MER-B Cruise
MER-B Approach
MER-B Landing 2/08/04
MER-B Surface Ops
Nozomi MOI
MEO MOI 12/25/1/1/04
M01,
Mars Express,
Nozomi
100% view is average
MER A and MER-B
Contour comet
encounter 11/12/03
Cassini
Contour
SIRTF
Cassini Saturn approach
DSN Maintenance (Earth
daylight)
Cassini Gravity Wave
12/15/03 - 1/23/04
Goldstone Radar Mercury
Deep Impact
Deep Impact launch
1/2/2004
50% overlap
Goldstone Radar Minos
Messenger
Messenger launch
3/10/04
Stardust comet
encounter 1/2/04
Goldstone Radar Mercury
MER-A Landing1/4/04
MER-B Landing 2/08/04
Stardust
MARS
M01O
MARX
NOZO
CAS
SRTF
DEEP
MSGR
CNTR
STAR
SUN
GSSR
percent view overlap
100%
80%
60%
40%
20%
0%
07/30/03
08/30/03
09/30/03
10/31/03
12/01/03
01/01/04
02/01/04
03/03/04
04/03/04
05/04/04
06/04/04
date
Note: Rosetta and MUSES-CN assumed in hibernation mode
Morris 8/3/00, Kehrbaum Dec/00, Chadbourne 3/23/01

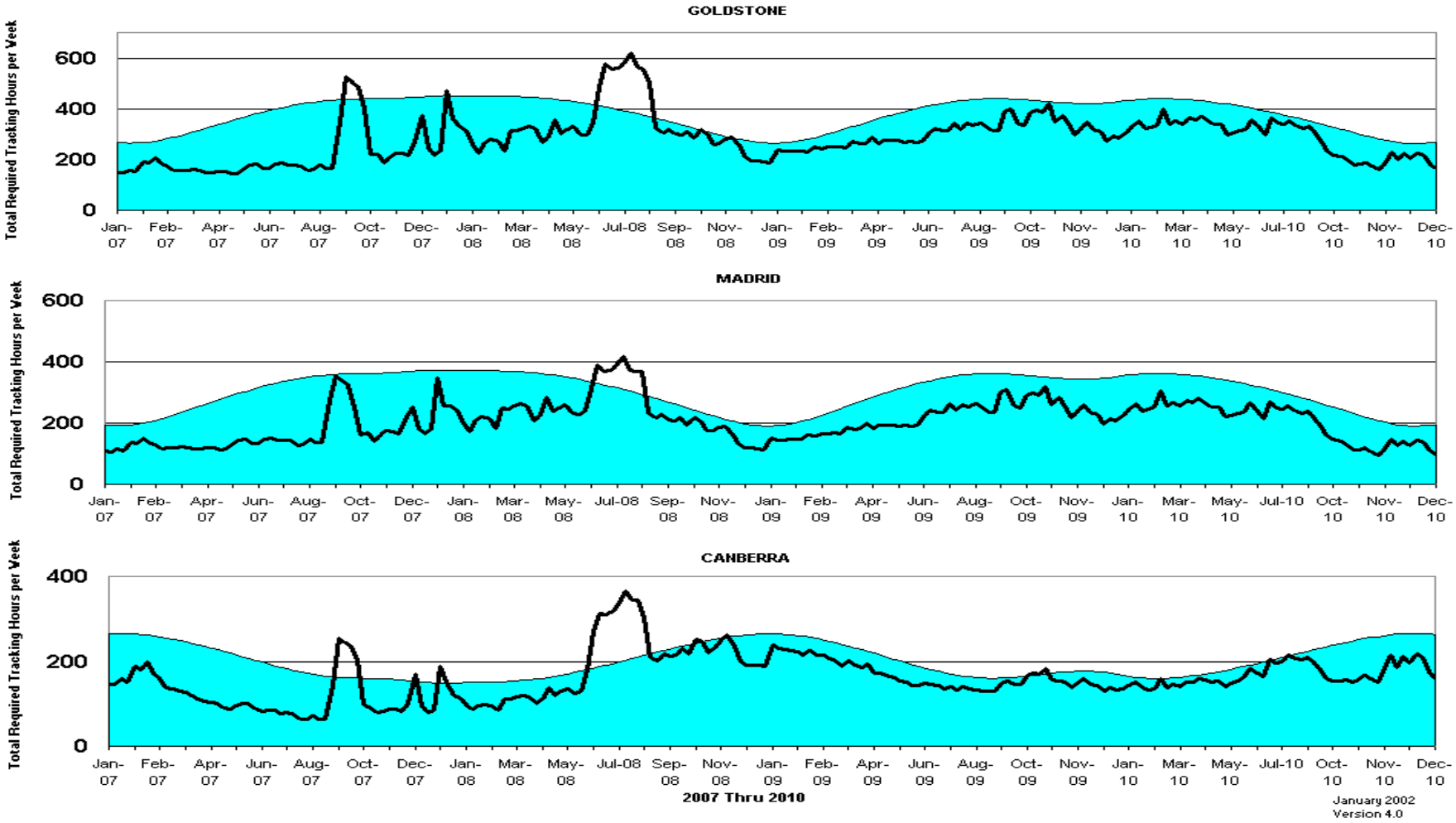
DSN 26m Strawman Process (3 weeks from R/T)
(Introduce TIGRAS to DSN for future 34m & 70m antenna operation)



