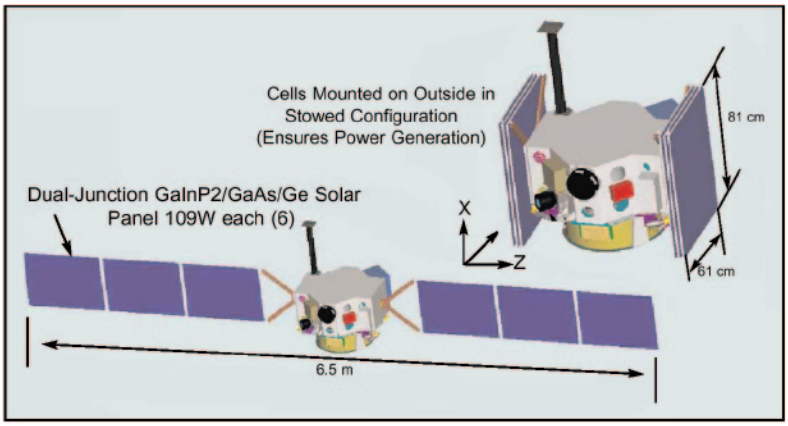
SPECTRUMASTRO

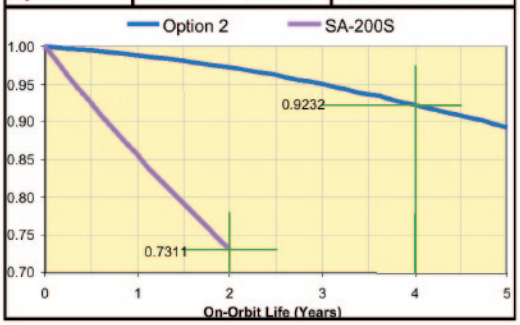
SA-200S Spacecraft Options

Option 1: Deployed Arrays - Option 1 to the SA-200S mission upgrades the orbit average payload power from 53W to 190W by replacing the solar panels with a deployed, 2-axis articulated pair of solar array wings. Adding a single, flight proven, 6U VME board to drive the motors for solar array articulation modifies the C&DH subsystem. The hinge, damper, and restraint mechanisms are similar to those used on our MSP-'01 and MightySat solar array programs. The reference orbit for Option 1 is 425 km circular, 28.5º inclination.

The 21.5% efficient cells have a Beginning-of-Life power level of 672 W. Their End-of-Life power is 655 W. The 15 Ahr NiH2 CPV battery provides 10% excess capacity over the minimum required for this reference mission.



Subsystem	SA-200S 2 yrs	SA-200S 4 yrs	Option 2 2 yrs	Option 2 4 yrs
ACS	0.8375	0.6984	0.9923	0.9713
Power	0.9400	0.8836	0.9970	0.9903
Propulsion	0.9999	0.9997	0.9999	0.9997
C&DH	0.9395	0.8826	0.9940	0.9821
Comm	0.9887	0.9775	0.9887	0.9775
System	0.7311	0.5323	0.9722	0.9232



Option 2: Full Redundancy - Option 2 to the SA-200S upgrades the basic spacecraft bus to fully redundant ACS and Power subsystems with a block redundant C&DH subsystem. System probability of success increases from 0.731 at two years to 0.972 at two years and 0.923 at 4 years. The dramatic increase in probability of success with Option 2 is accomplished with a 34 kg increase in launch mass leaving a 10% margin over the Pegasus XL capacity to the 325 km parking orbit. Since the redundant equipment is nominally power off, there is no increase in power requirements for the spacecraft.

C&DH subsystem reliability is enhanced by adding a block redundant card suite and replacing the General Purpose Board (GPB) with the Autonomous Redundancy Management (ARM) board. The total of fifteen VME boards are Packaged in one 21-slot chassis. The ARM adds the capability to autonomously switch over to the cold spare side in the event that the watchdog circuit fails to effect re-initialization of the primary side in the event of an anomaly. Note that the boards used in the basic 200S are already designed to be used together in this block redundant fashion.

