58th International Astronautical Congress

Touching Humanity: Space for Improving Quality of Life

Call for Paper & Registration of Interest

Hyderabad, India - September 24-28, 2007
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Harnessing the potential of space to enrich life on earth has been the driving spirit of ISRO. Today, space plays an important role in areas as diverse as tele-education, tele-medicine, telecommunication, TV and Radio, natural resource management, weather monitoring and disaster warning to name a few. Besides, ISRO has end-to-end capability in building space systems to carry out all these applications and to provide space based services to national and international customers.
Message from the President of the IAF

Our International Astronautical Congress in 2007 will take place in Hyderabad, India. This 58th Congress is being organized by the International Astronautical Federation in cooperation with the International Academy of Astronautics and the International Institute of Space Law. Our local hosts and co-organizers, the Astronautical Society of India and the Indian Space Research Organisation have selected a very fitting theme for the Congress: “Touching Humanity: Space for improving the quality of life.” With this theme we will focus on the growing use of space to improve the lives of mankind. Our colleagues in India have for many years been pursuing a wide range of space applications programs. We look forward to learning more about their accomplishments and plans during the Hyderabad Congress. The theme “Touching Humanity” also provides an opportunity to discuss the many robotic and human space exploration activities that expand our knowledge of the universe and inspire our citizens.

The 58th Congress will feature both the traditional oral lecture sessions as well as an enhanced program of interactive (poster) presentation sessions. We also are planning a series of plenary events and highlight lectures that focus on key topics of interest to the global space community. Our Congress will also commemorate the 50th anniversary of the launch of the first artificial satellite, the 40th anniversary of the Outer Space Treaty and the 50th anniversary of the International Geophysical Year.

The many volunteers who organize the Congress’ technical program, who plan the plenary and highlight lectures and who work on the Hyderabad Local Organizing Committee are preparing a very informative and exciting Congress that will reinforce the IAC’s reputation as the premier global space event. We invite you to join us at and to participate actively in the 58th International Astronautical Congress in Hyderabad.

James V. Zimmerman

Message from the Co-chairs of the Local Organising Committee

Astronautical Society of India and Indian Space Research Organisation are indeed delighted to have the opportunity to host the 58th International Astronautical Congress in Hyderabad during 24-28 September 2007. In more than one way, the year 2007 is significant for the global space community. Fifty years ago, the historic launch of Sputnik, heralded beginning of the Space era, which since then bestowed humanity with remarkable achievements and contributions to its development. Again it was forty years ago that a major milestone was crossed when the United Nation’s Outer Space Treaty entered into force in October 1967. It is fitting that we celebrate these and other unique footprints, which our generation has created in the field of space. Space has been of high significance to India, where over the last four decades it’s advancements were highly focused in meeting needs of society.

The International Astronautical Congress is being held in India after a long gap of nineteen years. I am sure that many of you still cherish the sweet memories of Bangalore Congress in 1988. Tremendous progress is made in diverse branches of space activities in India. India has not only sought to make space an instrument of development of geo-spatial technologies, thanks to the presence of National Remote Sensing Agency and several other leading institutions. This bustling city, with a four-century-old history, is the capital of Andhra Pradesh State and is fondly remembered by visitors for pearls, minarets and its unforgettable range of cuisine.

On behalf of host organisations and the local authorities, it gives me immense pleasure to invite you to participate in this Congress at Hyderabad, which I am sure, will provide you with enriching experience. We are eagerly looking forward to meeting you in this beautiful city of Hyderabad in September 2007.

Dr. B.N. Suresh
K.R. Sridhara Murthi
Message from the IPC Co-Chairs

The 58th International Astronautical Congress will be held from 24th to 28th September 2007 in Hyderabad, one of the major cities in India located in the central part of the Country. Hyderabad with its interesting historical places and traditional hospitality is blessed with pleasant climate around this time. An hour flight from here will take you to all major Indian cities like Delhi, Mumbai, Bangalore, Chennai etc. Hyderabad is the second Indian city to host the Congress in India.

Space systems all over the globe today play a very significant role in national development efforts and effectively utilize high technologies for development of space assets for the benefit of humanity. The theme of the Congress is therefore rightly chosen as “Touching Humanity: space for improving the quality of life”. The main theme reflects our focus and interest and we expect active participation and deliberations from space professionals, industries and students to promote the theme. Maximum attention will be given to structure the Plenary Events and Highlight Lectures to focus on major and interesting global space activities with the participation of eminent leaders and professionals from space faring nations. One or two sessions would necessarily address the defined theme of the Congress and also topic of regional interest.

With the active coordination of three major organizations, IAF, IAA, IISL the categorization of symposia has been well defined and this Congress will continue to maintain the good features of past Congresses. Efforts to improve upon the technical content wherever necessary based on the inputs from IPC Steering Group with the primary goal of improving the quality of the Congress has already been initiated and this will be further strengthened by rationalizing the sessions and by avoiding the duplication wherever possible, trying to keep compliance with the approved programme. Efforts initiated to streamline the poster session to enrich the presentation and to make it more interactive will get further impetus. You will find further information on this new initiative in the present announcement.

International space community is faced with many exciting challenges with increased focus towards the most extensive exploration of the Solar system. Technology developments to achieve cost effective space transportation system and efficient use of space for the benefit of society and mankind are attracting a lot of attention all over the globe. The Hyderabad Congress will provide the right platform to address and deliberate all these issues and to broadly define our future directions. We earnestly solicit your active participation and abstract submission. We look forward to see you all at Hyderabad, India in 2007.

Dr. B.N. Suresh

Prof. Richard Brook
The International Astronautical Federation (IAF)

The International Astronautical Federation (IAF) is a global space association established in 1951 to promote the exchange of information and to encourage international cooperation on space activities. The IAF’s 155 members include government agencies, companies, professional associations and research centers located in 45 countries around the world.

Each year the IAF organizes the International Astronautical Congress in cooperation with the International Academy of Astronautics (IAA) and the International Institute of Space Law (IISL). More than 2,000 space professionals, journalists and students participate in these annual meetings. The International Astronautical Congresses feature plenary presentations by key space officials and more than 100 technical sessions during which approximately 1,000 papers are presented on a wide variety of space program activities. Selected papers from each International Astronautical Congress are published in the journal Acta Astronautica.

The International Astronautical Federation manages an international remote sensing networking project and periodically sponsors symposia on current space topics. In collaboration with the United Nations, the IAF organizes an annual workshop for developing countries as well as seminars on space activities at U.N. meetings. The International Astronautical Federation – together with the Committee on Space Research (COSPAR) and the International Institute for Space Law (IISL) – also prepares an annual space activities report for the United Nations.