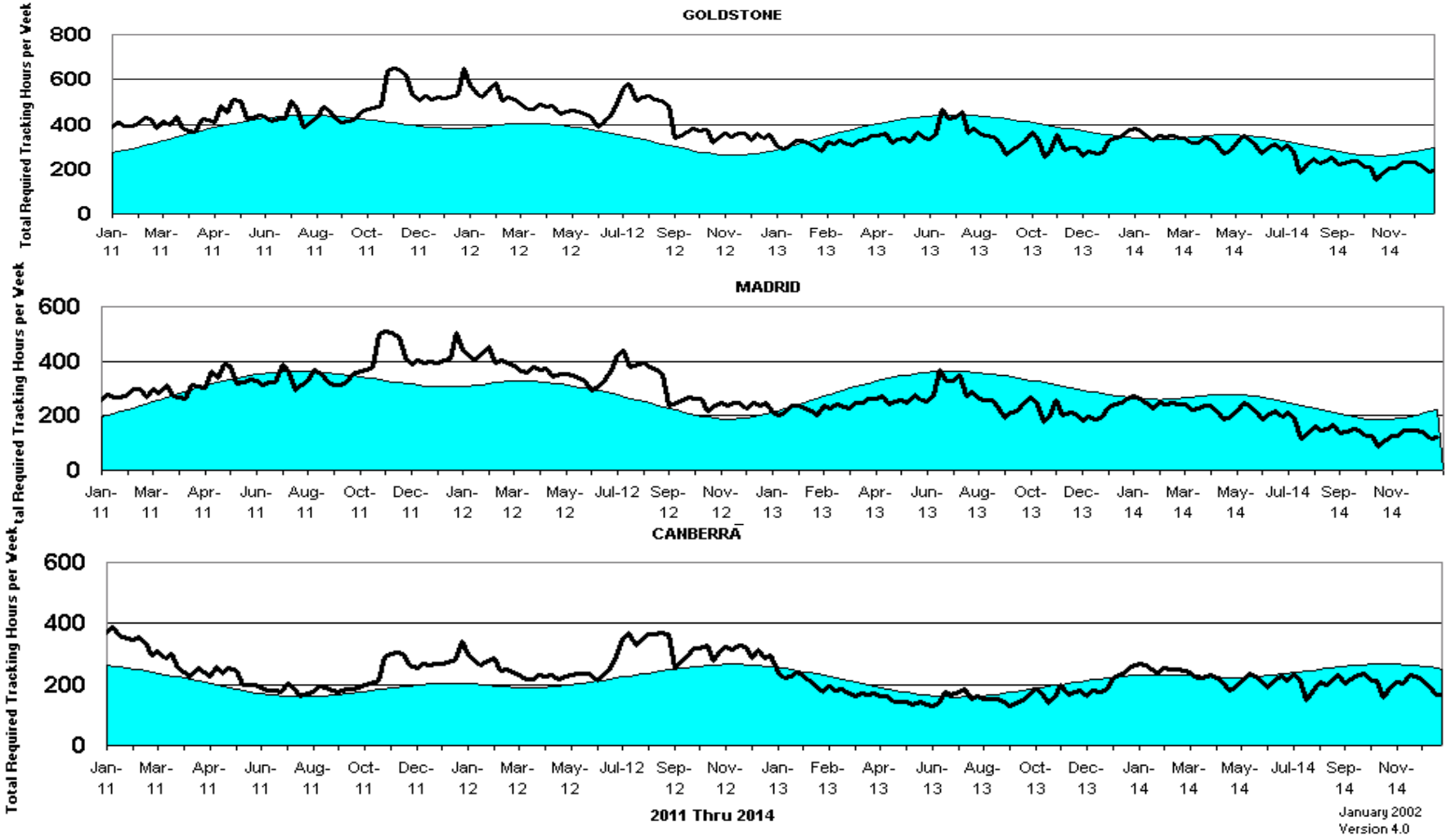
2003 - 2006 DSN 34M & 70M Load Forecast



2007 - 2010 DSN 34M & 70M Load Forecast



2011 - 2014 DSN 34M & 70M Load Forecast



Launch Status

Loading and Resource Issues

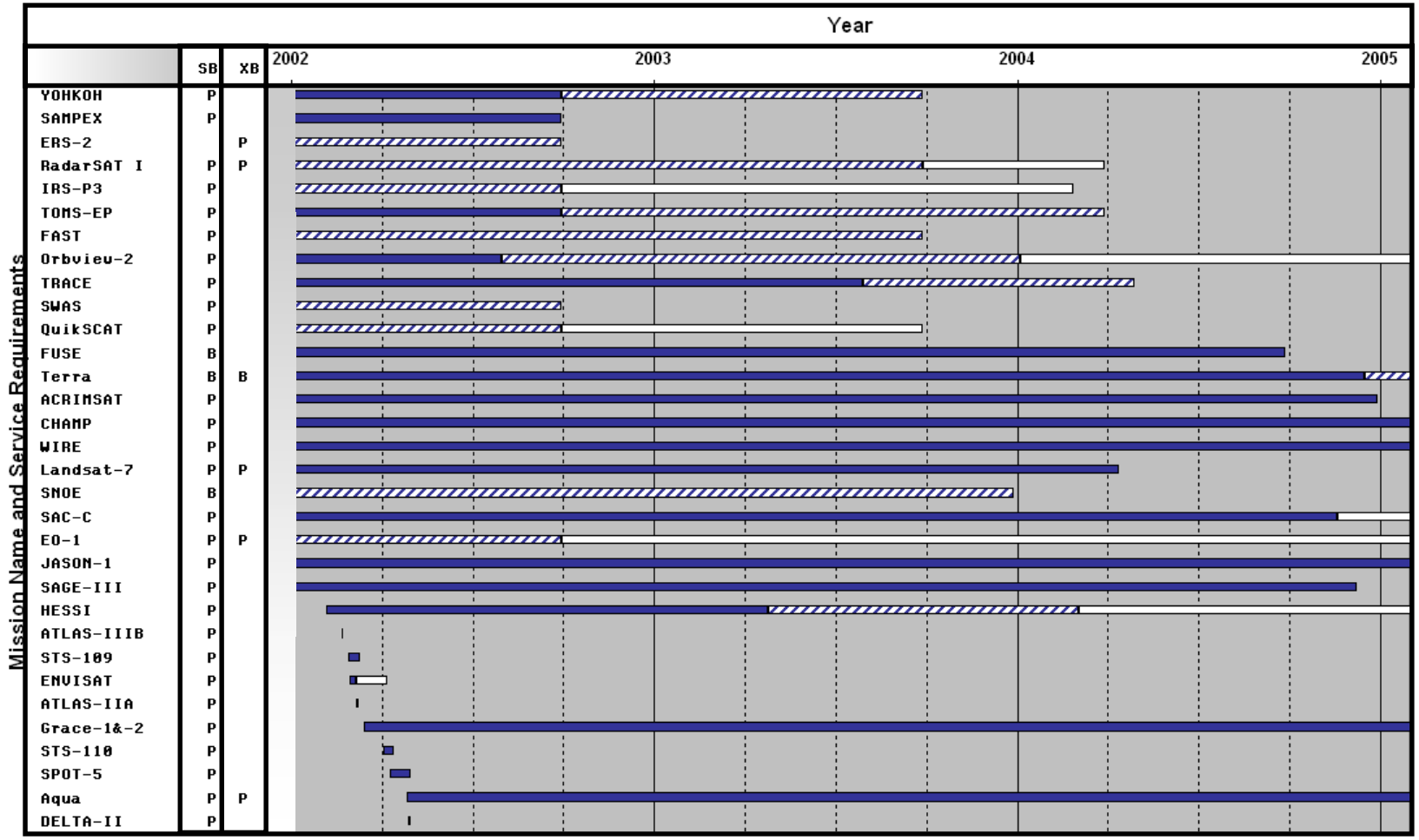
A. Levine
NASA Code 452 Service Planning Manager
(301) 286-9436
al.levine@gsfc.nasa.gov

