# Highlights from the April 2007 LCANS Workshop


Eliot F. Young
*Southwest Research Institute*

NASA Balloon Community Workshop, 7 AUG 2007

# Workshop Goals

From the workshop homepage: <www.boulder.swri.edu/LCANS>

- Teach participants about all aspects of current balloon programs.
- Discuss potential technologies for cheaper, lighter, more effective balloon platforms.
- Discuss "what-if" science that could be accomplished with routine access to near-space.
- Discuss strategies to grow support at NASA and NSF for LCANS.

# Sessions: present, future, and how to get there.

- SESSION 1 (THU Morning): Introduction to Balloons and NASA's Balloon Programs
- SESSION 2 (THU Afternoon): Current Balloon Efforts
- SESSION 3 (FRI Morning): Enabling Technologies for Low-Cost/ Lightweight Balloon Missions
- SESSION 4 (FRI Afternoon): "What if" Science Drivers
- SESSION 5 (SAT Morning): Making the Case for LCANS

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- SESSION 5 (SAT Morning): Making the Case for LCANS

1. 8:45-9:00; Welcome to workshop & orientation notes (Eliot Young, SWRI)

2. 9:00-9:50; A technical introduction to balloon missions (Steve Smith, SWRI)

3. 9:50-10:20; A practical introduction to NASA's balloon programs (David Pierce, NASA)

4. 10:35-11:05; NASA's balloon-based research opportunities (Vernon Jones, NASA)

5. 11:05-11:15; The near space environment and electrostatic discharge (Cindi Schmitt, ASRC Aerospace)

6. 11:15-12:00 Panel session (Vernon Jones, David Pierce, Steve Smith)

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7. 1:15-1:45; Gamma-ray astronomy from balloons. (Jack Tueller, NASA)

8. 1:45-2:15; FIREBALL: Faint Intergalactic medium Redshifted Emission Balloon (David Schiminovich, Columbia University)

9. 2:15-2:45; LSU's HASP payload (T. Greg Guzik, LSU)

10. 3:00-3:20; BalloonSat flight computers (L. Paul Verhage, Author/Teacher)

11. 3:20-3:40; Edge of Space Sciences balloon launches (Michael Manes, EOSS)

12. 3:40-4:10; Colorado Space Grant BalloonSat and MicroSat programs (Brian Saunders, CO Space Grant Consortium)

13. 4:10-4:30; Balloon mission concepts for Titan (Ralph Lorenz, JHU/APL)

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15. 8:30-9:00; Small balloons 1 (Mike Smith, Aerostar)
16. 9:00-9:30; Small balloons 2 (Tim Lachenmeier, Near Space Corp.)
17. 9:30-9:50; Balloon telemetry & communications (Gerald Knoblach, Space Data Corp.)
18. 9:50-10:05; The Mars Aerobot: A Lightweight Planetary Balloon Payload (Alberto Behar, JPL)
19. 10:20-10:40; Lightweight telescopes 1 (Bob Martin, Composite Mirror Applications)
20. 10:40-11:00; Lightweight telescopes 2 (Ed Friedman, Ball Aerospace)
21. 11:00-11:20; Pointing and stabilization of lightweight balloon-borne telescopes (Larry Germann, Left Hand Design Corporation)

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23. 1:15-1:35; Boat Launches of Medium-Sized Payloads (Bill Brown, High Altitude Research Corporation)

24. 1:35-2:00; Cosmic rays: The need for large payloads (T. Greg Guzik, LSU)

25. 2:00-2:25; Space Physics (David Klumpar, MSU)

26. 2:25-2:45; Solar observations (Craig DeForest, SWRI)

27. 3:00-3:20; Cosmic Microwave Background Observations (Shaul Hanany, UMN)

28. 3:20-3:40; Balloon observations of Occultations (Cathy Olkin, SWRI)

29. 3:40-4:00; Continuous observations of the inner Solar System: mapping Venus's winds (Mark Bullock, SWRI)

