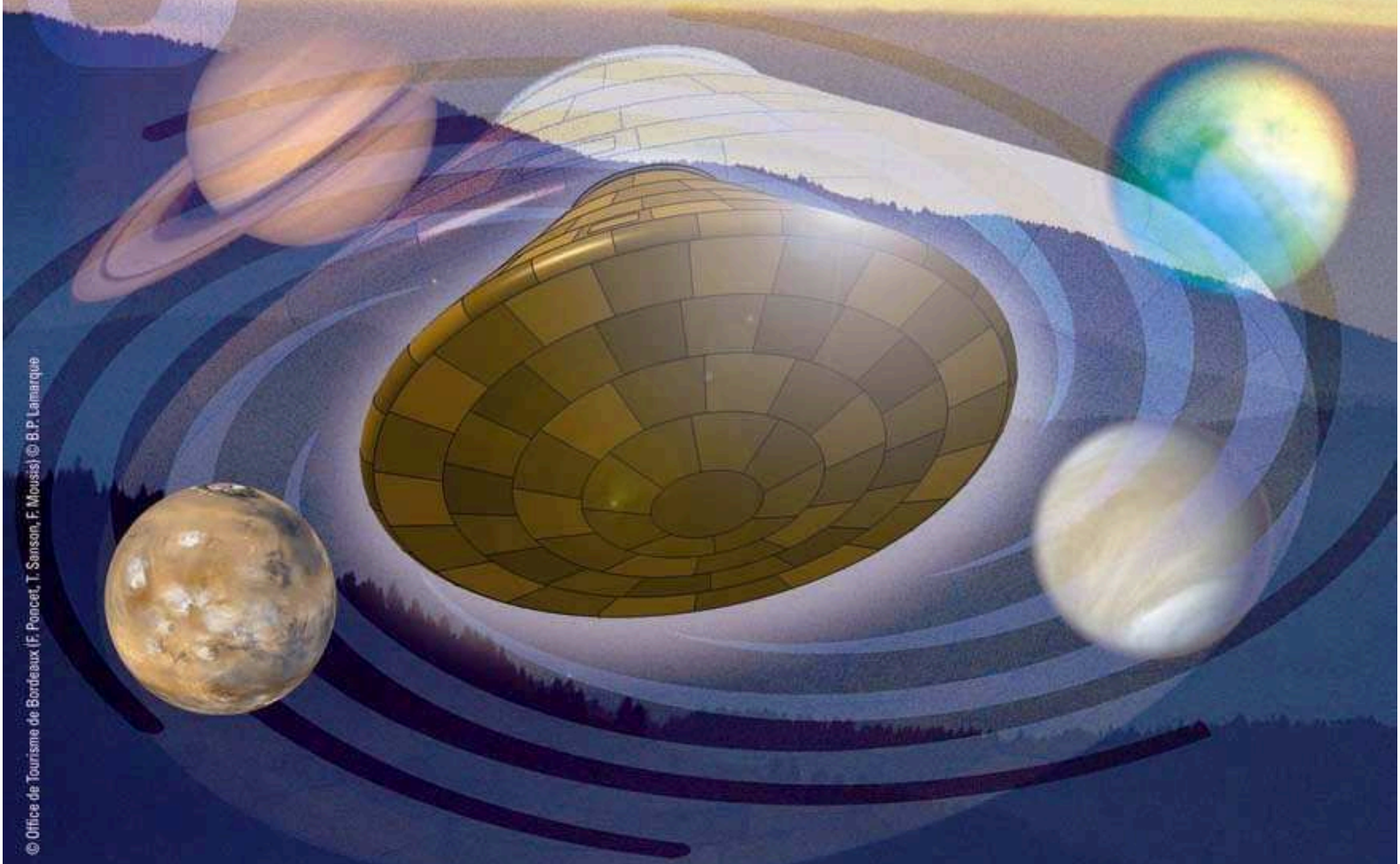
5TH INTERNATIONAL PLANETARY PROBE WORKSHOP

JUNE 25-29, 2007 – BORDEAUX, FRANCE



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PROGRAMME

Many thanks to IPPW5 Organizers and Sponsors.