D. Joesting
CSOC Systems Engineering
(301) 805-3500
david.joesting@csoconline.com

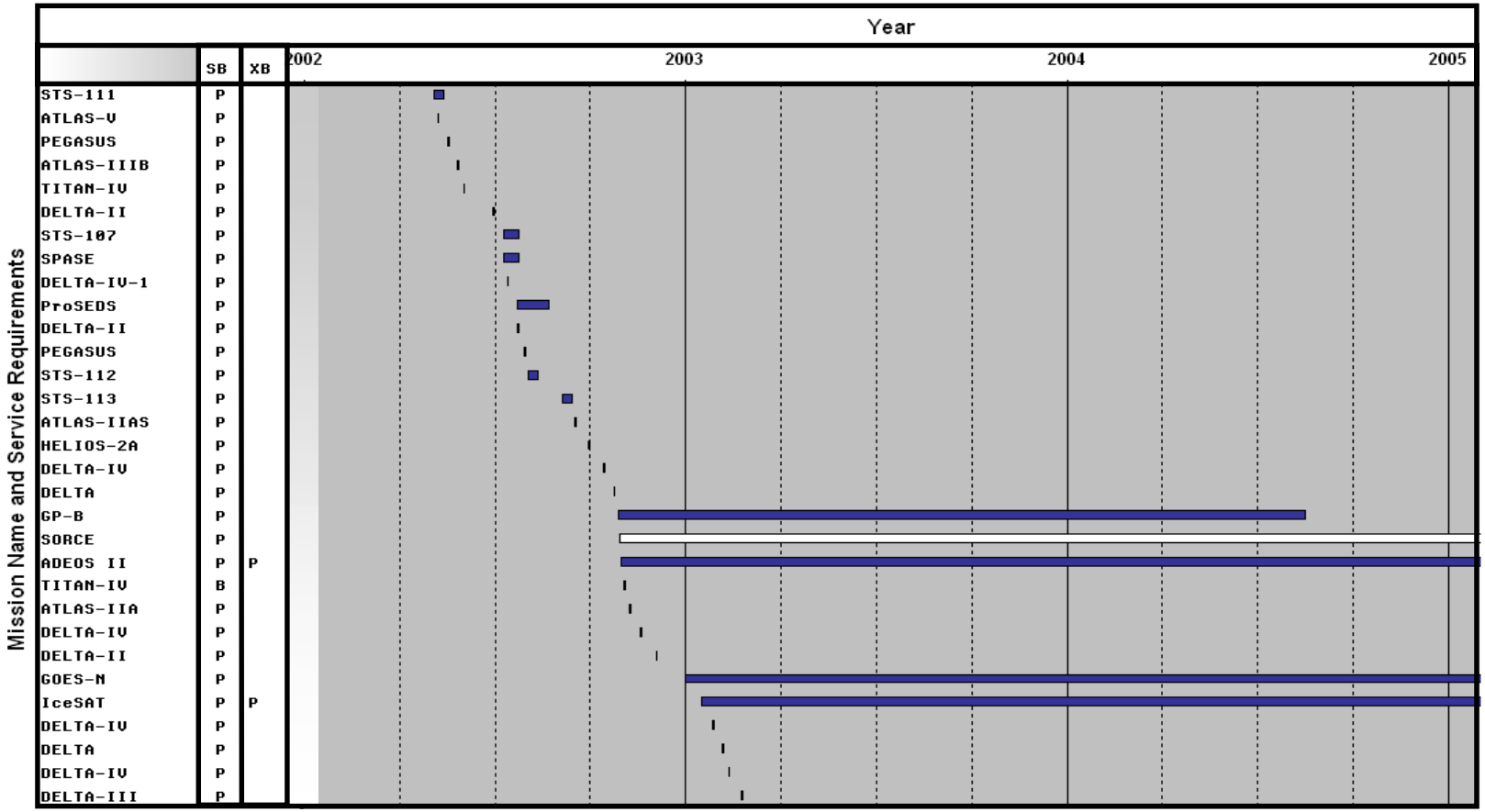
Resource Commitments

- **Current customer space communications service commitments will continue to grow over next several years**
  - GN is planned for modest expansion in customer support in 2002 with current commitments trending lower starting in FY 2003
  - SN demand is planned to be relatively level for near term
  - Commercial customers to utilize a percentage of available SA capacity on a non-interference basis to NASA programs
- **GN and SN loading through the middle of this decade is forecast to have additional capacity for new users**
  - GN resources are expandable through commercial service providers as required
  - SN resources, while more limited in terms of expansion, allow higher individual resource utilization due to longer visibilities
    - In-orbit spare TDRSs provide assurance of service