Power subsystem reliability is enhanced by adding an additional IPCU, CCU, 15 Ahr battery, and PDU. Each component is cross-strapped into both sides of the block redundant C&DH subsystem. We enhance ACS reliability by adding a second star tracker, a third TARA (providing full 3-axis redundancy rate sensing), a fourth reaction wheel, a second GPS receiver and antenna set, and a second three-axis magnetometer. Each component is cross-strapped into both sides of the C&DH.

For more information contact the Rapid Spacecraft Development Office

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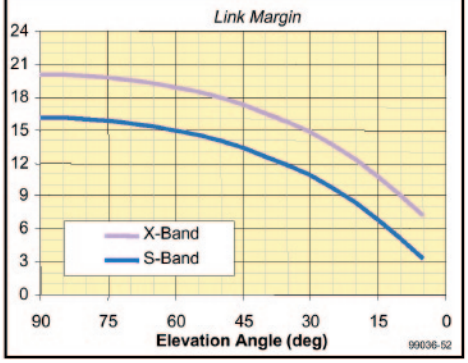
SA-200S Spacecraft Options

Option 3: Full Redundancy with Deployed Arrays - This option combines the Equipment changes and benefits from Options 1 & 2 and includes the additional B-side gimbal drive electronics board required for full redundancy. The satellite (with 100 kg reference payload) has a launch mass of 330 kg and a 30% LV performance margin to the 325 kg injection orbit.

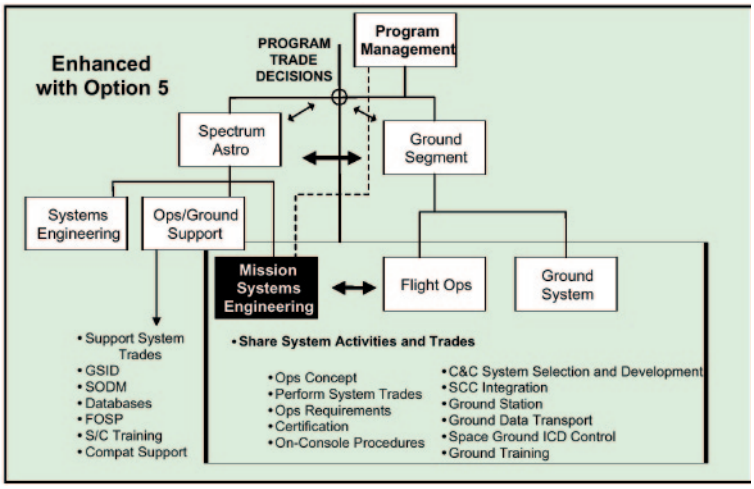
Option 4: High Rate Data - Option 4 to the SA-200S greatly increases the science data handling capacity – science downlink data rate increases to 80 Mbps (with potential for up to 320 Mbps) and total on-board science data storage increases to 32 Gbits. The figure to the right shows the key benefits of implementing Option 4 on the SA-200S. The 80 Mbps downlink increases the total daily data return 32 fold. The combination of the SSR and X-Band transmitters coupled with modifications to the UDL board to accommodate high rate data transfers provide the capability to downlink up to 32 Gbits of data in a single 7 minute pass. A typical pass time would be ~5.5 min for a 10° elevation angle on a 6 meter receive antenna.

	S-Band	X-Band
Data Rate	2,500 Kbps	80 Mbps
Nom. Pass	5.5 min	5.5 min
bits per pass	0.82 Gbits	26.37 Gbits
bits per day	6.4 Gbits	204.0 Gbits

Assumes 7-8 station passes per day



Option 5: Ground Support - Spectrum Astro offers ground segment integration support services allowing the customer ground segment team to work more closely with the spacecraft development team to further reduce risk and program costs. This service provides for engineering support in the form of a Mission Systems Engineer to define operational features affecting overall ground costs, resulting in reduced costs for ground development. Deliverables under this option include (Contractor specified format):



- Mission operations concept documentation
- Mission operations requirements documentation
- Ground Interface Control Document Inputs
- Specification for Ground Station Selection
- Specification for Ground Data Transmission Service (T-1, ISDN, etc.)

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AFFORDABILITY THROUGH INNOVATION

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