PROGRAMME OVERVIEW:

The workshop programme will include invited talks, contributed talks, and posters. The current schedule of sessions with Session Conveners is provided below.

Monday June 25

OPENING, WELCOME

SESSION I: **CURRENT OUTLOOK.** CONVENERS: S. HUBBARD (SETI INSTITUTE) AND J.-P. LEBRETON (ESA/ESTEC)

SESSION II: **MISSION CONCEPT STUDIES AND SCIENCE DRIVERS OF TECHNOLOGY, AND SAMPLE RETURN – VENUS AND MARS.** CONVENERS: K. BAINES (JPL), B. BIENSTOCK (JPL), AND P. PLOTARD (EADS)

Tuesday June 26

SESSION III: **ENTRY, DESCENT AND LANDING CONCEPTS FOR CURRENT AND FUTURE MISSIONS BEYOND EARTH.** CONVENERS: M. WRIGHT (NASA-ARC), A. BALL (OPEN UNIV.), AND W. LEE (JPL)

SESSION IV: **TECHNOLOGY SYSTEMS - ELECTRONICS, INSTRUMENTS & SENSORS, COMMUNICATIONS & BATTERIES.** CONVENERS: P. BEAUCHAMP (JPL) AND TH. BLANCQUAERT (ESA/ESTEC)

BANQUET

Wednesday June 27

SESSION V: **MISSION CONCEPT STUDIES AND SCIENCE DRIVERS OF TECHNOLOGY – GIANT PLANETS AND TITAN.** CONVENERS: A. COUSTENIS (OBSERVATOIRE DE MEUDON) AND T. SPILKER (JPL)

FREE AFTERNOON – SOCIAL ACTIVITIES – EXCURSION TO SAINT-EMILION

Thursday June 28

SESSION VI : **ENTRY, DESCENT, AND LANDING TECHNOLOGIES FOR PLANETARY MISSIONS.** CONVENERS: N. CHEATWOOD (NASA LARC) AND D. LEBLEU (THALES ALENIA SPACE)

SESSION VII: **EMERGING, ENABLING, AND EXTREME ENVIRONMENT TECHNOLOGIES; CROSS-CUTTING TECHNOLOGIES.** CONVENER: L. PELTZ (BOEING)

SESSION VIII: (PART 1) **EARTH ENTRY, DESCENT, AND LANDING FOR SAMPLE RETURN AND CREWED MISSIONS.** CONVENERS: J. ARNOLD (NASA ARC) AND B. FOING (ESA/ESTEC)

Friday June 29

SESSION VIII: (PART 2) **EARTH ENTRY, DESCENT, AND LANDING FOR SAMPLE RETURN AND CREWED MISSIONS.** CONVENERS: J. ARNOLD (NASA ARC) AND B. FOING (ESA/ESTEC)

SESSION IX: **FUTURE OUTLOOK AND CLOSING SESSION.** CONVENERS: J. CUTTS (JPL) AND J.-P. LEBRETON **(ESA/ESTEC)**

POSTERS WILL BE DISPLAYED THROUGHOUT THE WORKSHOP

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Ralph Lorenz Applied Physics Lab Titan Johns Hopkins University
David Atkinson Univ. Idaho IOC / SCC telecon lead

IPPW5: Bordeaux, France, 25-29 June 2007

SESSION I: Current outlook
(S. Hubbard, J.-P. Lebreton)
Monday June 25, 8:30-12:00

9:00 - 9:30	**Opening remarks, Welcome, Logistics, etc..**
09:30-10:00	**(Invited) J. Green** *"The NASA's Planetary Science Missions and Plans"*
10:00-10:30	**(Invited) M. Blanc** *"Tentative Title:* ESA's Cosmic Vision"
10:30-10:45	**Break**
10:45-11:15	**(Invited) J. Blamont** "*Tentative Title: Ballooning in planetary atmospheres: history and perspectives"*
11:15-11:30	**Q&A and Discussion**
11:30-12:00	**Al Seiff Award Presentation: H. Niemann** *"Planetary Entry Probes and Mass Spectroscopy: Tools and science results from in situ studies of planetary atmospheres and surfaces"*
12:00-13:30	**Lunch**