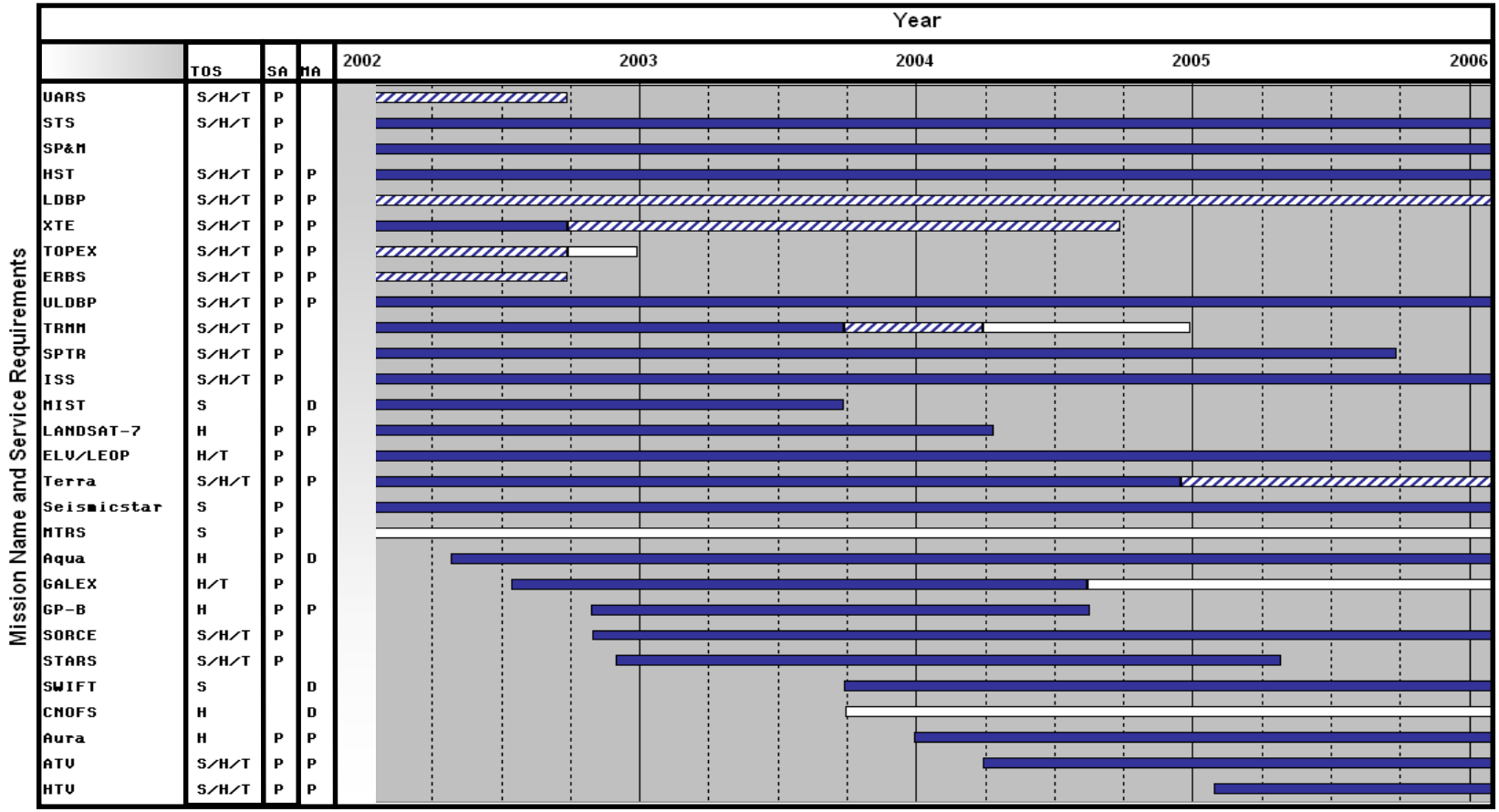
GN Mission Model (2002 through 2004)



GN Mission Model (continued)



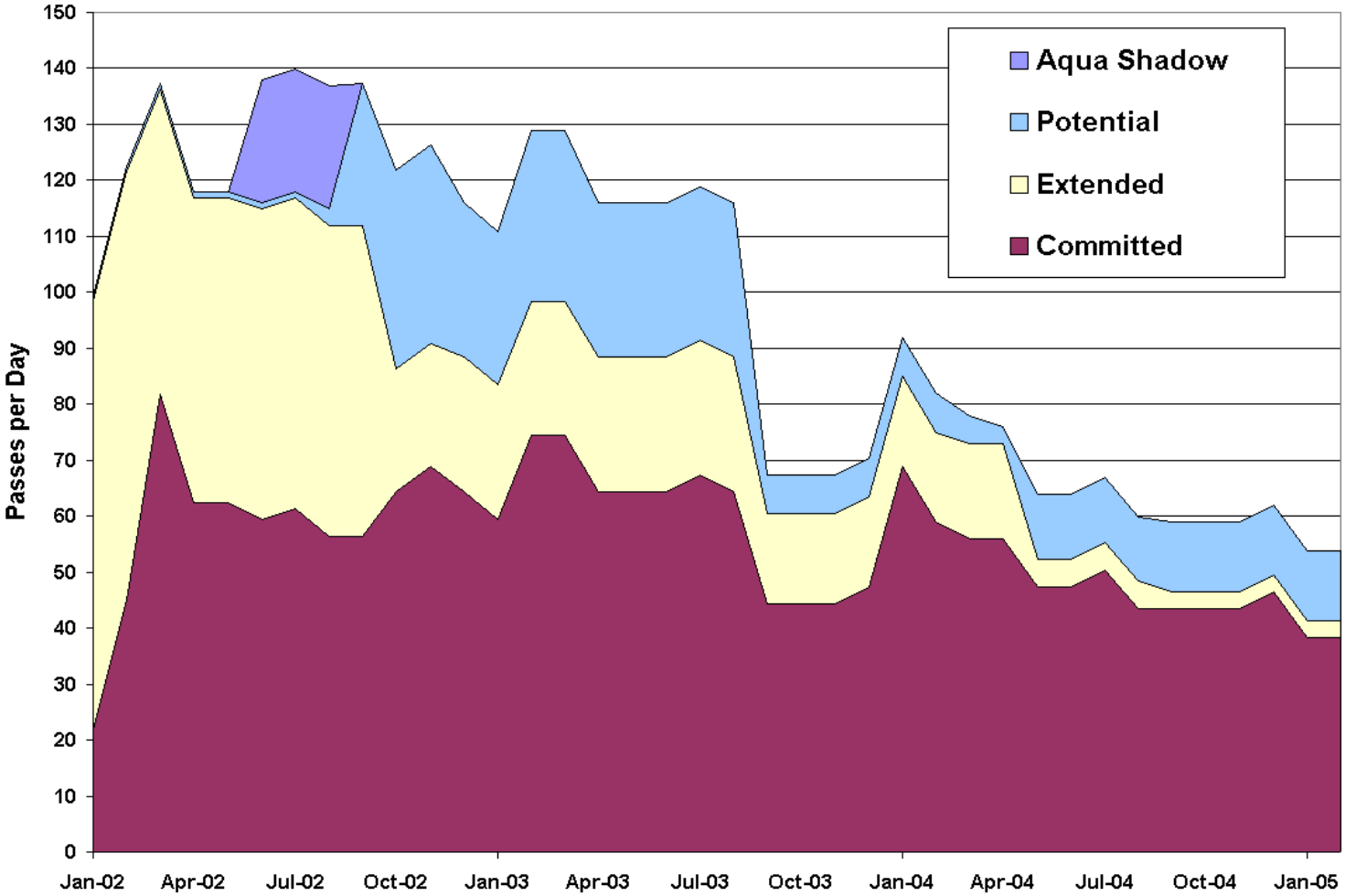
SN Mission Model (2002 through 2005)



