Report to the LWS MOWG
"Space-Based Ionosphere-Thermosphere Research Conference
The Next Steps"

October 17 - 19, 2007

Manhattan Beach Marriott, Manhattan Beach, CA

http://www.aero.org/conferences/sbitr/index.html

September 20, 2007

Anthony J. Mannucci, Co-Organizer

LWS MOWG Meeting

Conference Purpose

- Discuss the state of ionosphere-thermosphere (I/T) research in the context of the coupled sun-Earth system
- Focus on space-based missions and investigations that advance knowledge and enable exploration of this region
- Establish community consensus in planning for future I/T missions
- Delineate areas of investment that should be addressed.
- Conference products
  - Papers, executive summary, mission list by priority, size, etc.
- 15-year horizon

SPACE-BASED IONOSPHERE-THERMOSPHERE RESEARCH

Organizers

- J. Clemmons, The Aerospace Corporation, Chair
- G. Crowley, ASTRA
- K. Hand, The Aerospace Corporation
- R. Heelis, University of Texas at Dallas
- P. Kintner, Cornell University
- J. Kozyra, University of Michigan
- A. Mannucci, JPL
- L. Paxton, JHU/APL
- R. Pfaff, NASA/GSFC
- R. Robinson, NSF
- J. Spann, NASA/MSFC
- J. Thayer, University of Colorado

SPACE-BASED IONOSPHERE-THERMOSPHERE RESEARCH

Agenda: Day 1

- Programmatic Talks
  - Aerospace/DoD, NASA, NSF
- Applications
  - Satellite drag
  - Turbulence forecasting
  - GPS
  - Situational awareness
  - Forecast models
- Science
  - Systems approach
  - Fundamental processes
  - Ionosphere-thermosphere-magnetosphere coupling
  - Atmosphere-ionosphere-thermosphere coupling
  - Conductance impacts on magnetosphere
  - Planetary atmospheres
  - Modeling

Agenda: Day 2

- Tools For Science
  - Next generation models
  - In-situ measurements
  - Imaging
  - Radio-wave remote sensing (GPS, active sounders)
  - Small satellites
  - Mission size considerations
- Missions
  - Current
  - In formulation (all non-NASA, except for one instrument)
  - Existing concepts
  - Newer concepts
- New Technology

Agenda: Day 3

Roundtable Discussions

- Summary: science and applications
- Future missions
- Next steps
- Meeting products

Remarks

- The conference is a grass roots response to a lack of mission opportunities
- How should the community respond to future opportunities?
  - NASA Roadmapping
  - International collaboration
- How can the community help create opportunities?

SPACE-BASED IONOSPHERE-THERMOSPHERE RESEARCH

TABLE ES.1 Priority Order of the Recommended Programs in Solar and Space Physics

Type of Program	Rank	Program	Description
Large	1	Solar Probe	Spacecraft to study the heating and acceleration of the solar wind through in situ measurements and some remote-sensing observations during one or more passes through the innermost region of the heliosphere (from ~0.3 AU to as close as 3 solar radii above the Sun's surface).
Moderate	1	Magnetospheric Multiscale	Four-spacecraft cluster to investigate magnetic reconnection, particle acceleration, and turbulence in magnetospheric boundary regions.
	2	Geospace Network	Two radiation-belt-mapping spacecraft and two ionospheric mapping spacecraft to determine the global response of geospace to solar storms.
	3	Jupiter Polar Mission	Polar-orbiting spacecraft to image the aurora, determine the electrodynamic properties of the Io flux tube, and identify magnetosphere-ionosphere coupling processes.
	4	Multispacecraft Heliospheric Mission	Four or more spacecraft with large separations in the ecliptic plane to determine the spatial structure and temporal evolution of coronal mass ejections (CMEs) and other solar-wind disturbances in the inner heliosphere.
	5	Geospace Electrodynamic Connections	Three to four spacecraft with propulsion for low-altitude excursions to investigate the coupling among the magnetosphere, the ionosphere, and the upper atmosphere.
	6	Suborbital Program	Sounding rockets, balloons, and aircraft to perform targeted studies of solar and space physics phenomena with advanced instrumentation.
	7	Magnetospheric Constellation	Fifty to a hundred nanosatellites to create dynamic images of magnetic fields and charged particles in the near magnetic tail of Earth.
	8	Solar Wind Sentinels	Three spacecraft with solar sails positioned at 0.98 AU to provide earlier warning than L1 monitors and to measure the spatial and temporal structure of CMEs, shocks, and solar-wind streams.
	9	Stereo Magnetospheric Imager	Two spacecraft providing stereo imaging of the plasmasphere, ring current, and radiation belts, along with multispectral imaging of the aurora.
Small	1	Frequency-Agile Solar Radiotelescope	Wide-frequency-range (0.3-30 GHz) radiotelescope for imaging of solar features from a few hundred kilometers above the visible surface to high in the corona.