Monday Lunch offered by: Snecma Propulsion Solide SAFRAN Group EADS astrium

SESSION II: Mission concept studies, and science drivers of technology, and sample return – Venus and Mars
(B. Bienstock, K. Baines, P. Plotard)
Monday, June 25, 13:30-17:00

13:30-14:00	**(Invited) J. Cutts, et al.** *"Exploration of Mars, Venus and Titan With Planetary Aerobots: A Pathway to Flight Readiness"*
14:00-14:30	**(Invited) F. Bonnefond** *"Soft-Landing and Hazard Avoidance Aspects for Future Exploration Missions"*
14:30-14:45	**K. Baines, et al.** *"Exploring Venus with Balloons: Science Objectives and Mission Architectures"*
14:45-15:00	**P. Régnier, et al.** *"The MoonTwins Mission Concept: An Affordable and Science Attractive European Mission to Validate MSR Soft Landing and Hazard Avoidance Technologies"*
15:00-15:15	**Break**
15:15-15:35	**(Invited) R. Trautner, et al.** *"The ExoMars Mission - Overview and Expected Results for Planetary Entry Probe Science and Engineering"*
15:35-15:50	**R. Nadalini, et al.** *"HP^3 TEM - A Sensor to Measure the Thermal Characteristics of the Subsurface Temperature of Terrestrial Planets and Asteroids: Results of the Thermal Test Campaign"*
15:50-16:05	**M. Murbach, et al.** *"Atromos - A Mars Companion Mission"*
16:05-16:20	**C. Peterson** **"***Mission Architecture Impacts on Venus Surface Probe Lifetime"*
16:20-16:35	**B. Parreira, et al.** *"Hazard Avoidance Techniques for Vision Based Landing: Performance Assessment and Consolidation Analyses"*
16:35-17:15	**Panel Discussion** Topic - TBD
17:15–18:00	**Poster Session II, III, IV, V(authors in attendance)**

SESSION III: Entry, Descent and Landing Concepts for Current and Future Missions Beyond Earth
(M. Wright, A. Ball, W. Lee)
Tuesday, June 26, 8:30-12:00

8:30-9:00	**(Invited) A.D. Steltzner** *"Mars Science Laboratory Entry, Descent and Landing System"*
9:00-9:30	**(Invited) V. Giorgio, et al.** *"ExoMars Mission and Spacecraft Architecture"*
9:30-9:45	**F. Beziat,** P. Arfi *"A Robust Entry, Descent and Landing System for the ExoMars mission"*
9:45-10:00	**M.J. Gazarik, et al.** *"Overview of the MSL Entry, Descent and Landing Instrumentation (MEDLI) Project"*
10:00-10:15	**Break**
10:15-10:30	**M.R. Grover,** P.N. Desai *"Evolution of the Phoenix EDL System Architecture"*
10:30-10:45	**J.L. Prince, et al.** *"2007 Mars Phoenix Entry, Descent, and Landing Simulation and Modeling Analysis"*
10:45-11:00	**B. Thompson, et al.** *"Design of an Entry System for Cargo Delivery to Mars"*
11:00-11:15	**R. Fisackerly, et al.** *"Entry, Descent and Landing for Mars Sample Return : The European Technology Development and Demonstration Approach"*
11:15-11:30	**C. Wilson,** N.S. Wells *"Balloon-Deployed Probes for Venus"*
11:30-12:00	**Open Mic, Q&A, Panel Discussion, etc**
12:00-13:30	**Lunch**

SESSION IV: Technology Systems, Electronics, Instruments and Sensors, Communications and Batteries
(P. Beauchamp, Th. Blancquaert)
Tuesday, June 26, 13:30-17:00