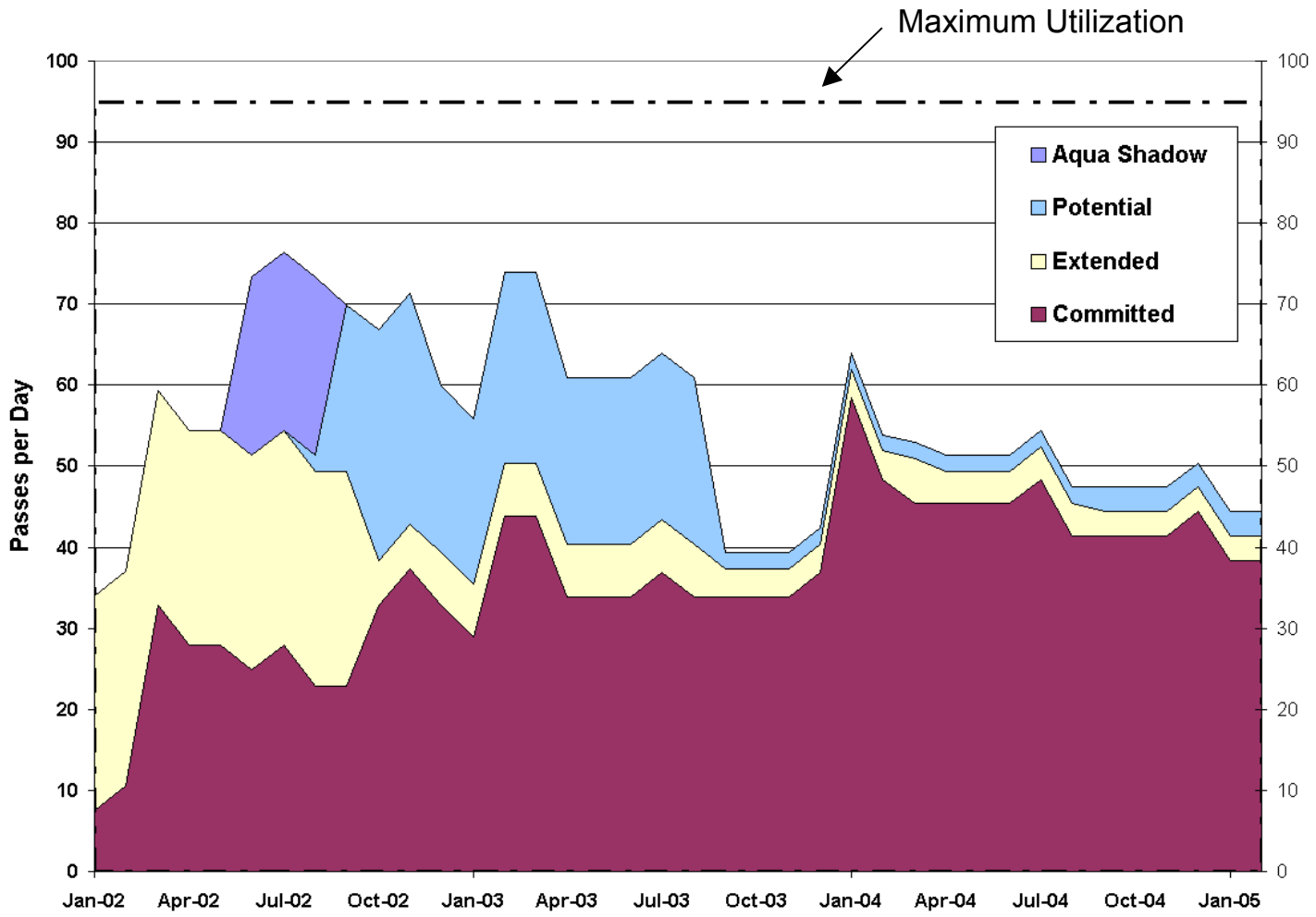
Support: P=Prime, B=Backup, D=DAS
TOS = Type Of Support: S=Science, H=Housekeeping, T=Tracking