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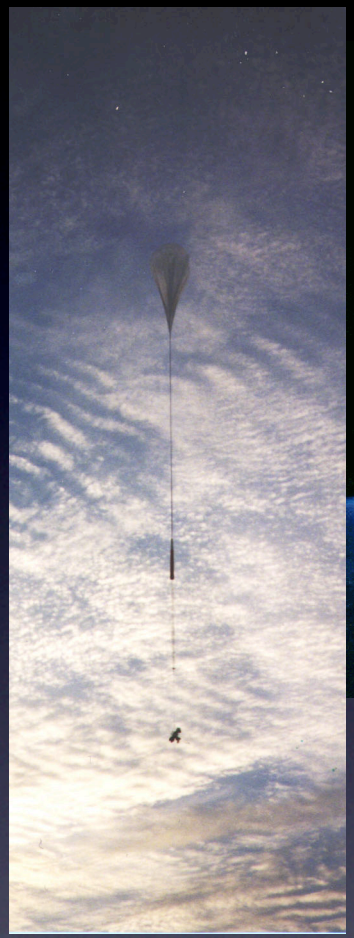
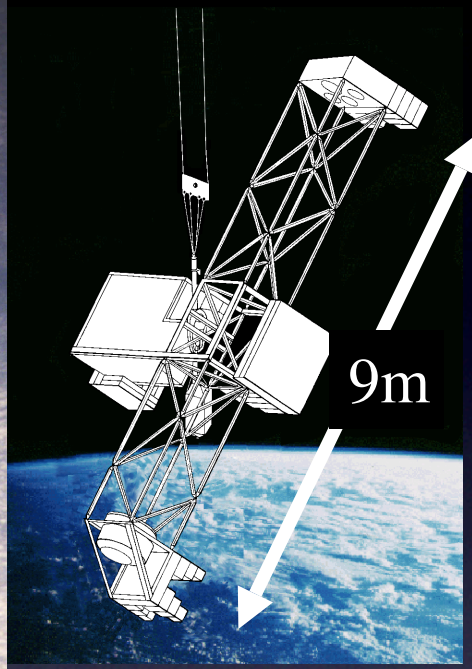
31. 9:00-9:30; Addressing the science priorities in NASA's Strategic Plans (Jonathan Ormes, DU)

32. 9:30-10:00; The case for a low-cost small-balloon program in SMD Planetary Division (Philippe Crane, NASA HQ)

33. 10:15-10:45; LCANS Missions in the Context of NASA's Planetary Instrument Definition and Development Program (Jonathan Rall, NASA HQ)

# Assorted highlights from the talks...




- Launch of InFOCuS X-Ray telescope (Tueller).
- 9-m truss was launched without special mechanism.

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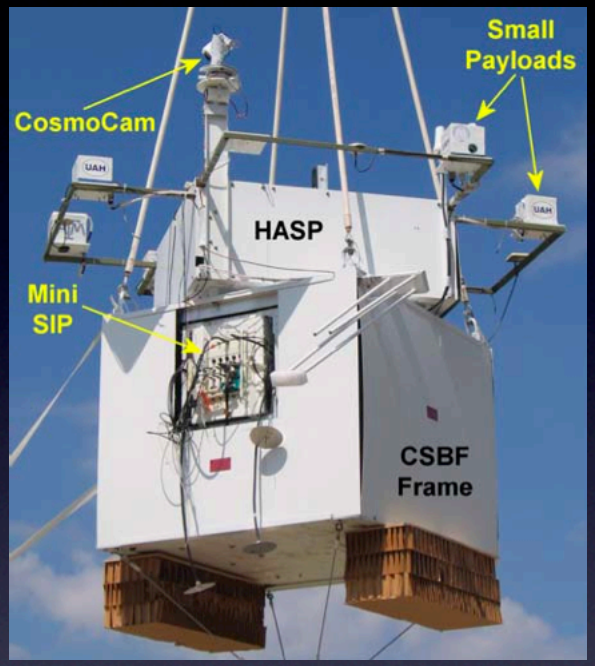
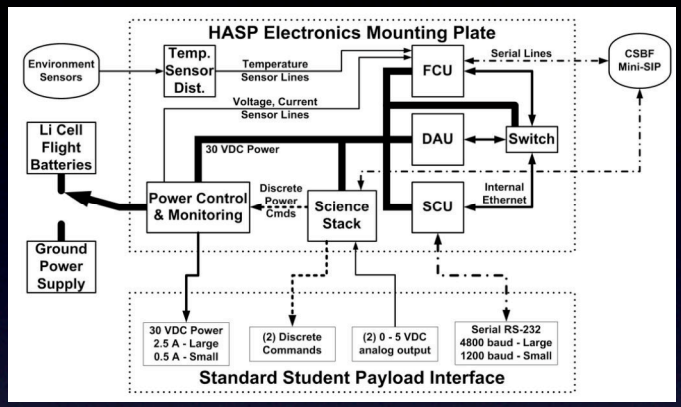
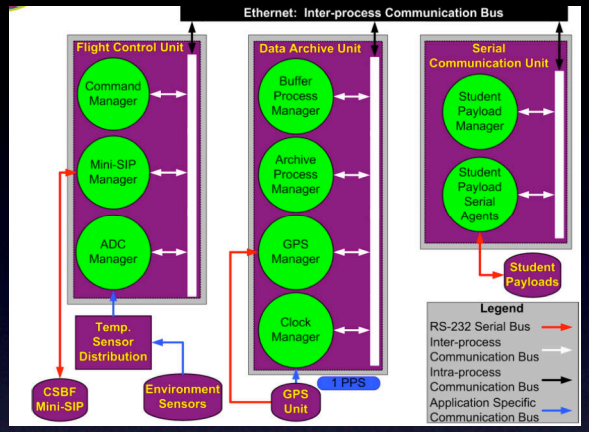



- Flew eight payloads from four institutions in Sept. 2006.
- Standard hardware interfaces & software interfaces.