13:30-14:00	**(Invited) T.S. Balint, et al** *"Extreme environments Technologies for Probes to Venus and Jupiter"*
14:00-14:15	**K. Andrews,** D. Divsalar, S. Dolinar, F. Pollara *"Radiation Tolerance and Information Theory"*
14:15–14:30	**J.-J. Berthelier,** M. Godefroy, M. Hamelin, E. Seran, F. Simões, S. Yahi, CETP/IPSL, and the ARES team, *"Balloon Flight Validation of ARES, an Atmospheric Electricity Instrument proposed for the ExoMars-GEP"*
14:30–14:45	**R.J. Brill**, T.N. Le, P. Papadopoulos, *"Development and Characterization of a compact Sun Photometer for Planetary Applications"*
14:45–15:00	**S. Sheridan**, S.J.Barber, G.H.Morgan, D.Morse, I.P.Wright, *"Miniaturized mass spectrometry for future space flight applications"*
15:00–15:15	**D. T. Young** & J. Hunter Waite, *"Ultra-high resolution Mass Spectrometry for Planetary Probes"*
15:15–15:30	**Break**
15:30–16:00	**(Invited) Brian J. Drouin**, John C. Pearson, Frank W. Maiwald, *"Rotational Spectroscopy on Planetary Probes"*
16:00–16:15	**V. Lazic** (ENEA), et al. *"Laser induced Breakdown Spectroscopy of soils, rocks and ice at subzero temperatures in simulated Martian conditions"*
16:15–16:30	**J. Apa**, J.M. Lafleur, and J.L. Sharma, *"Modification of Deep Space 2 Mars Microprobes for Earth Asteroid Investigation"*
16:30–16:45	**B. White**, et al. *"SOAREX-VI Re-entry Flight Test Experiment – Electronic Systems of the Slotted Compression Ramp (SCRAMP) Probe"*
16:45–17:00	**K.-M. Cheung,** *"Probabilistic Instrument Data Generation Analysis Using a Variant of Saddle-Point Approximation"*
17:00–18:00	**Poster Session VI, VII, VIII (authors in attendance)**

19:30-23:00	**Workshop Banquet** *(precise timing to be confirmed)*

Banquet Dinner offered by : ThalesAlenia Space — A Thales / Finmeccanica Company

Oenological Animation offered by : cea

SESSION V: Mission Concept Studies and Science Drivers of Technology- Giant Planets and Titan
(A. Coustenis, T. Spilker)
Wednesday, June 27, 2007, 8:30-12:00

8:30-8:50	**(Invited) S. Atreya, S. Bolton, A. Coustenis, D. Gautier, T. Guillot, P. Mahaffy, B. Marty, H. Niemann, T. Owen** *"Formation of giant planets and their atmospheres: entry probes into Saturn and Beyond"*
8:50-9:05	**B. Marty, T. Guillot, A. Coustenis, and the KRONOS Team** *"Kronos - Saturn exploration with probes"*
9:05-9:20	**M. Ayre, P. Regnier, J.-M. Bouilly, S. Kemble** *"Mission Design Consequences of a Jovian Atmospheric Probe"*
9:20-9:40	**T. Balint, et al.** *"JPL's studies of Mission to Saturn with Probes"*
9:40-9:55	**P. Subrahmanyam and P. Papadopoulos** *"Aerothermal Analysis for Planetary Entry Probes Using DOTNET Framework and OLAP Cubes database"*
9:55-10:15	**Break**
10:15-10:30	**H. Niemann** *"The Huygens Probe Gas Chromatogragh Mass Spectrometer Experiment Results and Lessons learned"*
10:30-11:10	**(Invited) T.R. Spilker and A. Coustenis** *"Mission Concepts for Titan Exploration"*
11:10-11:25	**R. Lorenz** *"Practical Balloon Designs for Titan"*
11:25-11:40	**A. Elfes, J. L. Hall, J. A. Cutts** *"Autonomy technologies for self-propelled and wind-driven aerobots"*
11:40-12:00	**Q&A and DISCUSSION**

12:00 – 13:30	**Lunch (for participants to excursion to Saint-Emilion)**
13:30 – 19:00	**Excursion to Saint-Emilion** *(precise timing to be confirmed)*

SESSION VI: Entry, Descent, and Landing Technologies for Planetary Missions
(N. Cheatwood, D. Lebleu)
Thursday, June 26, 8:30-12:00

