Space Network Loading

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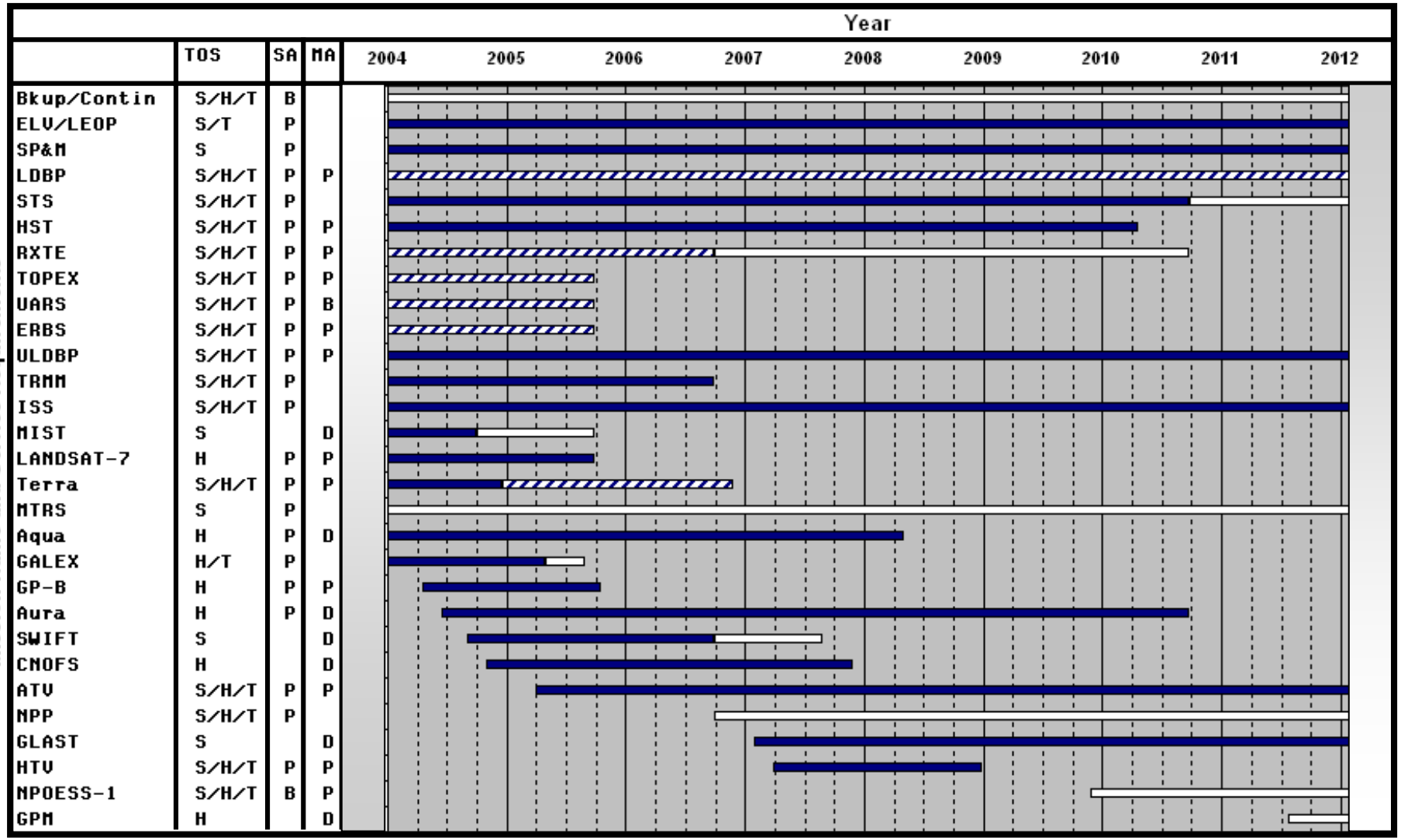
Mission Model (2004 through 2011)