HASP: The High Altitude Student Payload (Guzik)
<http://laspace.lsu.edu/HASP/>

# Assorted highlights from the talks...

**Small Balloons**

- Edge of Space Sciences (www.eoss.org)
- Colorado Space Grant Consortium
- High Altitude Research Corp. (http://www.harcspace.com/

# Assorted highlights from the talks...

**Medium Balloon Launches (30 - 200 lb)**

- Aerostar (Mike Smith)
- Near Space Corporation (Tim Lachenmeier)

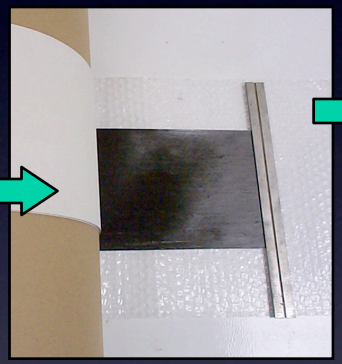
Shown here: Near Space Corp's "windsock" launch system. Features a two-stage balloon and a big canvas bag for deployment in winds up to 30 knots. Has the low cost and flexibility of a hand launch, but capability for larger payloads.

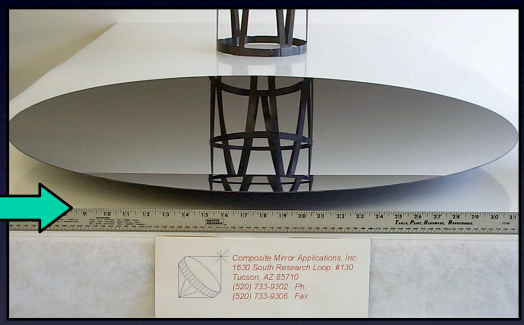

# Assorted highlights from the talks...

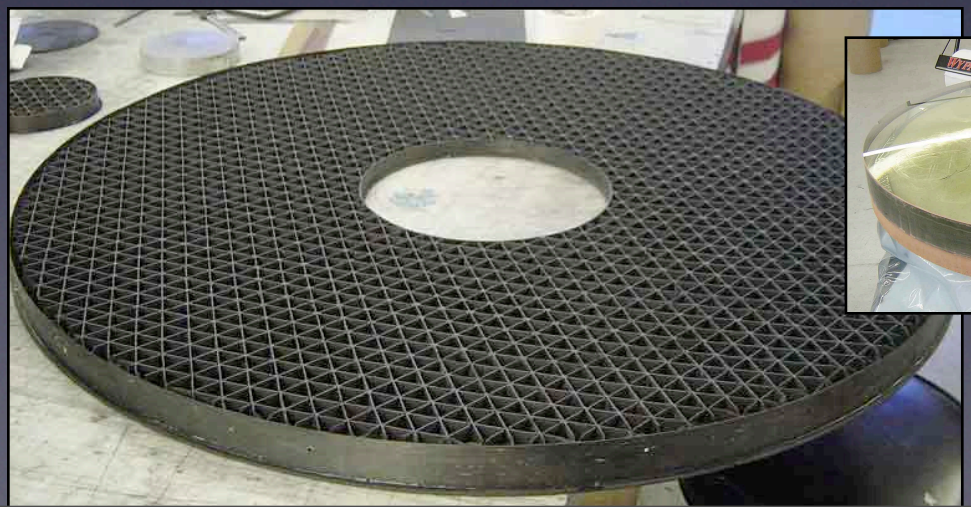
**Lightweight Mirrors**

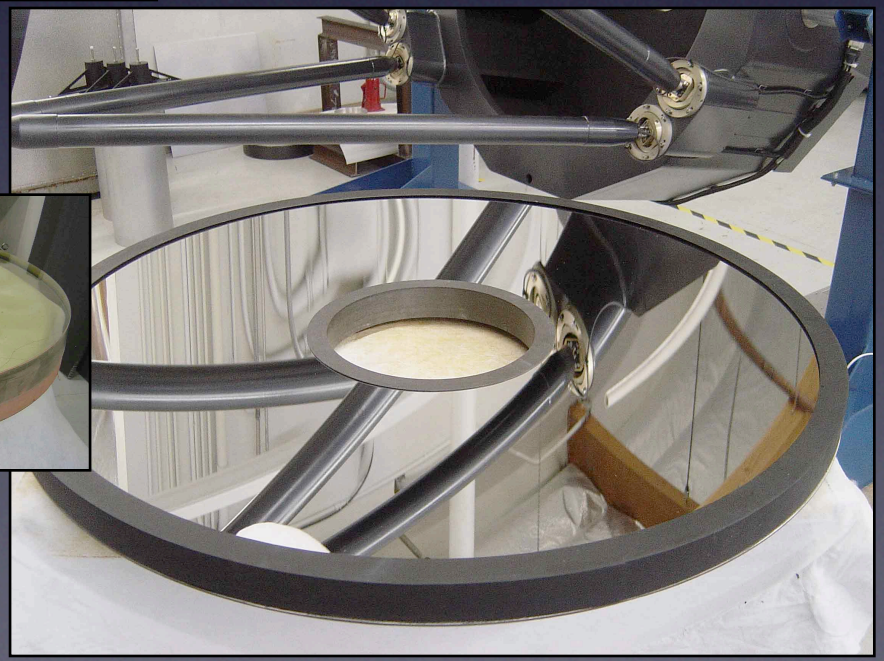
- Composite Mirror Applications (Bob Martin)
- Shown below: a 1-m telescope (27-lbs)

Mandrel CFRP Lay-Up Finished Product



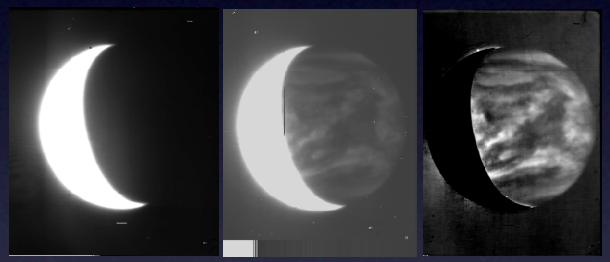




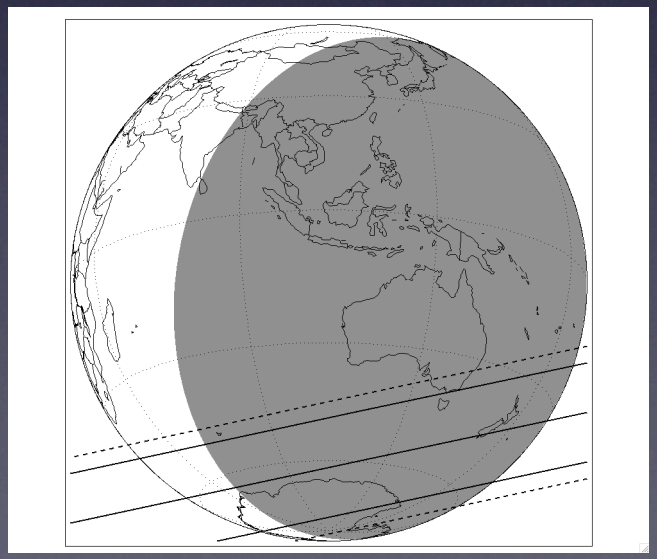
# Assorted highlights from the talks...

**Planetary Science Applications**

- Daytime observing (inner solar system)
- Occultation deployments
- Faint object surveys (e.g., Near Earth Asteroids)



Example: Venus nightside observations at 1.74 and 2.26 μm.



