

National Aeronautics and Space Administration



4 T H I N T E R N A T I O N A L Planetary Probe Workshop

HILTON PASADENA HOTEL

JUNE 27 - 30, 2006

PASADENA, CALIFORNIA, USA



Short Course
In Situ Instruments for Planetary Probes and Aerial Platforms
June 25 - June 26, 2006

Register Online:
<http://ippw.jpl.nasa.gov>



www.nasa.gov
Information: secretariat@ippw-4.jpl.nasa.gov



Fourth International Planetary Probe Workshop (IPPW-4)

Presented by
Jim Cutts &
Tibor Balint

at the
3rd VEXAG Meeting,
Washington, DC

Jan 11, 2007



4th International Planetary Probe Workshop

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Prior workshops:

- **International Workshop on Planetary Probe Atmospheric Entry and Descent Trajectory Analysis and Science**
 - October 6 - 9, **2003 - Lisbon**, Portugal
 - <http://www.mrc.uidaho.edu/entryws/>
- **2nd International Planetary Probe Workshop**
 - August 23 - 26, **2004 - Moffett Field**, California USA
 - <http://probews2.arc.nasa.gov/>
- **3rd International Planetary Probe Workshop**
 - June 27 - July 1, **2003 - Anavyssos**, Attica Greece
 - <http://www.ims.demokritos.gr/IPPW-3/>



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- 242 registered attendees
- Short course: over 70 registered
- Students: over 30 registered; many received ESA or NASA scholarships



*International Planetary Probe Workshop
June, 2006 Pasadena, California*



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WORKSHOP GOALS

- **Review the state-of-the-art** in science, mission design, engineering implementation and technology for the in situ robotic exploration of planets with atmospheres.
- **Share ideas**, mission opportunities, and emerging technologies to enable future mission success.
- **Serve as a forum** for initiating discussions on innovative methodologies and techniques for future missions to explore planets and satellites with atmospheres.
- Provide **young scientists and engineers** in the field of entry, descent, and flight in planetary atmospheres with the opportunity **to learn from experienced researchers and practitioners**.
- **Foster international collaboration** among the communities of scientists, engineers, and mission designers interested in planetary probes.



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SHORT COURSE (2 days): INSTRUMENTS FOR PLANETARY PROBES AND AERIAL PLATFORMS

- Lectures addressed:
 - **Science drivers** for instruments
 - **Instrumentation** for various mission phases:
 - In space phase
 - Entry or Aerocapture phase
 - Descent phase
 - Aerial platform operations
- **Case Study:** Titan In-Situ Exploration Mission Concepts
 - 3 Teams: (1) **Airship**; (2) **Hot air Balloon**; (3) **H₂/He Balloon**
 - Teams had about **4 hours** to come up with their concepts, utilizing the knowledge gained during the course
 - Each team gave a **presentation** to the full group on their design concept
 - The **teamwork environment** promoted interaction between experienced specialists and students



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WORKSHOP (3.5 days):

4th INTERNATIONAL PLANETARY PROBE WORKSHOP

- Technical Presentations
- Panel discussions (Summary & Conclusions)
- Posters
 - 51 posters, including student posters; and
 - a preflight student design of a small probe
- Exhibits by Agencies and Industry
 - Including full size Huygens probe mockup; other models; videos; posters of proposed missions
- Social Events:
 - IMAX movie on the MER rover
 - Banquet at Caltech Athenaeum





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PRESENTATIONS IN 8 SESSIONS:

- Current Outlook for Probe Missions
 - e.g., *ESA Cosmic Vision; NASA SSE Roadmap*
- Scientific Results from Probe Missions
 - e.g., *Huygens HASI; Trajectory reconstruction*
- In Situ Measurements of Earth's Atmosphere
 - e.g., *TPS technology; Sample returns: Stardust, Lunar missions; Earth balloons; Planetary unmanned aerial vehicles*
- Mission Concepts and Studies
 - e.g., *ESA VEP, JEP; NASA balloon; Exo-Mars; Saturn Probes*
- Sensors, Instruments and Sample Acquisition Systems
 - e.g., *instruments for MSL; miniaturization for probe missions; sample manipulation; p/T sensors; XRD/XRF; X-ray / Gamma-ray Spectrometer*
- Thermal Control and Pressure Vessels
 - e.g., *Beagle 2; Pressure vessel development at JPL; RHU's; RPSs*
- Electronics, Communication, and Batteries
 - e.g., *Extreme Environment mitigation: SiGe electronics; DC motors; SiC high T Electronics; Packaging for Venus & Mars In situ missions; Batteries for probes;*
- Entry, Descent, and Mobility Systems
 - e.g., *MSL EDL; Aerocapture; TPS for Mars, for ESA-Aurora; Mars dust effects; Balloons and balloons; Montgolfiere for Titan*



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SESSION 9: SUMMARY, DISCUSSION AND CONCLUSIONS

- Panel Discussions:
 - **International Cooperation** on Future Missions
 - *Panel chair: Jean-Pierre Lebreton*
 - **New Capabilities and Technologies** for Exploring Planets with Atmospheres
 - *Panel chair: Jim Cutts*
 - **Probe Missions** to Saturn and Beyond
 - *Panel chair: Sushil Atreya*
- Student Awards
- Plans for IPPW-5: Bordeaux, France!



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SUMMARY

- This year's workshop was **again a major success**
- It **brought together the** technology and science **community**
- This year, the **scope of the workshop** was **extended** from atmospheric entry only to in situ instruments on air mobility platforms
- The workshop **promoted international cooperation**, and fostered the interaction between international researchers, technologists and scientists
- It also **helped unify the probe community**, including students, who are the next generation of engineers and scientists
- The proceedings for the workshop will be published in the spring



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IPPW-5

- IPPW-5 will return to Europe in 2007. It will take place in Bordeaux, France on June 23-29 2007. For further details:
<http://www.rssd.esa.int/SM/IPPW>
- The short course (June 23-24) will be focused on “Controlled Entry and Descent into Planetary Atmospheres”
- The deadline for abstract submittal is 13 April, 2007
- A notice of paper acceptance will be give by 27 April, 2007
- A limited number of student travel scholarships will be available. Details can be found on the IPPW-5 website.



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Back up



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PRESENTATIONS

- Scientific results of past atmospheric entry probe missions, with implications for future explorations
- Applications of experiences gained from Earth atmospheric entry studies to future planetary probe missions
- Future mission concepts and studies
- Technical, environmental, and mission design issues of atmospheric entry probe missions
- Sensors, Instruments and Sample Acquisition Systems
- Technologies that manage thermal and pressure environments throughout the probe mission
- Capabilities and prospects of existing and emerging electronics, communications and battery technologies for operation in extreme environments encountered by the atmospheric probe missions
- Atmospheric entry, descent, and mobility technologies including thermal protection systems, parachute technologies, balloons, gliders etc.