8:30-8:55	**(Invited) J.-M. Muylaert, et al.** *"Expert Aerothermodynamic Flight Instrumentation Environment andIintegration"*
8:55-9:15	**J.E. Theisinger** *"Hypersonic Aerodynamic Aeroshell Shape Optimization"*
9:15-9:35	**A.A. Dyakonov, et al.** *"Aerodynamic Interference Effects and Aeroheating Augmentation due to Operation of the Reaction Control System during Atmospheric Entry"*
9:35-9:55	**R.A. Gowen, et al.** *"Kinetic Micro-Penetrators for Exploration of Solar System Bodies"*
9:55-10:05	**Break**
10:05-10:30	**(Invited) M. Adler** *"Mars EDL Capability Drivers and Technology Needs"*
10:30-10:50	**I. Clark, et al.** *"Design and Development of an Inflatable Supersonic Tension Cone Decelerator"*
10:50-11:10	**B. Laub, et al.** *"Requirements for Development of Thermal Protection Materials for Multiple Missions"*
11:10-11:30	**S.T. Surzhikov, D.V. Kotov** *"Computational Aerophysics of Space Vehicles for Planetary Missions"*
11:30-12:00	**Open Mic, Q&A, Panel Discussion, etc**
12:00-13:30	**Lunch**

Thursday Lunch offered by :

REGION AQUITAINE

aerospace vallée valley

SESSION VII: Emerging, Enabling, and Extreme Environment Technologies; Cross-Cutting Technologies
(L. Peltz)
Thursday, June 28, 13:30-17:00

13:30-14:00	**(Invited) A. Keys** *"Radiation Hardened Electronics for Space Environments"*
14:00-14:15	**P. Estabrook, et al.** *"Robust, Miniaturized Avionics Suite for Network-Enabled Deep Space Probes"*
14:15-14:30	**W. Schmidt, A Mälkki,** *"Single-Chip FPGA-based Processor-Sensor-Controller"*
14:30-14:45	**L. Peltz, et al.** *"Silicon Germanium (SiGe) Technology for Europa Missions"*
14:45-15:00	**M. Alles, et al.** *"Simulation of Radiation Effects for Performance Prediction and Design Optimization of Electronic Systems"*
15:00-15:15	**Break**
15:15-15:45	**(Invited) W. Johnson** *"Electronics Packaging for Extreme Environments"*
15:45-16:00	**G.W. Hunter, et al.** *"High Temperature Electronics, Communications, and Supporting Technologies for Venus Missions"*
16:00-16:15	**J.P. Roux, et al.** *"PU-238 Radio-Isotopic Thermoelectric Generator (RTG) for Planets Exploration"*
16:15-16:30	**D. Ila, et al.** *"Highly Efficient Thermoelectric Materials: Nano-Layered Nanoclusters"*
16:30-16:45	**B. Farkin, et al.** *"Real-Time 3D Collaborative Design Simulation in Support of NASA and ESA Planetary Exploration Programmes"*
16:45-17:00	**Q&A and technical summary**

SESSION VIII: Earth Entry, Descent and Landing (EDL) for Sample Return and Crewed Missions (Part 1)
(J. Arnold, B. Foing) Thursday, June 28, 17:15 - 18:35

17:15-17:45	**(Invited) D. Kontinos and M. Stackpoole** *"Overview of Post-Flight Analysis of the Stardust Sample Return Capsule Entry"*
17:45-18:10	**(Invited) B. Foing** "Sample return from the Moon"
18:10-18:25	**P. Desai, and G. Qualls** "Reconstruction of the Stardust Entry"
18:25-18:35	**Discussion**

SESSION VIII: Earth Entry, Descent and Landing (EDL) for Sample Return and Crewed Missions (Part 2)
(J. Arnold, B. Foing) Friday, June 29, 8:30 - 10:00

8:30-8:50	**A. Moisheev, V. Vorontsov, M. Martynov, S. Alexashkin, V. Finchenko** *"Descent Vehicle for Delivery of Soil Samples from Phobos to the Earth"*
8:50-9:10	**(Invited) J. Reuther and E. Venkatapathy** *"Overview of Advanced Technology Development for Orion's Heat Shield"*
9:10-9:30	**(Invited) B. Bryant and J. Corliss** *"Orion Landing System Advanced Development"*
9:30-9:50	**G. Chen, C. De Tong, M. Ivanov, C. Ong, C. Seybold and D. Hash** *"Testing Lunar Return Thermal Protection Systems Using Sub-Scale Flight Test Vehicles"*
9:50-10:00	**Wrap-up discussion: 10 minute on Sample Return Technologies**
10:00-10:15	**Break**