Example: Deploy a dozen small (disposable?) balloon telescopes from an airplane that flies perpendicular to the shadow path.

# Outcome from the LCANS Workshop: A white paper with 7 recommendations

- *Enable TRL 6 Qualification for Appropriate Balloon-Borne Instruments*. Currently balloon payloads cannot be qualified past TRL 4.
- *Establish a New Tier of Cross-Division Opportunities for LCANS Payload Development*. Currently NASA funds balloon payload development entirely through its R&A programs. There needs to be a separate funding opportunity for payload development (e.g., *TEX*).
- *Develop Separate Large and Small Opportunities within the Balloon Program Itself*. Need to have a balance of large and small missions within the balloon program itself.

<http://www.boulder.swri.edu/LCANS/LCANS07_WhitePaper.pdf>

# Outcome from the LCANS Workshop: A white paper with 7 recommendations

- *Develop Multiple-Payload Missions*. Like *HASP*.
- *Formally Promote Rideshare (aka "Hitchhiker") Opportunities*. Formal opportunities for small payloads that can be competed (analogous to HST "snapshot" opportunities).
- *Relax Restrictions/Accept Higher Risk for a Class of Balloon Missions*.
- *Change the Language in R&A Solicitations to Make Investigators Aware of LCANS Opportunities*.

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