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E-mail: philippe.willekens@iafastro.org

Deputy Executive Director:
Mrs. Annie Moulin
E-mail: annie.moulin@iafastro.org

IAC Technical Program and Publications Coordinator:
Mrs. Valerie Noquet Renaud
E-mail: valerie.noquet@iafastro.org

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Ms. Rocio Caparros
E-mail: rocio.caparros@iafastro.org

Networking Projects Engineer:
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E-mail: thomas.hetier@iafastro.org
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- Argentine Association for Space Technology (ARGENTINA)
- ArianeSpace (FRANCE)
- Asociacion Argentina de Ciencias Espaciales (ARGENTINA)
- Association Aérospatiale & Astronautique de France (AAAF) (FRANCE)
- Association Tunisienne de la Communication (ATUCOM) (TUNISIA)
- Associazione Italiana di Aeronautica e Astronautica (AIDAA) (ITALY)
- Astronaut Technology Sdn Bhd (MALAYSIA)
- Astronautical Society of India (INDIA)
- Austrian Research Promotion Agency (AUSTRIA)
- Azerbaijan National Aerospace Agency (AZERBAIJAN)
- Babakin Science & Research Space Center (RUSSIA)
- Brazilian Space Agency (AEB) (BRAZIL)
- BrazilSat Commercial Space Services Ltda. (BRAZIL)
- British National Space Centre (BNOC) (UK)
- Bufete Capin Capdevielle y Asociados, S.C. (MEXICO)
- Bulgarian Aerospace Agency (BULGARIA)
- Canadian Aeronautics & Space Institute (CASI) (CANADA)
- Canadian Space Agency (CANADA)
- Central R&D Institute of Robotics and Technical Cybernetics (RUSSIA)
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- Centre National de Télédiffusion et de Télévision (CNET) (MOROCCO)
- Centre Spatial de Liège (BELGIUM)
- Centro de Investigacion y Difusion Espacial de Argentina (CIDA-E) (ARGENTINA)
- Centro Para el Desarrollo Tecnologico Industrial (CDTI) (SPAIN)
- Chinese Society of Astronautics (CHINA)
- Comisión Nacional de Actividades Espaciales (CONAE) (ARGENTINA)
- Commission d’Astronautique de l’Académie Roumaine (ROMANIA)
- Comisión Espacial Portuguesa Limitada (PORTUGAL)
- CSIRO Office of Space Science & Applications (COSA) (AUSTRALIA)
- Cyprus Astronautical Society (CYPRUS)
- Czech Space Office (CEZON REPUBLIC)
- Danish Astronautical Society (DENMARK)
- Dosassault Aviation (FRANCE)
- Design Bureau of Transport Machinery (KBTM) (RUSSIA)
- Deutsches Zentrums für Luft-und Raumfahrt (DGLR) (GERMANY)
- Deutsches Zentrum für Luft-und Raumfahrt e.V. (DLR) (GERMANY)
- Dutch Space (NETHERLANDS)
- EADS Astrium (FRANCE)
- EADS CASA España (SPAIN)
- EADS Space Transportation (FRANCE)
- Engineers Australia (EA) (AUSTRALIA)
- EURIST Association (FRANCE)
- Eurocopter Launch Services GmbH (GERMANY)
- European Space Agency (ESA)
- European Space Policy Institute (ESPI) (FRANCE)
- Eurospace (FRANCE)
- Federal Space Agency (RUSSIA)
- Fédération de Recherche “Énergétique, Propulsion, Espace, Environnement” (France)
- General Organization of Remote Sensing (GORS) (SYRIA)
- I Space-Prospex (FRANCE)
- IHI Aerospace Co. Ltd. (JAPAN)
- Indian Space Research Organization (ISRO) (INDIA)
- Indonesian National Institute of Aeronautics and Space (INDONESIA)
- Institut Français d’Histoire de l’Espace (FRANCE)
- Instituto Nacional de Pesquisas Espaciais (Brazil)
- Instituto Nacional de Tecnica Aeroespacial (INTA) (SPAIN)
- Instituto Politecnico Nacional (MEXICO)
- International Association for the Advancement of Space Safety (NETHERLANDS)
- International Launch Services (ILS) (USA)
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- Internationaläner Förderkreis für Raumfahrt Herman Oberth-Werhner von Braun (GERMANY)
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- Israel Society of Aeronautics & Astronautics (ISRAEL)
- Israel Space Agency (ISRAEL)
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- Italian Space Agency (ASI) (ITALY)
- Japan Aerospace Exploration Agency (JAXA) (JAPAN)
- Japan Society for Aeronautics and Space Sciences (JSASS) (JAPAN)
- Japanese Rocket Society (JAPAN)
- Kawasaki Heavy Industries (JAPAN)
- Khruzhinich State Research & Production Space Center (RUSSIA)
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- Korea Aerospace Research Institute (KARI) (KOREA)
- Law Offices of Stens and Tenen (USA)
- Lockheed Martin Corporation (USA)
- MASTI-Hungarian Astronautical Society (HUNGARY)
- MAIBs s.d. (FRANCE)
- Marsh SA (FRANCE)
- MDA Corporation (CANADA)
- Microcosm, Inc (USA)
- Mitsubishi Electric Corporation (JAPAN)
- Mitsubishi Heavy Industries, Ltd. (JAPAN)
- Moscow Aviation Institute (RUSSIA)
- National Aeronautics and Space Administration (NASA) (USA)
- National Aerospace Laboratory (NLR) (NETHERLANDS)
- National Oceanic and Atmospheric Administration (NOAA) (USA)
- National Space Agency of Ukraine (NSAU) (UKRAINE)
- National Space Society (USA)
- NIEC Toshiba Space Systems, Ltd. (JAPAN)
- Nethaers Agency for Aerospace Programs (NIVI) (NETHERLANDS)
- Netherlands Industrial Space Organisation (NISO) (NETHERLANDS)
- Netherlands Society for Aerospace (NETHERLANDS)
- Nigerian Meteorological Agency (Nigeria)
- Noris Astronautik Forening (DENMARK)
- Norwegian Space Centre (NORWAY)
- Novespace (FRANCE)
- Office National d’Études et de Recherches Aérospatiales (ONERA) (FRANCE)
- OHB System AG (GERMANY)
- Pakistan Space & Upper Atmosphere Research Commission (PAKISTAN)
- PBS Media Ltd. (USA)
- Polish Astronautical Society (POLAND)
- Prospective 2100 (FRANCE)
- Ramirez de Arellano y Abogados, S.C. Law Firm (MEXICO)
- Rocket Research Institute, Inc. (USA)
- Russian Academy of Sciences (RAS) (RUSSIA)
- Russian Technology Transfer Center (RUSSIA)
- SAAB Ericsson Space AB (SWEDEN)
- School of Engineering, UNAM (MEXICO)
- SENER Ingenieria y Sistemas S.A. (SPAIN)
- SES-GLOBAL (LUXEMBOURG)
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- Soderm (FRANCE)
- Space Communications Corporation (IRAN)
- Space Generation Advisory Council “SGAC” (AUSTRIA)
- Space Policy Institute, George Washington University (USA)
- Spacehab, Inc. (USA)
- Spaceweek International Association (USA)
- Starsem (FRANCE)
- Sunsat Energy Council (FRANCE)
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THE INTERNATIONAL ACADEMY
OF ASTRONAUTICS (I.A.A.)

The Academy is an international community of leading experts (1221 members) committed to expanding the frontiers of space, the newest realm of human activity. To foster the development of astronautics, the Academy undertakes a number of activities, including the recognition of outstanding contributors through election and awards. It also facilitates professional communication, develops and promotes new ideas and initiatives, engages the public, and fosters a sense of community among the members.

This is a unique non-governmental organization, 75-nationality body, established in the sixties at the time of the race to the Moon and recognized by the United Nations in 1996. It is an honorary society with an action agenda. Its members work closely with national and international space agencies, industry, and the academy community, particularly the national science and engineering academies, to determine needs and objectives, and to help shape policy and forge cooperation by means of cosmic studies (9 studies published in 2004-2005 available upon request), position papers, conferences and publications.