■ Committed ▨ Extended □ Potential

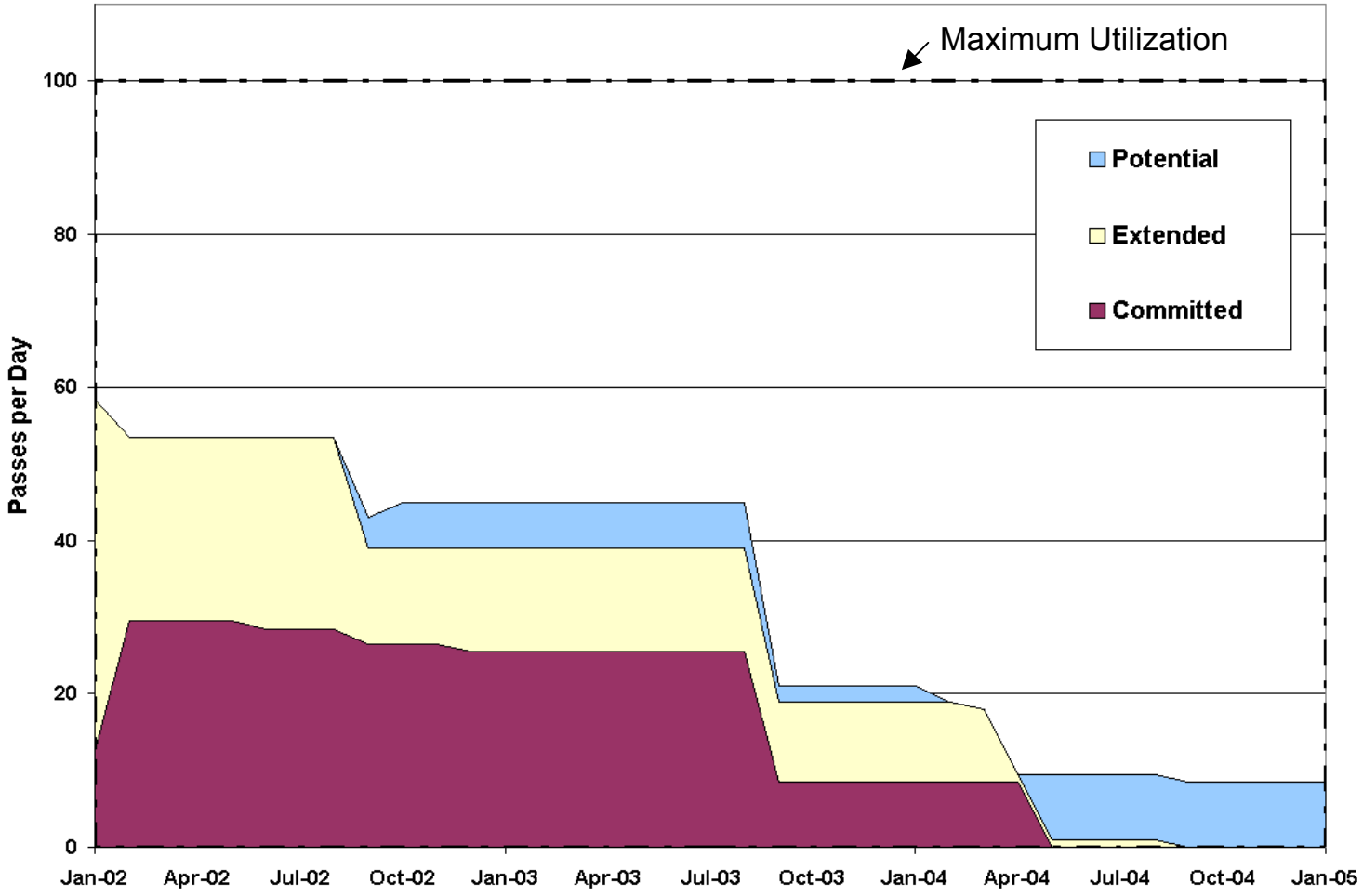
GN Load Forecast



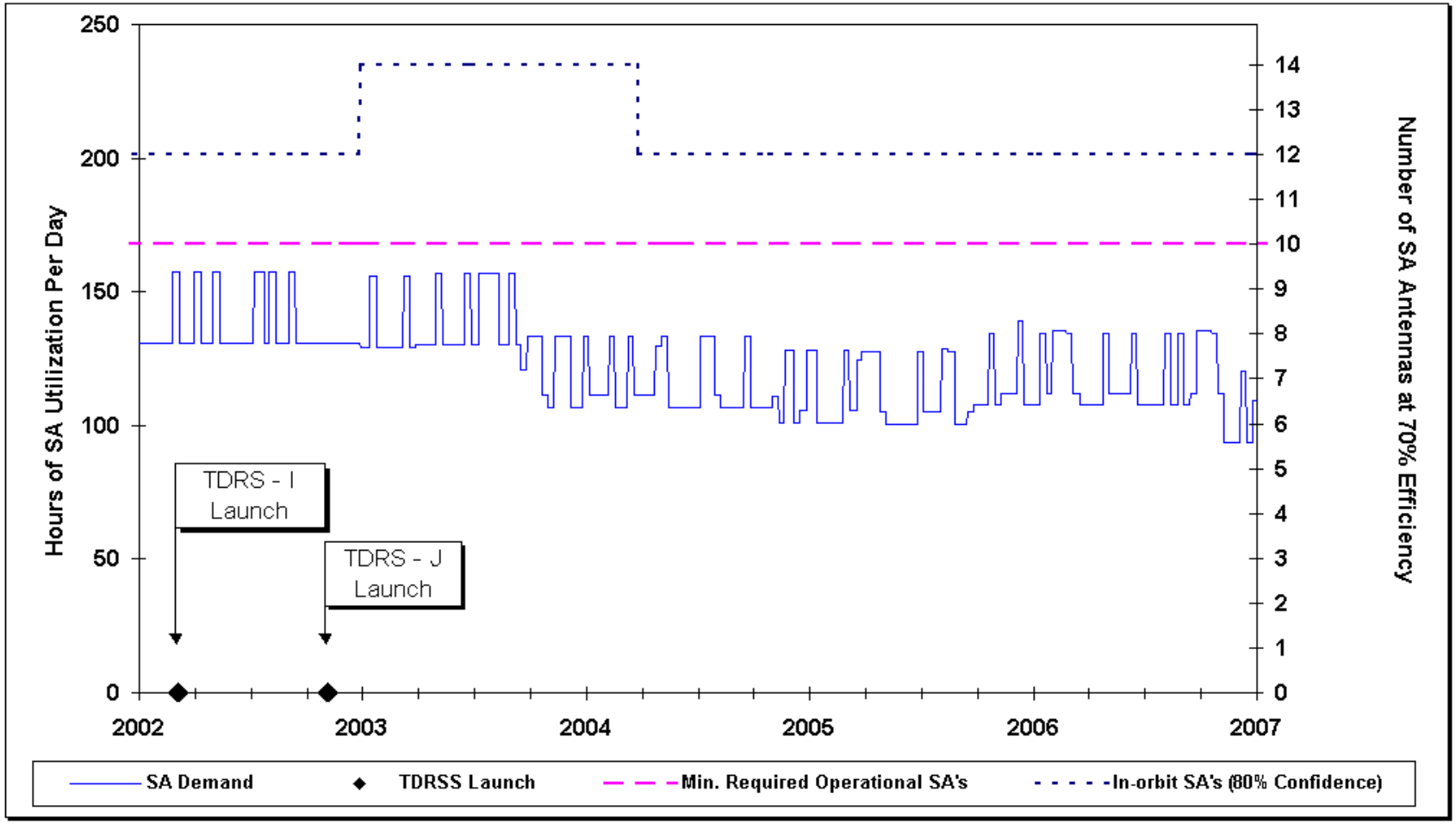
GN 11 Meter Antenna Load Forecast



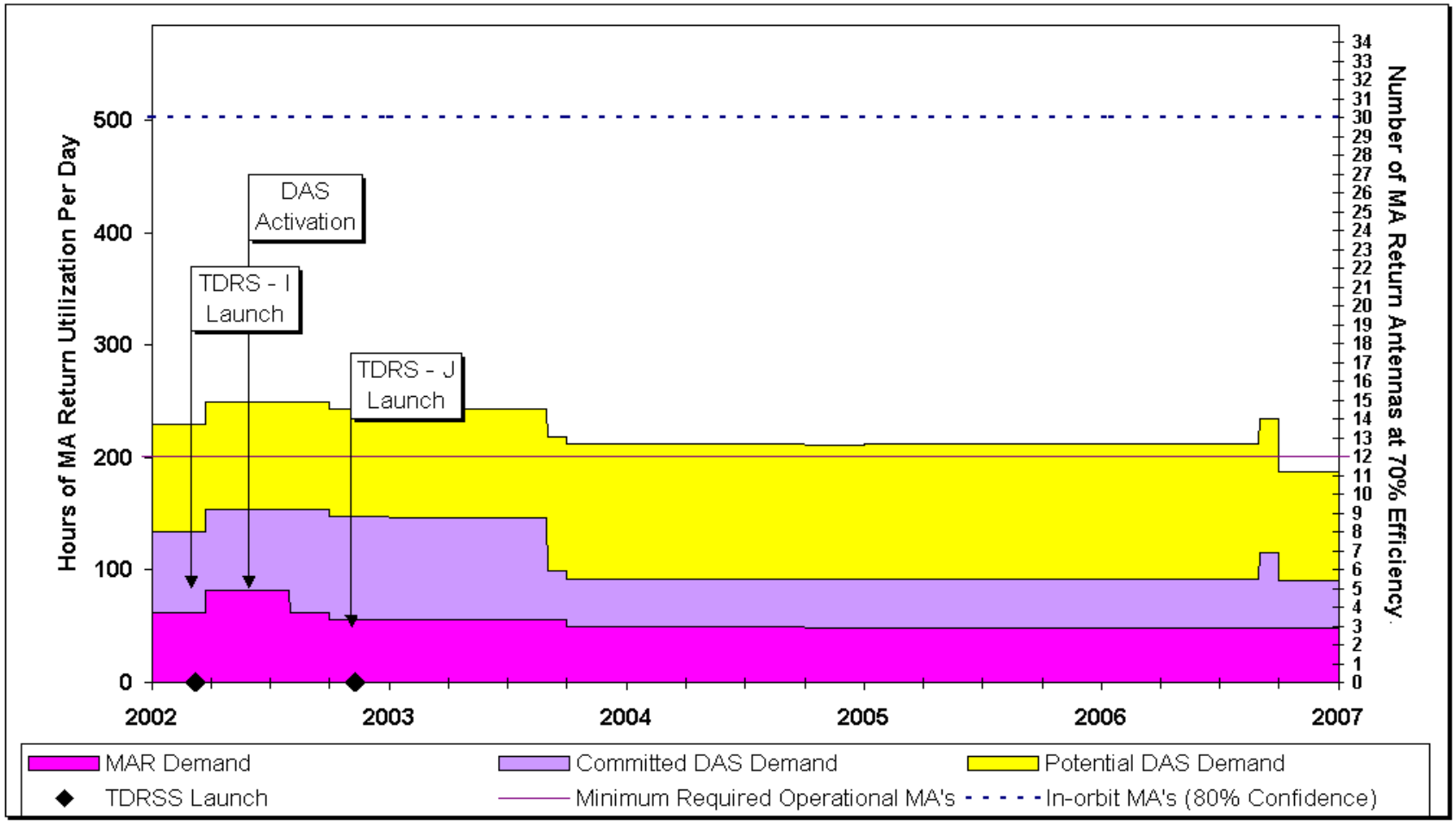
GN 5/8 Meter Antenna Load Forecast



SN SA Load Forecast



SN MAR Load Forecast



Meeting Customer Commitments

- **Both GN and SN customer support resources will be sufficient to meet current CSOC Mission Set commitments under most conditions**
  - Contingent upon Aqua confidence in proficient data return without use of shadow passes
    - Probable conflict with Aqua shadow passes when Aura launched
- **There will be certain periods of time for both the GN and SN during which contention for resources will occur**
- **Better service planning will require more timely and complete detailed ground service requirements from the customers including periodic updates that reflect service level changes**

GN Support Impact Issues

- **High priority support (launch and early operations, spacecraft emergencies, targets of opportunity, etc.) can create short period of time where some impacts to other spacecraft nominal support requirements may be encountered**
  - Possible overlapping Aqua and GRACE-1/2 LEOPs present such a situation. (Potential overlapping Aqua and IceSat LEOPs require monitoring.)
  - Due to mission phasing and possible launch slips, exact amount of impact impossible to predict more than several weeks in advance
- **High visibility science requirements may drive resource utilization**
  - Aqua X-Band telemetry shadow passes during spacecraft/Network operations checkout will greatly exercise GN Polar resources