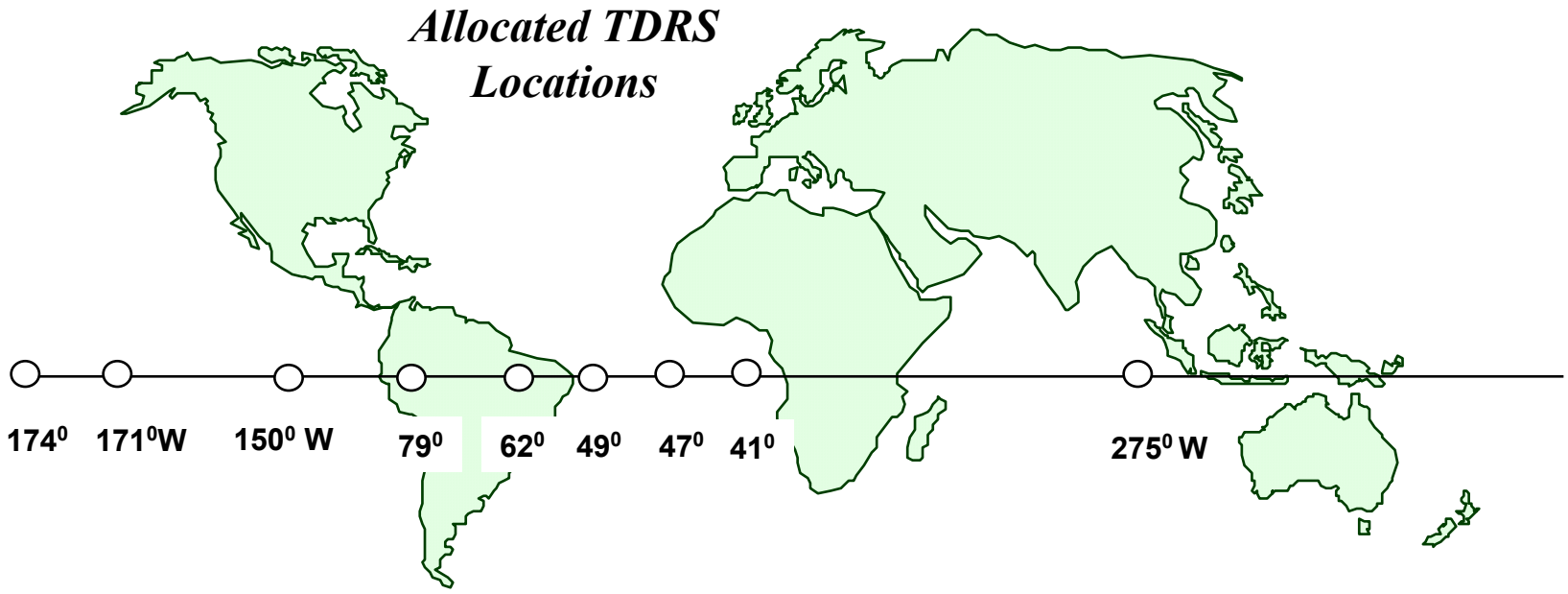
SN Mission Set



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

■ Committed ▨ Extended □ Potential

2004 Through 2011

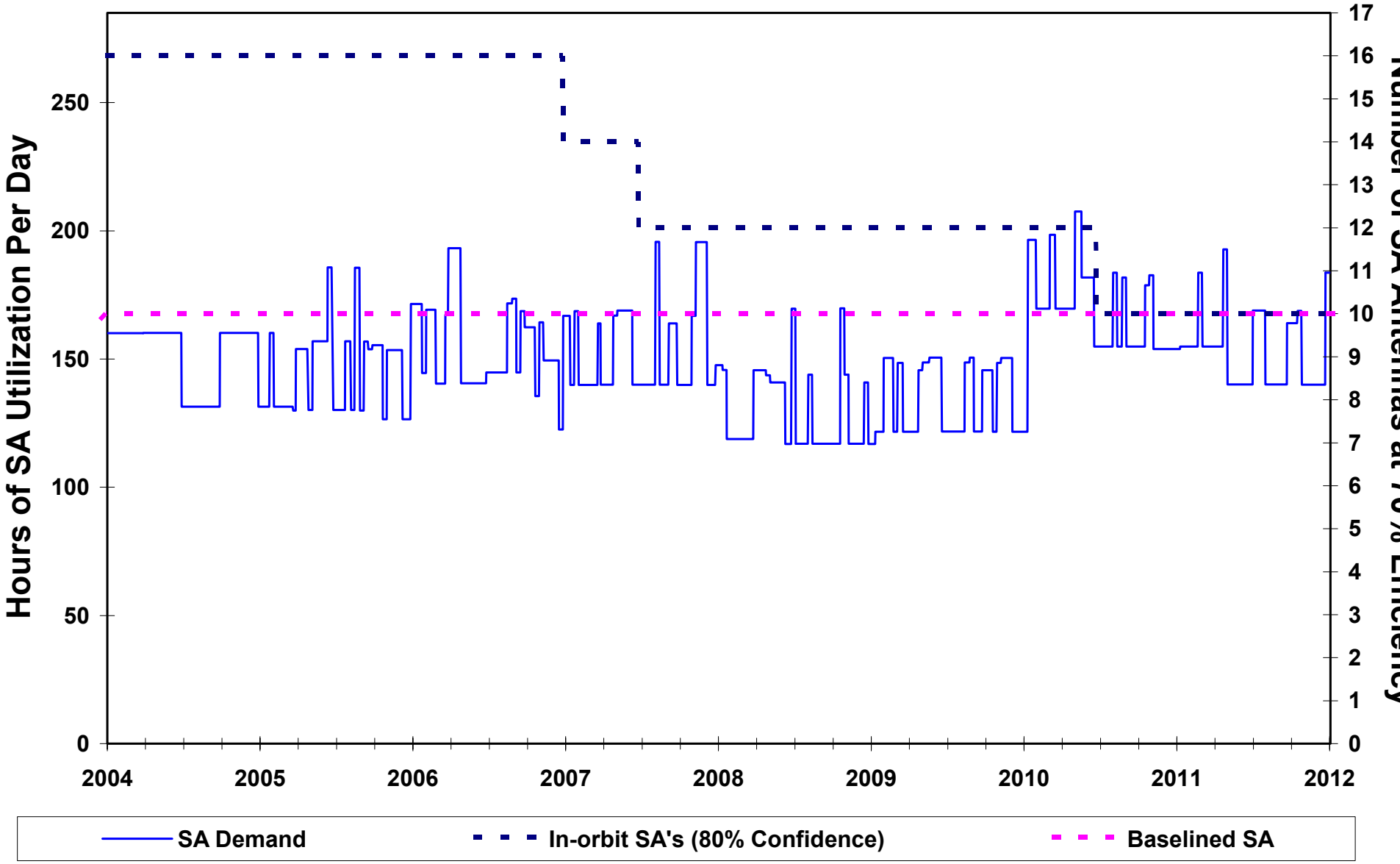


Candidate Operational Constellation (Based on Reliability and Demand)

Timeframe Modeled	41 Degrees West Longitutude		47 Degrees West Longitutude		171 Degrees West Longitutude		174 Degrees West Longitutude		174 Degrees West Longitutude		Total No. of SA's
4Q04-4Q06	2	F10	2	F4	2	F5 *	2	F6	2	F3	10
1Q07-2Q07	2	F10	2	F4	2	F5 *	2	F6	2	F7	10
3Q07-2Q10	2	F10	2	F6	2	F5 *	2	F8	2	F7	10
3Q10-2Q12	2	F10	2	F6	2	F9 / F5* (MA Only)	2	F8	2	F7	10