In 2005 the Academy sponsored a large number of conferences focused on the development and promotion of new ideas and initiatives. Beginning with the 1st IAA Conference on the Impact of Space on Society held in Budapest, and including the first IAA Asia-Pacific Workshop on Advances in Planetary Science in Bangalore, seven IAA sponsored meetings have been held in six countries (Hungary, Germany, Austria, India, Italy and Japan). Nearly 1500 individuals from around the world participated, an indication of the value the Academy brings to the international astronautical community.

Another way in which the Academy helps formulate the future is through recognition of the positive impact of space on humanity. With the co-sponsorship of the European Space Agency, the Study Group on the Impact of Space on Society released their report in connection with the Budapest conference. With a unifying theme of One World and an opening contribution by the United Nations Secretary General Kofi Annan, the report features insightful and inspirational comments that illustrate the diverse and beneficial impact of space on humanity.

The value of the Academy derives from its members, and the Board of Trustees with its new vice-Presidents Prof. Hiroki Matsun, Dr. Madhavan Nair, Dr. Stanislav Konyukhov and Dr. Claudie Haigneré. It is making a strategic effort to proactively identify the new generation of major contributors to astronautics for election to the Academy, recognizing that new national space activities continue to join those of the now traditional spacefaring nations. To make the selection process more efficient and easier for all involved, the Academy has initiated a new website (http://www.iaaweb.org) that is providing for electronic peer review and voting. This website provides service to its members with new databases including 500 authors currently publishing in Acta Astronautica journal and 3000 paper archives of all IAA conferences over the last decade.

The Academy continues to enjoy and appreciate its close relations with the IAF and COSPAR, and its participation in the International Astronautical Congresses and COSPAR Assemblies by sponsoring and co-sponsoring sessions, symposia, round tables and plenary sessions. In addition the Academy publishes the journal Acta Astronautica containing refereed papers.

THE INTERNATIONAL INSTITUTE
OF SPACE LAW (I.I.S.L.)

The International Institute of Space Law (IISL) was founded by the International Astronautical Federation (IAF) in 1968. The IISL replaced the Permanent Committee on Space Law which the IAF had created in 1958 under the chairmanship of Andrew G. Haley.

Since 1958, the IISL has held over 40 annual Colloquia on space law in many nations, the Proceedings of which are published by the American Institute of Aeronautics and Astronautics. The Institute also publishes a bi-annual Newsletter.

The IISL has elected individual and institutional members from more than 40 countries, who are distinguished by their contributions to or proven interest in the field of space law or other social science aspects related to space activities.

The purposes and objectives of the Institute include the cooperation with appropriate international organizations and national institutions in the field of space law, the holding of meetings, colloquia and competitions on juridical and social science aspects of space activities, the preparation or commissioning of studies and reports and the publication of books and proceedings.

Since 1990, the IISL organizes the annual Manfred Lachs Space Law Moot Court Competition. A hypothetical space law case is written by ISSL members on invitation of the Organizing Committee established by the ISSL Board of Directors to manage the competition. Preliminary competitions are organized each spring in North America, Europe and the Asia Pacific region. The winning teams of the preliminaries meet in the final round held in conjunction with the annual ISSL Space Law Colloquium, which is judged by members of the International Court of Justice. In 2007, the winners of the preliminaries will meet in Hyderabad for the world finals of the 16th competition.

As the IAF is an officially recognized observer at sessions of the United Nations Committee on the Peaceful Uses of Outer Space and its Scientific & Technical and Legal Subcommittees, members of the ISSL are entitled to be designated IAF observers to those sessions. The ISSL presents reports on its activities to the Legal Subcommittee and contributes to the UN «Highlights in Space» report.

In cooperation with the European Centre for Space Law (ECSL), the ISSL organizes an annual space law symposium for the delegates and staff attending the annual session of the UNCOPOUS Legal Subcommittee in Vienna, Austria. The programs deal with topical space law issues, and the papers there presented are published in the ISSL Proceedings.

Since 2001, the ISSL holds regional conferences in addition to the annual Colloquia. The first of these was held in Singapore in 2001, the second in April 2004 in Beijing, China, the third in June 2005 in Bangalore, India, and a fourth was held in Bangkok, Thailand in August 2006.

President: Prof. Edward C. Stone – USA
Secretary General: Dr. Jean Michel Contant – 6 rue Galilée, 75016 Paris • Mailing address: P.O. Box 1268-16 – 75766 Paris Cedex 16 – France • Phone: 33 (0) 1 47 23 82 15, Fax: 33 (0) 1 47 23 82 16 • http://www.iaaweb.org • Email: sgeneral@iaaweb.org

President: Dr. Nandasiri Jasentuliyana – Sri Lanka/USA
Secretary General: 8-10 rue Mario Nikis, 75015 Paris - France • Tel. (33 1) 45.67.42.60, Fax. (33 1) 42.73.21.20 • Website: www.iafastro-iisl.com • Email: secretary@iafastro-iisl.com
As a national space agency, CNES is in charge of conceiving, directing and implementing French space policy through space programs in cooperation with industry partners. To this end, CNES pursues a dual approach:

Playing a leading role in European Space Agency (ESA)

Conducting a national program geared to keep the French space industry competitive in the modern world.

CNES is actively seeking to develop the use of space to meet the civil and military needs of public authorities, to satisfy the requirements of the scientific community and to foster the development and dissemination of new applications designed to create wealth and employment.
Dear Authors,

Before selecting the session to which you would like to submit your abstract, we invite you to carefully read this message, explaining the transition initiated by the IAF Executive Secretariat together with the IPC Co-Chairs for Hyderabad, in 2007.

INTERACTIVE LECTURES AND PRESENTATIONS SESSIONS

A new approach towards improving the classical poster session will be initiated at the IAC 2006 and further refined at the IAC 2007.

The goal of this initiative is to make in the near future, that the existing poster revised under a new concept become a basic element of the technical program of the Congress.

To achieve this goal some changes are needed affecting the quality of the existing poster papers, their presentation during the Congress, their acceptance for publication and also the format of the sessions, introducing any improvement that new visual technologies may offer.

This means that the concept and accordingly the name of the poster papers and sessions will be changed to Interactive Presentation Sessions which will expand the existing Interactive Lecture Session formerly named Technical Sessions. Both formats will require the submission of an Abstract and, if selected, a manuscript which follows the same guidelines and instructions.

An explicit guide for submission will be posted on the IAF Web Site www.iafastro.org after the IAC 2006 in Valencia.

The Interactive Presentations will benefit from a high visibility and several new opportunities such as:

- The announcement by the Chair during the Interactive Lecture Sessions making them, in a formal manner, an integral part of the corresponding Symposia
- Introductory presentations made by the authors before the Interactive Lecture Sessions open
- An extended Public Session during the entire week and specific time slots, when the authors may discuss their results with the congress delegates.

This new approach, the IAF believes, will give those papers selected for Interactive Presentations the same status as those papers selected for the Interactive lecture sessions. All papers selected for Interactive Presentations and those selected for Interactive Lecture Sessions will be included on the DVD produced by the IAF and will be considered for publication in Acta Astronautica.

CATEGORY A – SCIENCE AND EXPLORATION

Systems Sustaining Space Missions Including Life, Microgravity, Space Exploration, Space Debris and SETI.