GN Loading Prediction Issues

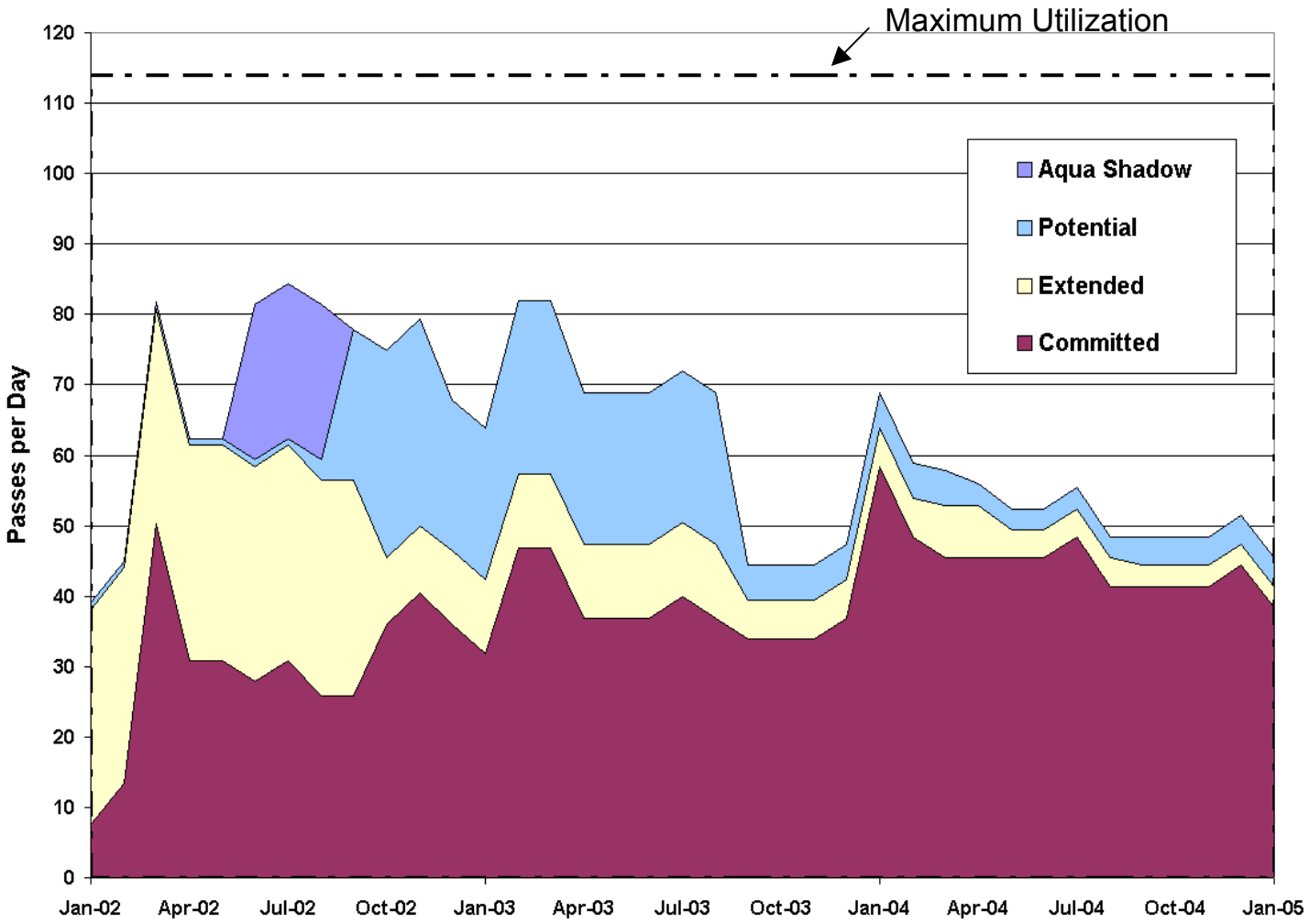
- **Missions rarely terminated early but have a tendency to receive support extensions**
  - Work with best estimate of project end date available to MCM/CSR
- **NASA missions do not necessarily have highest priority at the commercial sites**

Other Issues

- **SN: HST servicing mission will require critical periods for each of the Space Shuttle and HST**
  - HST will require critical checkout periods subsequent to the mission
- **There is a question on whether potential mutual interference between spacecraft should be a constraint in scheduling at the DSMC**
  - Who should have responsibility in assessment and final resolution?

Backup Material

GN 11/10 M Antenna Load Forecast



Action Item Review

Action Item Status

AI #	ASSIGNEE(S)	ACTION:	STATE	STATUS
MSCF-11-15-01	Shuby Ambardekar (GSFC CSR Manager) and Jon Walker (CCM)	Look into generating an ICD between GSFC and the DSN.	Open	Acknowledged, discussed, in-progress but low priority
MSCF-11-15-02	Steve Currier (WFF)	Re-present commercial resources at the next MSCF meeting.	Closed	Action item combined with MSCF-11-15-08
MSCF-11-15-03	Michele Crizer (GSFC/LandSAT-7)/John Grassel (GSFC/CSR)	Update DMR and PSLA for Landsat-7.	In process	Status not known
MSCF-11-15-04	All Projects	Ensure issues are raised sufficiently early to ensure that adequate time is available to address mission concerns (i.e., compatibility testing, requirements, etc.) and thus possibly avoid a need to form TIGER teams.	On-going	
MSCF-11-15-05	NISN	Provide a presentation on NISN status at the next MSCF meeting.	Closed	Presentation being made at 2/21/02 forum.
MSCF-11-15-06	Cathy Barclay (GSFC)	Provide a quick update on the DSMC schedule at the next MSCF meeting.	Closed	Presentation being made at 2/21/02 forum.
MSCF-11-15-07	DSN	Provide a presentation on DSN plans at the next MSCF meeting.	Closed	Presentation being made at 2/21/02 forum.
MSCF-11-15-08	Service Providers	Provide a briefing for the next MSCF meeting.	Open	- DataLynx - Presentation was prepared. - SDS - Status not known - University of Chili (AGO) - We have one, but it does not address technical capability. - USN - In progress