SESSION IX : Future outlook
(J-P Lebreton, J. Cutts)
Friday, June 29, 10:15-12:30

10:15-10:35	**A. Coustenis, T. Spilker, K. Baines, B. Bienstock, P. Plotard** *"Highlights of new mission concept development"*
10:35-10:55	**P. Beauchamp, E. Kolawa, N.Cheatwood, A. Ball, L. Peltz, Th. Blancquaert** *"Highlights of technology developments"*
10:55-11:15	**S.Hubbard** (chair), Participants to be confirmed *"Prospects for international collaboration"*
11:15-11:30	*Overall discussion*
11:30-12:00	*Poster awards*
12:00-12:15	*Next Workshop, IPPW-6*
12:15-12:45	*Closing remarks*
13:00	*Workshop adjourn*

Poster session II : Mission concept studies, and science drivers of technology, and sample return – Venus and Mars
(B. Bienstock, K. Baines, P. Plotard)

Poster 2.1	**M. Forrest, et. al.,** *"Mars Anti-Polar Lander Network Mission: EDL and Science Station Design"*
Poster 2.2	**S. Otter, et. al.** *"Spectroscopy at the Martian Surface - Modelling and Future Instrumentation"*

Poster session III : Entry, Descent and Landing Concepts for Current and Future Missions beyond Earth
(M. Wright, A. Ball, W. Lee)

Poster 3.1	**G. Gelly** *"Guidance Viewpoints of Mars exploratory missions"*
Poster 3.2	**R. Lorenz** *"Identification of Atmospheric Turbulence Parameters in Dynamics Measurements on Probes and Balloons"*
Poster 3.3	**M. I. Gritsevich** *"Luminosity of gas at the entry of probes and natural cosmic bodies into planetary atmospheres"*
Poster 3.4	**A. Howard, A. Colaprete** *"Miniturization of atmospheric entry probes options for future planetary exploration missions"*
Poster 3.5	**C. Tang, M. Wright, K. Edquist, and A. Dyakonov** *"Simulation of Aftshell Features on the Mars Science Laboratory Entry Capsule"*
Poster 3.6	**R. H. Ramos** *"Status of ExoMars Mission Analysis and Design: Entry, Descent and Landing"*

Poster session IV : Technology Systems, Electronics, Instruments and Sensors, Communications and Batteries
(P. Beauchamp, Th. Blancquaert)

Poster 4.1	**F. De Filippis, A. Del Vecchio, A. Martucci; R. Savino** *"Flat faced water calorimetric probe for heat flux measurements in plasma wind tunnels"*
Poster 4.2	**A. Morris** *"In-situ monitoring of compounds in planetary atmospheres using a minaturised field assymetric ion mobility spectrometer (FAIMS)"*
Poster 4.3	**G.W. Hunter, R.S. Okojie, M. Krasowski, G.M. Beheim, G. Fralick, J. Wrbanek, P. Greenberg, P.G Neudeck, and J. Xu** *"Microsystems, Space Qualified Electronics, and Mobile Sensor Platforms for Harsh Environment Applications and Planetary Exploration"*
Poster 4.4	**R. Trautner** *"The ESA Planetary Science Archive - A Source of Science and Engineering Data from European Planetary Missions including the Huygens Data Archive"*
Poster 4.5	**J. Schlee** *"Thermal Protection System (TPS) Embedded Sensor Technologies"*
Poster 4.6	**Y. Lin** *"To preserve and to protect - planetary protection considerations for planetary probes and in situ instruments"*
Poster 4.7	**University of Idaho Team ThermaSense** *"Wireless sensors in thermal protection systems"*

Poster session V : Mission Concept Studies and Science Drivers of Technology-Giant Planets and Titan
(A. Coustenis, T. Spilker)