A1. SPACE LIFE SCIENCES SYMPOSIUM
A2. MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM
A3. SPACE EXPLORATION SYMPOSIUM
A4. 36th SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps
A5. HUMAN EXPLORATION OF THE MOON AND MARS SYMPOSIUM
A6. SPACE DEBRIS SYMPOSIUM

A1. SPACE LIFE SCIENCES SYMPOSIUM
A1.2. Integrative Human Physiology: Musculo-Skeletal and Sensorimotor Effects
A1.3. Integrative Human Physiology: Cardiovascular Responses and Body Fluid Regulation
A1.4. Integrative Human Physiology: Metabolism and Nutritional Effects
A1.5. Critical Factors for Human Exploratory Missions: Radiation Health Issues

A1.6. Critical Factors for Human Exploratory Missions: Environmental Control and Life Support
A1.7. Astrobiology: The Search for Signatures of Life Beyond Earth
A1.8. Teledmedicine in Space and Terrestrial Applications
A1.9/A2.7. Joint Session on Physical Sciences and Life Sciences for Space Exploration

A2. MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM
A2.1. Gravity and Fundamental Physics
A2.2. Fluid and Materials Sciences
A2.3. Microgravity Experiments from Sub-orbital to Orbital Platforms
A2.4. Science Results from Ground Based Research
A2.5. Facilities and Operations of Microgravity Experiments
A2.6. Microgravity Sciences onboard the International Space Station and Beyond
A2.7/A1.9. Joint Session on Physical Sciences and Life Sciences for Space Exploration

A3. SPACE EXPLORATION SYMPOSIUM
A3.1. Space Based Astronomy
A3.2. Solar System Exploration
A3.3. Mars Exploration
A3.4. New Mission Concepts for Space Exploration
A3.5. Small Bodies Missions and Technologies
A3.6. Moon Exploration
A3.7. Interactive Session on Space Exploration

A4. 36th SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps
A4.1. SETI I – Technical Aspects
A4.2. SETI II – Interdisciplinary Aspects
A4.3. Mitigation and Standards

A5. HUMAN EXPLORATION OF THE MOON AND MARS SYMPOSIUM
A5.1. Strategies to Establish Lunar and Mars Colonies
A5.2. Human and Robotic Partnerships to Realize Space Exploration Goals
A5.3. Interactive Session on Human Exploration of the Moon and Mars

A6. SPACE DEBRIS SYMPOSIUM
A6.1. Measurements and Space Surveillance
A6.2. Modeling and Risk Analysis
A6.3. Mitigation and Standards

CATEGORY B – APPLICATIONS AND OPERATIONS


B1. EARTH OBSERVATION SYMPOSIUM
B2. SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM
B3. HUMAN SPACE ENDEAVOURS SYMPOSIUM
B4. SMALL SATELITE MISSIONS SYMPOSIUM

B1. EARTH OBSERVATION SYMPOSIUM
B1.1. International Cooperation in Earth Observation Missions
B1.2. Future Earth Observation Systems
B1.3. Earth Observation Sensors & Technology
B1.4. Earth Observation Data Management Systems
B1.5. Earth Observation Applications and Economic Benefits
B1.6. Global Earth Observation Initiatives for Disaster Reduction
B1.7. Interactive Session on Earth Observation
**CATEGORY C – TECHNOLOGY**
Common Technologies to Space Systems Including Astrodynamics, Structures, Power and Propulsion

### C1. ASTRODYNAMICS SYMPOSIUM
- Attitude Control, Sensors and Actuators
- Multibody Dynamics
- Optimization
- Orbital Dynamics
- Mission Operations
- Guidance and Control
- Mission and Constellation Design
- Attitude Dynamics, Modelling and Determination

### C2. MATERIALS AND STRUCTURES SYMPOSIUM
- Space Structures I - Development and Verification (Space Vehicles and Components)
- Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures)
- Space Structures - Dynamics and Microdynamics
- New Materials and Structural Concepts
- Smart Materials and Adaptive Structures
- Space Vehicles - Mechanical/Thermal/Fluidic Systems
- Specialized Technologies, including Nanotechnology
- Interactive Session on Materials and Structures

### C3. SPACE POWER SYMPOSIUM
- Space Power Systems, Concepts and Architectures
- Space Power Technologies and Components
- Experiments and Demonstrations for Advanced Space Power
- Joint Session on Advanced Concepts for Space Power: Enabling Ambitious Space Exploration and Utilization
- Joint session on Nuclear Propulsion and Power

### C4. SPACE PROPULSION SYMPOSIUM
- Propulsion Systems I
- Propulsion Systems II
- Propulsion Technology
- Electric Propulsion
- Hypersonic and Combined Cycle Propulsion
- Advanced Propulsion - Non Chemical, non Electric
- Joint session on Nuclear Propulsion and Power

**CATEGORY D – INFRASTRUCTURE**
Systems Sustaining Space Missions Including Space System, Transportation, Future Systems and Safety

### D1. SPACE SYSTEMS SYMPOSIUM
- Innovative and Visionary Space Systems Concepts
- Enabling Technologies for Space Systems
- System Engineering Tools, Processes & Training
- Space Systems Architectures
- Lessons Learned in Space Systems
- Interactive Session on Space Systems

### D2. SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM
- Launch Vehicles in Service or in Development
- Indian Launchers Overview
- Upper Stages, Space Transfer, Reentry and Landing Systems
- Future Space Transportation Systems
- Future Space Transportation Systems Technologies
- Future Space Transportation Systems Technologies In-Flight Experimentation
- Requirements for New Space Transportation Systems
- Interactive Session on Space Transportation Innovations and Solutions
D3. SYMPOSIUM ON STEPPING STONES TO THE FUTURE: STRATEGIES, ARCHITECTURES, CONCEPTS AND TECHNOLOGIES

D3.1. Strategies and Architectures to Establish a “Stepping Stone” Approach to our Future in Space
D3.2. Novel Concepts and Technologies for the Exploration and Utilization of Space
D3.3. Infrastructures and Systems to Enable Ambitious Future Exploration and Utilization of Space
D3.4./C3.4. Joint Session on Advanced Concepts for Space Power: Enabling Ambitious Space Exploration and Utilization
D3.5./E5.5. Joint Session on Space Technology and Systems Management Practices and Tools

D4. SYMPOSIUM ON THE FAR FUTURE: RENEWED VISIONS

D4.1. Space Elevator System and its Applications
D4.2. Space Elevators and Advanced Tethers – Technologies and Strategies

D5. 40th SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES

D5.1. Quality and Knowledge Management
D5.2. Assessing the Space Environment and its Effect

E2. 37th STUDENT CONFERENCE

E2.1. Student Conference I
E2.2. Student Conference II
E2.3. Student Conference III

E3. SPACE BENEFITS - OPPORTUNITIES FOR MANKIND: POLICY AND ECONOMIC ASPECTS

E3.1. Socio-Economic Benefits of Space Activities for Developing Countries
E3.2. Space Systems Benefits for Global Security
E3.3. Economic and Cultural Benefits of Space Systems
E3.4. Exploration and Discovery
E3.5. Scientific-Legal Roundtable

E4. 41ST HISTORY OF ASTRONAUTICS SYMPOSIUM

E4.1. The International Geophysical Year, Sputnik 1 and the Space Race
E4.2. Memoirs
E4.3. Organisational, Scientific & Technical Reviews
E4.4. History of Indian Contributions to Rocketry and Astronautics

E5. 18th SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY

E5.1. Innovating Through Technology Spin-in and Spin-off
E5.2. Space Expectations: How the Public Views Space Activities
E5.3. Impact of Space Applications on Societal Issues
E5.4. The Architecture of Space: A Multi-Disciplinary Approach
E5.5./D3.5 Joint Session on Space Technology and Systems Management Practices and Tools

