SCIENCE TEAM ORIENTATION & FALL 1999 SEMESTER REVIEW

- Summary of Science Mission for New & Prospective Team Members (6 minutes)
- Review of Previous Progress (4 minutes)
- Fall 1998 Lightning Activities (6 minutes)
- Fall 1998 Sprite Activities (3 minutes)
- Fall 1998 Photometry Activities (7 minutes)
- Fall 1998 Instrument Design Activities (3 minutes)

REVIEW OF PREVIOUS PROGRESS

- Objective: build and orbit a satellite that performs meaningful science

- "Zeroth order" baseline design presented on September 3, 1997 and intended to:
  1) provide the other teams with a starting point for their work
  2) provide subsystem teams with approximate, size, mass & volume constraints
  3) provide a "benchmark" for evaluation of alternative mission concepts

- Prototype sensor designed and built to:
  1) provide subsystem teams with design details not available from baseline design
  2) test certain of the baseline design flight hardware algorithms
  3) provide students with requested "hands-on" experience

- Semester Review in May, 1998, provided subsystem teams with:
  1) Approximate Flux Values
  2) Approximate Data Rates
  3) Preliminary Data Format
  4) Preliminary Bus Voltages
  5) Clarified Science Objectives

UASAT "ZEROTH ORDER" BASELINE DESIGN VS. OTHER LIGHTNING SENSORS

	LIS	OTD	UASAT Baseline
Optics	Wide-Field-of-View Lens	Wide-Field-of-View Lens	Reflector
Field of View	80x80 degrees	100x100 degrees	5x5 degrees
Field of View	600x600 km	1300x1300 km	1100x200 km
Sensor Size	8 inch diam x 14 inch	8 inch diam x 15 inch	6 inch diam x 20 inch
Spatial Resolution	5-10 km	10 km	10 km
Wavelength	777.4 nm	777.4 nm	All Visible
Detector	Photodiode Array	Photodiode Array	CCD
Detector Size	128 x 128	128 x 128	TBD
Temporal Resolution	2 ms	2 ms	TBD
Power	25 watts	70 watts	TBD

FALL 1998 LIGHTNING ACTIVITIES

- Began Detailed Investigations of OTD & LIS.
- Began Investigation of Polar Lightning Observations
- Developed Mission Operation Timeline & Protocols
- Continued Development of Detailed Lightning Detection Algorithm
- Located Experimental Prototype CCD Optimized for Lightning Detection
- Began Trade-off Studies and Definition of Alternative Mission Concepts
  - Statistical Significance of Lightning Counts vs. Sensor Field of View
  - Readout Speed vs. Statistical Significance of Lightning Counts
  - Power Consumption vs. Readout Speed
  - Power Consumption vs. Observation Duration
  - Observation Duration vs. Statistical Significance of Lightning Counts
  - Readout Speed vs. Processor Size
  - Processor Size vs. On-Board Storage of All Images
  - Processor Size vs. Real-time Downlink
  - CCD vs. Photodide Array
  - Detector Dynamic Range vs. Statistical Significance of Lightning Counts

FALL 1998 SPRITE ACTIVITIES

- Field Tested Prototype in Yucca Ridge Colorado
  - Identified Necessary Improvements: Wide FOV Guiding Camera
    - Mounting and Pointing Improvements
    - CCD Exposure Trigger
- Designed Laboratory Test Apparatus for "Simulated Sprites"
- Continued Development of Detailed Sprite Detection Algorithm
- Began Investigation of Statistical Sampling Requirements for Scientific Merit
- Began Trade-off Studies:
  - Detector Dynamic Range vs. Statistical Significance of Spite Counts
  - Scientific Merit vs. Image Resolution
  - CCD vs. Photodide Array
- Began Investigation of Alternative Sprite Detection Concepts:
  - Separate Intensified CCD Camera
  - Electronic vs. Optical Image Processing (Power Consumption)
  - RF Signature Detection
- Began Investigation of Alternative Air Glow/Aurora Discrimination Concepts:

FALL 1998 PHOTOMETRY ACTIVITIES

- Completed Design and Construction of Basic Optical and Electronic Prototype
  -- David Sing & Guthrie Partridge
- Began Design of Filter Wheel and Aperture Wheel
- Interfaced Prototype Detector to Data Acquisition Board via LabView Software
- Began Definition of Target List and Filter Selection
- Began Trade-off Studies:
  - Exposure Times & Detector Sensitivity vs. Scientific Merit
  - Scientific Merit vs. Aperture Size
  - Scientific Merit vs. Pointing Accuracy and Stability
  - Power Consumption & Complexity vs. Internal Pointing Correction (Fold-Mirror)
- Began Studies to Quantify Accuracy Goals and Calibration Methodology
- Began Feasibility Study for Extra-Solar Planet Detection

FALL 1998 INSTRUMENT DESIGN ACTIVITIES

- Obtained Machine Shop Training for 6 Team Members
- Prepared Recruiting Letters In August, 1998 to Meet Need for Optical and Electrical Engineering Students
- Began Trade-off Studies:
  - Optimization for Photometry vs. Lightning Detection
  - Optical Speed vs. Field of View
  - Reflector vs. Refractor
  - Resolution of Most of These Issues Dependent on Results of Lightning, Sprite and Photometry Studies
- Began Investigation of Wynn Inverse Cassegrain Design (7 degree FOV Reflector)
- Struggled with the task of developing a single sensor for three independent science experiments