PART 9. EO-1 FIRSTS

When considering the large number of accomplishments resulting from the EO-1 mission, a sizable number can be classed as "firsts". Listed below are those "firsts" that are considered most significant.

1. Hyperion Science Validation

First to:

1. Acquire spaceborne hyperspectral observations of the Earth with Landsat spatial resolution (30 m) and AVIRIS spectral resolution (10 nm) over the entire Landsat reflective range.

2. Accurately map and characterize temperature distributions of active lava flows and forest fire "hot spots" from space.

3. Track re-growth in partially logged Amazon forests and reliably estimate Amazon forest drought stress.

4. Demonstrate that spaceborne hyperspectral sensors can identify and map vegetation species (including invasive species), canopy nitrogen concentrations, and minerals.

5. Map several fire fuel classes from space at very high accuracies, including senesced grass, soil, and chamise.

6. Separate total carbon into living biomass, dead biomass, and soil background with high accuracy.

2. ALI SCIENCE VALIDATION

Relative to Landsat, first to:

1. Demonstrate sequentially-sampled push-broom detector array technology.

2. Provide superior SNR and 12-bit A/D to capture the full dynamic range of Earth imagery.

3. Provide Pan-band-enhanced imagery of exceptional quality.

4. Provide additional SWIR band 5p (1.200-1.300 µm) to supply new information for identifying forest and crop types.

5. Provide additional VNIR blue band 1p (0.433-0.453 µm) to supply new information for coastal studies and aerosol estimation.

6. Provide improved SNR to track subtle changes in the velocity of ice sheet flows.

3. SPACECRAFT BUS

First to:

1. Use high data rate electronically steerable antenna at X-band frequency.
2. Use NASA very high data rate solid-state recorder (> 1 Gbps).
3. Use Reed-Solomon error detection and correction chip that operates at 1 Gbps.
4. Validate non-linear autonomous, long term formation flying and use of software that incorporates fuzzy logic.
5. Use pulsed plasma thruster as precision attitude control actuator.
6. Use shape memory alloy for system hinge and deployment mechanism.
7. Use panel with Carbon-Carbon as facesheet material where panel is utilized both as a radiator and as part of spacecraft primary structure.

4. OPERATIONS

First to:

1. Reduce cost of imagery 10-fold in the first 18 months of operation.
2. Generate a comprehensive space-borne hyperspectral imagery archive.
3. Implement an on-board cloud detection algorithm.
4. Demonstrate use of onboard autonomy and autonomous ground coordination to enable sensor web capabilities.
5. Experiment with adaptive algorithms coupled to a low cost ground-based scanning antenna array to dramatically lower the cost of communicating with low earth orbiting satellites.
6. Use onboard feature detection to autonomously modify onboard imagery tasking decisions.