E6. 50th INTERNATIONAL COLLOQUIUM ON THE LAW OF OUTER SPACE (IISL)

E6.1. The Impact of Outer Space Law on Regional Policies
E6.2. Legal Issues of Private Spacelift and Space Tourism
E6.3. New Legal Developments in the Protection of the Space Environment
E6.4. Legal Aspects of Satellite Navigation
E6.5. Other Legal Matters

CATEGORY E – SPACE AND SOCIETY

E1. SPACE EDUCATION AND OUTREACH SYMPOSIUM

E1.1. “Hands-On” Space Education
E1.2. Structures for Space Education
E1.3. Educational Outreach
E1.4. Innovative and Informal Space Education
E1.5. Space Exploration Education

E2. 37th STUDENT CONFERENCE

E2.1. Student Conference I
E2.2. Student Conference II
E2.3. Student Conference III

E3. SPACE BENEFITS - OPPORTUNITIES FOR MANKIND: POLICY AND ECONOMIC ASPECTS

E3.1. Socio-Economic Benefits of Space Activities for Developing Countries
E3.2. Space Systems Benefits for Global Security
E3.3. Economic and Cultural Benefits of Space Systems
E3.4. Exploration and Discovery
E3.5. Scientific-Legal Roundtable

E4. 41ST HISTORY OF ASTRONAUTICS SYMPOSIUM

E4.1. The International Geophysical Year, Sputnik 1 and the Space Race
E4.2. Memoirs
E4.3. Organisational, Scientific & Technical Reviews
E4.4. History of Indian Contributions to Rocketry and Astronautics

E5. 18th SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY

E5.1. Innovating Through Technology Spin-in and Spin-off
E5.2. Space Expectations: How the Public Views Space Activities
E5.3. Impact of Space Applications on Societal Issues
E5.4. The Architecture of Space: A Multi-Disciplinary Approach
E5.5./D3.5 Joint Session on Space Technology and Systems Management Practices and Tools

E6. 50th INTERNATIONAL COLLOQUIUM ON THE LAW OF OUTER SPACE (IISL)

E6.1. The Impact of Outer Space Law on Regional Policies
E6.2. Legal Issues of Private Spacelift and Space Tourism
E6.3. New Legal Developments in the Protection of the Space Environment
E6.4. Legal Aspects of Satellite Navigation
E6.5. Other Legal Matters
**A1. SPACE LIFE SCIENCES SYMPOSIUM**

The symposium will cover all topics of space life sciences including human physiology and psychology, radiation health issues, life support and risk assessment for exploratory missions, and astrobiology.

**Coordinators:**
- Gerda Hornack
  DLR – GERMANY
  Email: gerda.horneck@dlr.de
- John D. Rummel
  NASA Headquarters – USA
  Email: jrummel@hq.nasa.gov


The session will deal with psychological, interpersonal, cultural, circadian/sleep, and human factors issues involved with human space flight and space exploration.

**Chairs:**
- Nick Kanas
  University of California, San Francisco – USA
  Email: nick.kanas@ucsf.edu
- Gro M. Sandal
  University of Bergen – NORWAY
  Email: gro.sandal@psych.ubn.no

**Rapporteur:**
- Vadim Gushin
  Institute for Biomedical Problems – RUSSIA
  Email: vgushin@imbp.ru

**A1.2. Integrative Human Physiology: Musculo-Skeletal and Sensorimotor Effects**

The session will deal with studies on musculo-skeletal and sensorimotor effects of real and simulated weightlessness which are responsible for the development of motor performance in space.

**Chairs:**
- Ronald J. White
  USRA - USA
  Email: white@ds1.usra.edu
- Inessa Kozlovskaya
  Institute of Biomedical Problems - RUSSIA
  Email: ikozlov@mail.ru

**Rapporteur:**
- William H. Paloski
  NASA Johnson Space Center – USA
  Email: william.h.paloski@nasa.gov

**A1.3. Integrative Human Physiology: Cardiovascular Responses and Body Fluid Regulation**

The session will focus on the short and long-term changes in the distribution of fluids and the cardiovascular system during spaceflight and its analogs.

**Chairs:**
- Satoshi Isawa
  Aichi Medical University - JAPAN
  Email: s_isawa@inis.com
- Jay C. Buckey
  Dartmouth Medical School – USA
  Email: jay.c.buckey@dartmouth.edu

**Rapporteur:**
- Helmut Hinghofer-Szalkay
  University of Graz - AUSTRIA
  Email: helmut.hinghofer@meduni-graz.at

**A1.4. Integrative Human Physiology: Metabolism and Nutritional Effects**

The session will deal with the influence of nutrient supply on physiological responses during real and simulated microgravity conditions.

**Chairs:**
- Martina Heer
  DLR Cologne – GERMANY
  Email: martina.heer@dlr.de
- Irina Larina
  State Scientific Center of RF - Institute for Biomedical Problems - RUSSIA
  Email: irina_larina@hotmail.com

**Rapporteur:**
- Scott M. Smith
  NASA Johnson Space Center - USA
  Email: scott.m.smith@nasa.gov

**A1.5. Critical Factors for Human Exploratory Missions: Radiation Health Issues**

The session will deal with the radiation field in space (measurements and modeling), its biological effectiveness and radiation protection issues for human exploratory missions.

**Chairs:**
- Guenther Reitz
  DLR, German Aerospace Center – GERMANY
  Email: guenther.reitz@dlr.de
- Vladislav M. Petrov
  Institute of Biomedical Problems – RUSSIA
  Email: petrov@imbp.ru

**Rapporteur:**
- Marco Durante
  Università Federico II - Napoli - ITALY
  Email: marco.durante@na.infn.it


The session will deal with strategies and technologies needed for physiological, psychological and environmental support in long term spaceflight and extraterrestrial habitats.

**Chairs:**
- Bernhard Koch
  DLR - GERMANY
  Email: bernhard.koch@dlr.de
- Ake Ingemar Skoog
  DLR - GERMANY
  Email: ake.ingemar.skoog@t-online.de

**Rapporteur:**
- KarlHeinz Kreuzberg
  ESA Headquarters - FRANCE
  Email: karlheinz.kreuzberg@esa.int

**A1.7. Astrobiology: The Search for Signatures of Life Beyond Earth**

The session will deal with laboratory and space studies and in search for signatures of life on the other planets and moons of our solar system and beyond.

**Chairs:**
- Gerda Hornack
  DLR – GERMANY
  Email: gerda.horneck@dlr.de
- François Raulin
  Université de Paris XII et Paris VII - FRANCE
  Email: raulin@lisa.univ-paris12.fr

**Rapporteur:**
- Michael Meyer
  NASA Headquarters - USA
  Email: michael.a.meyer@nasa.gov

**A1.8. Telemedicine in Space and Terrestrial Applications**

The session will focus on telemedicine developments for spaceflight, on terrestrial applications of telemedicine and on non-invasive telediagnostic systems.

**Chairs:**
- Rupert Gerzer
  DLR, Institute of Aerospace Medicine - GERMANY
  Email: rupert.gerzer@dlr.de
**A1.9/A2.7. Joint Session on Physical Sciences and Life Sciences for Space Exploration**

Space life science and physical science is essential in preparation for the exploration in space and long duration flights. The understanding of the biology consequences of microgravity and radiation exposure will be significant to humans living in space. The session will be to bring together scientists from different fields to discuss topics of interdisciplinary character for space exploration, i.e. radiation biology, radiation shielding, biofluids under microgravity, habitats and life support systems, exploration of planetary resources, biochemical analysis, environmental resource utilisation.