Poster 5.1	**G. Bampasidis, X. Moussas** *"Future probe instrumentation in Titan : Seismograph?"*
Poster 5.2	**G. Bampasidis, A. Coustenis, X. Moussas** *"Titan : Determination of the local tectonic field at the Titan lake observed from the Cassini flyby on february 2007"*
Poster 5.3	**K. Sugiyama, M. Odaka, K. Nakajima, Y.-Y. Hayashi** *"Numerical Modeling of Moist Convection in Jupiter's atmosphere and future Jupiter probe mission"*

Poster session VI :
Entry, Descent, and Landing Technologies for Planetary Missions
(N. Cheatwood, D. Lebleu)

Poster 6.1	**J. Lachaud** *"A new experimental/theoretical approach to measure and extrapolate the ablative properties of TPS materials"*
Poster 6.2	**K. G. Medlock and J. M. Longuski** *"Aerocapture Ballutes for the Exploration of the Solar System"*
Poster 6.3	**I. Dupzyk** *"Current status of design, construction, and testing of supersonic parachutes for Mars EDL applications"*
Poster 6.4	**M. Capuano** *"ExoMars descent module EDL simulator"*
Poster 6.5	**B. Van Ootegem, D. Conte, J.M. Bouilly** *"Improvements on aerothermal flow characterization of industrial facilities"*
Poster 6.6	**J. McKinney** *"Mars Guided Parachute Guidance System for Wind Drift Compensation"*
Poster 6.7	**D. Pirotais, I. Montois, D. Conte, N. Sauvage, O. Chazot** *"Overview of dust effects during Mars atmospheric entries : models, facilities and design tools"*
Poster 6.8	**C. L. Tanner** *"Optimization of Earth Flight Test Trajectories to Qualify Parachutes for Use on Mars"*
Poster 6.9	**J. Benito and K. D. Mease** *"Mars Entry Guidance for High Elevation Landing"*
Poster 6.10	**A. Sanz-Andres** *"Pararrotors for planetary atmosphere exploration"*
Poster 6.11	**J. Benton, N. Bialke, S. Bradburn, L. Garbowski, R. Lane, G. Manfull, M. Murbach** *"A small, high velocity reentry probe capable of reconstructing atmospheric parameters"*
Poster 6.12	**P. Arfi** *"Safeto-Mars a multi-body simulation for planetary entry, descent and landing"*
Poster 6.13	**M. Murbach** *"The SOAREX-VI Re-entry Flight Test Experiment"*
Poster 6.14	**E. Millour** *"The New Mars Climate Database"*
Poster 6.15	**M. Paton** *"Atmospheric modeling for realistic EDL scenarios"*
Poster 6.16	**A. Verges, R. Braun** *"Analysis of the Mars Pathfinder Parachute Drag Coefficient"*

Poster session VII : Emerging, Enabling, and Extreme Environment Technologies; Cross-Cutting Technologies
(L. Peltz)

Poster 7.1	**J. Founds** *"High-voltage series mosfet output driver in CMOS technologies for extreme environments"*
Poster 7.2	**V. Abidzina & al.** *"Effects of Glow-Discharge Plasma on Metals, Polymers and Glasses"*

Poster session VIII : Earth Entry, Descent and Landing (EDL) for Sample Return and Crewed Missions
(J. Arnold, B. Foing)

Poster 8.1	**G. Ferraro** *"Trajectory Optmization for an Atmospheric Re-Entry Test Bed"*
Poster 8.2	**R. Prakash and C. Dunn** *"An Altimeter and Velocimeter Trade Study for the Orion Terminal Descent System"*
Poster 8.3	**M. Ivanov, W. Strauss and R. Maddock** *"Entry, Descent and Landing Mission Design for the Crew Exploration Vehicle Thermal Protection System Flight Test"*
Poster 8.4	**S. Surzhikov and D. Kotov** *"Current Problems of Physical-Chemical Computational Fluid Dynamics Applied to Earth Re-Entry Space Vehicles"*
Poster 8.5	**C. Seybold, Ch. de Jong, C. Ong** *"Flight System Design for the Crew Exploration Vehicle Thermal Protection System Material -Qualification Flight Tests"*
Poster 8.6	**G. Vekinis and G. Xanthopoulou** *"Hybrid-TPS: Current Developments and Prospects"*