* Assumed KSAF failure on F5/SA #1 by 3rd Qtr 2004

On-Orbit Capacity



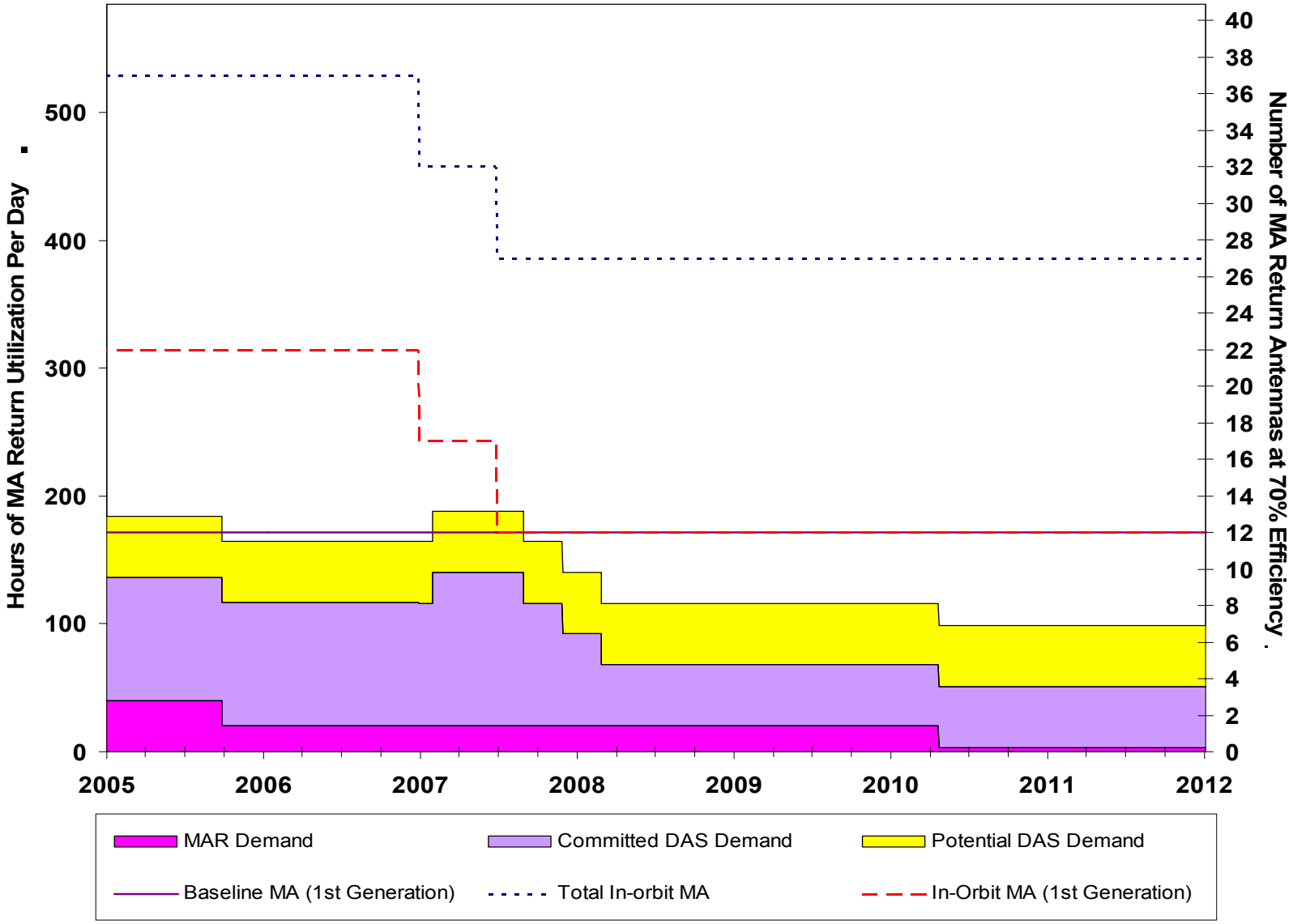
SA Forecast Loading Results

- Nominal Loading (without Shuttle In-orbit or Critical Support)
  - All users receive at least 90% of the customer service requirements for the period 2004 through 2011
    - Lower priority missions receive at least 95% due to flexibility and/or use of SMA
  - Maximum loading is 58% in 2006
- Loading with Shuttle In-orbit
  - All users (except STS 88% in 2010) receive over 90% of the customer service satisfaction for the period 2004 through 2011
    - Starting in 2006, ISS and STS will have only limited support from TDZ which will reduce support by ~ 7% (on average between the 2 S/C)
      - Need for “Virtual S/C” during docked operations to reduce impacts
  - Maximum loading is 69% in 2006

SA Forecast Loading Results (Continued)

- Peak Loading
  - Most users can expect some launch day impacts to their support commitments.
    - STS/ISS support will drop below 90% without Virtual S/C
    - Terra support will drop to ~ 80%
      - May require periodic off-loading to the GN X-band resources
  - Maximum loading is 76% (on a daily basis) in 2006

On-Orbit Capacity



Note: Baselined MA's reflect 5 MAR's (1 TDRS) in East Node, 5 MAR's (1 TDRS) in West Node, 2 MAR's (1 TDRS) in ZOE to meet the projected demand while providing needed operational balance

MA Forecast Loading Results

- All MA users forecasted to receive at least 99% of their telecommunications requirements
- MA return loading utilization peaks at 13% in 2004/05
- MA Forward loading utilization peaks at 23% in 2006
- TDRS-H/I/J SMA helps to relieve SSAR contentions
  - Aqua, Aura, TOPEX, XTE, Landsat-7 and GP-B SSAR service requirements can be accommodated by SMA on TDRS-8/9/10

DAS Forecast Loading Results

- Demand Access Service (DAS) loading utilization peaks at 20% in 2005 and 26% in 2007
- All DAS users forecasted to receive their telecommunications requirements
  - Some issues with sufficient DAS capacity during LDBP & ULDBP campaigns
    - Number and geographic location of balloons (due to flight duration and wind drift) could exceed current planned DAS capacity

Conclusions and Recommendations

- SA demand appears to stay at or near "saturation level"
  - 80% TDRSS reliability confidence level
  - Issues exist with critical operations:
    - For ISS rendezvous operations, multiple SA antennas required simultaneously in each hemisphere unless "Virtual S/C" is implemented
    - Other programs may have similar needs as the ISS (for example, ELV range safety and targets of opportunity due to cosmic events or disaster support)
    - Advance negotiations and adherence to agreements will be necessary to satisfy all concerned customers. Compromise is strongly encouraged
- Demand for DAS services may require additional ground system equipment within one to two years
  - Further analysis is in progress
- Maintenance of global DAS coverage will require co-location of 1st and 2nd generation TDRSs