Chairs:  
Jancy C. McPhee  
NASA - Johnson Space Center/USRA - USA  
Email: jancy.c.mcphee1@jsc.nasa.gov

Rainer Willnecker  
DLR - Institut für Raumsimulation - GERMANY  
Email: rainer.willnecker@dlr.de

Rapporteurs:  
Vladislav M. Petrov  
Institute of Biomedical Problems – RUSSIA  
Email: petrov@imbp.ru

Ziad M. Saghir  
Ryerson Polytechnic University - CANADA  
Email: zsaghir@ryerson.ca

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**A2.2. Fluid and Materials Sciences**

The main focus of the session is on perspective research fields in fluid and materials sciences, multi-phase and chemically reacting flows including theoretical modelling, numerical simulations, and results of pathfinder laboratory experiments.

Chairs:  
Nickolay N. Smirnov  
Moscow Lomonosov State University - RUSSIA  
Email: abfisu11@mech.math.msu.su

Raimondo Fortiuzzo  
MARS - Microgravity Advanced Research and Support Center - ITALY  
Email: fortiuzzo@marcenter.it

Rapporteur:  
Peter Hofmann  
Kayser-Threde GmbH - GERMANY  
Email: peter.hofmann@kayser-threde.com

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**A2.3. Microgravity Experiments from Sub-orbital to Orbital Platforms**

This session presents recent results of microgravity experiments from all disciplines using different microgravity platforms, including drop towers, parabolic aircrafts, sounding rockets and capsules.

Chairs:  
Ziad M. Saghir  
Ryerson Polytechnic University - CANADA  
Email: zsaghir@ryerson.ca

Raffaele Savino  
University of Naples Federico II – ITALY  
Email: rassavino@unina.it

Rapporteur:  
Vladimir Pletser  
ESA/ESTEC - THE NETHERLANDS  
Email: vladimir.pletser@esa.int

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**A2.4. Science Results from Ground Based Research**

This session is focused on the results of ground based preparatory experiments from all disciplines.

Chairs:  
Antonia Viviani  
Seconda Universita di Napoli - ITALY  
Email: antonia.viviani@unina2.it

Valentina Shevtsova  
Université Libre de Bruxelles - BELGIUM  
Email: vshev@ulb.ac.be

Rapporteur:  
Nickolay N. Smirnov  
Moscow Lomonosov State University - RUSSIA  
Email: abfisu11@mech.math.msu.su

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**A2.5. Facilities and Operations of Microgravity Experiments**

This session is devoted to new diagnosis developments, new instruments definition and concepts for the future, ground and flight operation (telescience, robotics, hardware & software).

Chairs:  
Romain Marcout  
EADS SPACE Transportation - FRANCE  
Email: romain.marcou@space.eads.net

Rainer Willnecker  
DLR - Institut für Raumsimulation - GERMANY  
Email: rainer.willnecker@dlr.de

Rapporteur:  
Rodney Herring  
University of Victoria - CANADA  
Email: rherring@uvic.ca

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**A2.1. Microgravity Sciences and Processes Symposium**

The objective of this Symposium is to highlight and discuss the state-of-the-art in microgravity physical sciences and processes as well as to prepare the future orbital infrastructure. Session topics cover all microgravity sciences disciplines (materials sciences, fluid sciences, combustion science, fundamental physics, multi-phase flows), current results and research perspectives, together with relevant technology developments.

Coordinators:  
Rainer Willnecker  
DLR - Institut für Raumsimulation - GERMANY  
Email: rainer.willnecker@dlr.de

Antonia Viviani  
Seconda Universita di Napoli - ITALY  
Email: antonia.viviani@unina2.it

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**A2.1. Gravity and Fundamental Physics**

This session is devoted to the search of new fields of research in condensed matter physics and gravitational physics including cryogenic fluids, critical fluids, equivalence principle, atomic clock & plasma crystals.

Chairs:  
Marcus Dejmek  
Canadian Space Agency – CANADA  
Email: marcus.dejmek@space.gc.ca

François Gonzalez  
CNES - FRANCE  
Email: francois.gonzalez@cnes.fr

Rapporteur:  
Joachim Richter  
Institute for Physical Chemistry - RWTH Aachen - GERMANY  
Email: richter@rwth-aachen.de
A3.2. Solar System Exploration

This Session covers robotic missions for Solar System exploration (inner and outer planets and their satellites, and space plasma physics) except the Earth, Moon, Mars, and small bodies covered in other sessions of this symposium.

Chairs:
- Luc Frelon
- Alcatel Alenia Space - FRANCE
  Email: luc.frelon@alcatelaleniaspace.com
- Marc D. Rayman
  Jet Propulsion Laboratory - California Inst. of Technology - USA
  Email: mrayman@jpl.nasa.gov

Rapporteur:
- Jim Middelton
  MDA - CANADA
  Email: jim.middelton@mdacorporation.com

A3.3. Mars Exploration

The planet Mars is being explored now and in the coming years with multiple robotic missions from a variety of nations. This Session will cover current results from ongoing Mars missions and the designs for proposed Mars missions including expected experiments. Papers on any aspect of the search for evidence of extant or extinct Martian life, and forward and backward contamination are particularly welcome.

Chair:
- Christian Sollabouger
  MDA - CANADA
  Email: christian.sollabouger@mdacorporation.com

Rapporteurs:
- Walt Faulkner
  APL – USA
  Email: walter.faulkner@jhuapl.edu
- Eduardo W. Bergamini
  INPE - BRAZIL
  Email: e.w.bergamini@stanfordalumni.org

A3.4. New Mission Concepts for Space Exploration

This Session will deal with the new fields of space missions which are today emerging such as fundamental physics, exobiology, etc. Mission concepts as well as the associated specific technologies will be addressed.

Chairs:
- Junichi Kawaguchi
  ISAS/ JAXA - JAPAN
  Email: kawaguchi.junichi@jaxa.jp
- Denis Moura
  CNES - FRANCE
  Email: denis.moura@cnes.fr

Rapporteurs:
- Doug O’Handley – USA
  Email: dohphd@earthlink.net
- William H. Siegfried
  The Boeing Company (retired) – USA
  Email: wsiegfried@comcast.net

A3.5. Small Bodies Missions and Technologies

This Session will present the mission and technological aspects related to the exploration of small bodies including a search for pre-biotic signatures.

Chairs:
- Marc D. Rayman
  Jet Propulsion Laboratory - California Inst. of Technology - USA
  Email: mrayman@jpl.nasa.gov
- Stephan Ulanece
  DLR - GERMANY
  Email: stephan.ulanece@dlr.de

Rapporteurs:
- Craig Holton
  Space Technology (Ireland) Ltd - IRELAND
  Email: holton@mdacorporation.com

A3.6. Moon Exploration

This session will address current and future lunar missions. The session will address orbital missions, robotic surface missions, as well as life sciences on the Moon, resource utilisation and preparatory activities for future solar system exploration.
A3.P. Interactive Session on Space Exploration

Rapporteurs:
Bernard H. Foing
ESA/ESTEC - THE NETHERLANDS
Email: bernard.foing@esa.int

Christian Sallaberger
MDA - CANADA
Email: Christian.sallaberger@mdacorporation.com

A4. 36th SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps

The symposium deals with the scientific, technical and interdisciplinary aspects of the search for extraterrestrial intelligence (SETI) including a discussion of all kinds of contacts. The technical side is not limited to the microwave window, but includes also optical and any kind of radiation. The interdisciplinary aspects include all societal implications, risk communication and philosophical considerations of any kind of discovery or contact.

Coordinators:
Claudio Maccone (retired) - ITALY
Email: clmaccone@libero.it

Seth Shostak
SETI Institute - USA
Email: seth@seti.org

A4.1. SETI I – Technical Aspects

All technical aspects involved in the search for extraterrestrial intelligence, including current and future search strategies.

Chairs:
Gaurav Swarup
Tata Institute of Fundamental Research
National Centre for Astrophysics – INDIA
Email: gswarup@ncfa.tifr.res.in

Paul Shuch
SETI League – USA
Email: n6tx@setileague.org

Rapporteur:
John D. Rummel
NASA Headquarters – USA
Email: jrummel@hq.nasa.gov

A4.2. SETI II – Interdisciplinary Aspects

All aspects concerning the societal implications of extraterrestrial intelligence are considered, including public reaction to a discovery, risk communication and the possible impacts on society.

Chairs:
Lori Walton
Tiggerist Cosmicsence – CANADA
Email: loreth@tiggerist.com

Douglas Vakoch
SETI Institute - USA
Email: vakoch@seti.org

Rapporteur:
Kathryn Denning
York University – CANADA
Email: kdennig@yorku.ca

A5. HUMAN EXPLORATION OF THE MOON AND MARS SYMPOSIUM

This Symposium covers the strategic plans, architectural concepts and technology development for future human exploration of the Moon and Mars. In particular the topics of Moon and Mars colonies and Human/Robotic synergies are examined in depth.

Coordinators:
George W. Morganthal
University of Colorado at Boulder – USA
Email: morganthal@colorado.edu

Christian Sallaberger
MDA - CANADA
Email: Christian.sallaberger@mdacorporation.com

A5.1. Strategies to Establish Lunar and Mars Colonies

Many studies of human lunar return have been conducted in the 35 years since the first Apollo Moon landing. Utilization and colonization of the Moon will require that a long term, sustainable strategy be developed - and followed. In addition, future lunar enterprise must be considered as part of an evolving space infrastructure that can utilize the goods and services stemming from a lunar colony to enhance or enable ever more ambitious human and robotic space exploration goals. This session will address strategic aspects of political, philosophical, legal and commercial “enablers”, including technological road maps and benefits to humanity that might result from human exploration and ultimately colonization. A goal of the session is the advancement of a strategy leading toward self-supporting colonies.

Chairs:
Uwe Apel
Hochschule Bremen – GERMANY
Email: uweapel@hs-bremen.de

Christian Sallaberger
MDA - CANADA
Email: Christian.sallaberger@mdacorporation.com

Benton C. Clark
Lockheed Martin Space Systems – USA
Email: benton.c.clark@lmco.com

Rapporteurs:
George W. Morganthal
University of Colorado at Boulder – USA
Email: morganthal@colorado.edu

Christian Sallaberger
MDA - CANADA
Email: Christian.sallaberger@mdacorporation.com

A5.2. Human and Robotic Partnerships to Realize Space Exploration Goals

This session seeks papers on new systems, and technologies needed for future human missions to the Moon and Mars, and the role of human and robotic partnerships to realize ambitious future space exploration goals, including human surface mobility systems (rovers), habitat/infrastructure construction, robotic assistants, and, precursor activities such as sample returns, in-situ plant growth and food production demonstration, Mars weather and seismic stations, etc.

Chairs:
Christian Sallaberger
MDA - CANADA
Email: Christian.sallaberger@mdacorporation.com

Benton C. Clark
Lockheed Martin Space Systems – USA
Email: benton.c.clark@lmco.com

Rapporteurs:
George W. Morganthal
University of Colorado at Boulder – USA
Email: morganthal@colorado.edu

Christian Sallaberger
MDA - CANADA
Email: Christian.sallaberger@mdacorporation.com

A6. SPACE DEBRIS SYMPOSIUM

The Symposium will address the complete spectrum of technical issues of space debris: measurements and space surveillance, modeling, risk assessment in space and on the ground, reentry, hypervelocity impacts and protection, mitigation, and standards.

Coordinators:
Christophe Bonnal
ONES – FRANCE
Email: Christophe.Bonnal@ones.fr

Nicholas Johnson
NASA Johnson Space Center – USA
Email: nicholas.l.johnson@nasa.gov

A6.1. Measurements and Space Surveillance

This session will address advanced ground- and space-based measurement techniques, relating processing methods, and results on the derived spatial and temporal distribution of debris and meteors. This includes space surveillance concepts, their implementation and operation, and the establishment and maintenance of space object catalogs.

Chairs:
Thomas Schildknecht
Astronomische Institute University of Bern (AIUB) – SWITZERLAND
Email: Schildk@aiub.unibe.ch
### A6.2. Modeling and Risk Analysis

This session will address the characterization of the current and future debris population and methods for in-orbit and on-ground risk assessments. The in-orbit analysis will cover collision risk estimates based on statistical population models and deterministic catalogs and active avoidance, including evasive manoeuvres.

**Chairs:**
- Jer-Chyi Liu
  NASA Johnson Space Center - USA
  Email: jer-chyi.liu@nasa.gov
- Carsten Wiedemann
  TU Braunschweig - GERMANY
  Email: c.wiedemann@tu-bs.de

**Rapporteur:**
- Claudio Portelli
  Italian Space Agency - ITALY
  Email: claudio.portelli@asi.it

### A6.3. Mitigation and Standards

This session will focus on the definition and implementation of debris prevention and reduction measures and vehicle passive protection and shielding. The session will also address space debris mitigation guidelines and standards that exist already or are in preparation at the national or international level.

**Chairs:**
- A.S. Ganeshan
  ISRO - INDIA
  Email: akganeshan@isro.gov.in
- Fernand Alby
  CNES - FRANCE
  Email: fernand.alby@cnes.fr

**Rapporteur:**
- Akira Kato
  JAXA - JAPAN
  Email: kato.akira@jaxa.jp

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### CATEGORY B – APPLICATIONS AND OPERATIONS

#### B1. EARTH OBSERVATION SYMPOSIUM

**B1.1. International Cooperation in Earth Observation Missions**

Focus is on efforts being made by governments, agencies and society to achieve coordination, cooperation and compatibility in the development of space-based Earth observation systems. Presentations are encouraged which involve cooperative efforts with developing countries. Papers on current and ongoing missions involving coordination among commercial, government and other entities are especially encouraged.

**Chairs:**
- W. John Hussey
  The Aerospace Corporation - USA
  Email: john.hussey@aero.org
- Pierre Ranzoli
  EADS Astrium - GERMANY
  Email: p_ranzoli@gmx.de

**Rapporteur:**
- Jan Kolar
  Charles’s University – CZECH REPUBLIC
  Email: kolar@kolar.net

**B1.2. Future Earth Observation Systems**

Emphasis is on technical descriptions of planned and new space systems and missions for experimental and operational Earth observation. Descriptions of new concepts and innovative Earth observation systems are encouraged.

**Chairs:**
- Benoît Boissin
  CNES - FRANCE
  Email: benoit.boissin@cnes.fr
- Mukund Rao
  Navayuga Spatial Technologies Pvt. Ltd - INDIA
  Email: mukundrao@nbsl.net.in

**Rapporteur:**
- Gilles Corlay
  Sodern - FRANCE
  Email: gilles.corlay@sodern.fr

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### B1.3. Earth Observation Sensors & Technology

Focus is on sensors now being developed or tested for all aspects of Earth observation. Particular emphasis is on new sensors for meeting the growing demand of user markets.

**Chairs:**
- Andrew Court
  TNO Institute of Applied Physics - THE NETHERLANDS
  Email: andy.court@tno.nl

**Rapporteur:**
- Pierre Ranzoli
  EADS Astrium - GERMANY
  Email: p_ranzoli@gmx.de
B1.4. Earth Observation Data Management Systems
Earth Observation Data Acquisition, Communication, Processing, Dissemination and Archiving.

Chairs:
Bruce K. Quirk
U.S. Geological Survey - EROS Data Center - USA
Email: quirk@usgs.gov

Carlo Uliasi
University of Rome “La Sapienza” - ITALY
Email: uliasi@psm.uniroma1.it

Rapporteur:
Jesus Gonzalez
INSA – SPAIN
Email: jgonzalo@insa.org

B1.5. Earth Observation Applications and Economic Benefits
Earth Observation value-added products.

Chairs:
Luigi Bussolino
Alenia Spazio S.p.A. - ITALY
Email: lbussoli@to.alespazio.it

Paul Kamoun
Alcatel Alenia Space - FRANCE
Email: paul.kamoun@alcatelaleniaspace.com

Rapporteur:
W. John Hussey
The Aerospace Corporation - USA
Email: john.hussey@aero.org

B1.6. Global Earth Observation Initiatives for Disaster Reduction
Cooperation in meteorological satellite systems.

Chairs:
Jan Kolar
Charles’ University – CZECH REPUBLIC
Email: kolar@e-kolar.net

Robert Missotten
UNESCO - FRANCE
Email: r.missotten@unesco.org

Rapporteur:
Y.J.A. Chong
National University of Singapore – SINGAPORE
Email: y.j.chong@alumni.nus.edu.sg

B1.P. Interactive Session on Earth Observation

Rapporteur:
Andrew Court
TNO Institute of Applied Physics - THE NETHERLANDS
Email: andy.court@tno.nl

B2. SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM
The Symposium on space communications and navigation examines developments in the technology, application and system developments as they relate to fixed and mobile communications services, satellite broadcasting, position determination and interactive multimedia provision.

Coordinators:
Robert D. Briskman
Sirius Satellite Radio – USA
Email: rbriskman@sirius.com

M.G. Chandrasekhar
Orbimage, Inc. – USA
Email: drchandramg@yahoo.co.in

B2.1. Mobile Communications and Satellite Navigation
New and emerging mobile and personal communications systems will be addressed, including those providing services to hand held terminals, cars, trucks, trains, ships and planes.

Chairs:
Ryutaro Suzuki
National Institute of Information and Communications Technology - JAPAN
Email: ryutaro@nict.go.jp

Colin Rosett
FRIN UK - FRANCE
Email: colinrosett@hotmail.com

Rapporteur:
Ramu Kathuri
EADS – INDIA
Email: verkat@eadsindia.com

B2.2. Near-Earth and Interplanetary Communications Systems
This session addresses systems with relative motion between space and ground segments operating in both Near-Earth and interplanetary environments with particular regard to their unique concepts, techniques and technologies.

Chairs:
Patrick Anglin
Sirius Satellite Radio – USA
Email: panglin@siriusradio.com

Ramon De Paula
NASA Headquarters – USA
Email: rdepaula@hq.nasa.gov

Rapporteur:
K.R. Sridhara Murthi
ANTRIX Corporation Ltd. - INDIA
Email: ssisro@vsnl.com

B2.3. Advanced Technologies
New and promising space communications/navigation technologies are presented as applied to existing and developing systems.

Chairs:
Edward W. Ashford
Ashford Aerospace Consulting - USA
Email: ed.ashford@ashford.com

Euler Berenyi
E. Berenyi & Associates Inc. – CANADA
Email: berenyi@magma.ca

Rapporteur:
Bruno Perrot
SES GLOBAL – LUXEMBOURG
Email: bruno.perrot@ses-global.com

B2.4. Fixed and Broadcast Services
Advances in fixed and broadcast services will be presented, including Ka frequency band systems, television and radio direct-to-user systems and related satellite technology improvements.

Chairs:
Patrick Agnieray
Alcatel Alenia Space – FRANCE
Email: patrick.agnieray@alcatelaleniaspace.com

Joe M. Straus
The Aerospace Corporation - USA
Email: joe.m.straus@aero.org

Rapporteur:
Jean-Paul Hoffmann
SES GLOBAL – LUXEMBOURG
Email: jean-paul.hoffmann@ses-global.com

B2.5. Communication Satellite Infrastructure and Economics
The interoperability, policy and regulatory environments can considerably impact the development of satellite communication systems, as these can greatly influence both the technical and economic feasibility of such systems. Domestic, regional and global satellite systems will be addressed and reviewed with respect to these and other non-technical considerations.

Chairs:
Cantina Jorgenson
Advancing Space Consulting Group - USA
Email: cm@advancingspace.com

Desaraju Venugopal
Advanced Space Technologies and Services – INDIA
Email: dvenugopal53@yahoo.com

Rapporteur:
Manfred Wittig
ESA/ESTEC
Email: manfred.wittig@esa.int

B2.6. Advanced Systems
Advanced satellite communications concepts and systems will be presented.

Chairs:
Otto Koudelka
Graz University of Technology – AUSTRIA
Email: koudelka@tuwien.ac.at

Robert Prevaux
Space Systems Loral - USA
Email: prevaux.robert@ssd.loral.com

Rapporteur:
Ying W. Sit
Delft University of Technology – THE NETHERLANDS
Email: y.w.sit@tudelft.nl
B3. HUMAN SPACE ENDEAVOURS SYMPOSIUM

This Symposium addresses all aspects of human space endeavours, including the design, development, operation, utilization and future plans of space missions involving humans. The scope covers past, present and future human space endeavours.

Coordinators:
Carlo Mirra
EADS Space Transportation – THE NETHERLANDS
Email: carlo.mirra@space.eads.net

Mag Iskander
MDA - CANADA
Email: mag.iskander@mdacorporation.com

B3.1. Human Space Endeavour: Overview

This session will include papers on the status of the programs of the International Space Station. It also covers plans for other human missions in Earth orbit and beyond. Papers are encouraged from government and private sectors.

Chairs:
Graham Gibbs
Canadian Space Agency – USA
Email: graham.gibbs@space.gc.ca

Terry Reese
NASA Headquarters – USA
Email: terry.reese@nasa.gov

Rapporteur:
Tai Nakamura
JAXA – JAPAN
Email: nakamura.ta@jaxa.jp

B3.2. Spacecraft for Human Transport

This session will cover the design, development and operations of vehicles that transport humans from Earth to sub-orbital trajectories, LEO and beyond. It also covers unique technologies involved in human spacecraft design and experience with existing vehicles.

Chairs:
Guenther Brandt
EADS Space Transportation – GERMANY
Email: guenther.brandt@space.eads.net

Todd Fox
The Boeing Company – USA
Email: todd.fox@boeing.com

Rapporteur:
Raimondo Fortezza
MARS s.r.l.
Microgravity Advanced Research and Support Center – ITALY
Email: fortezza@marscenter.it

B3.3. Space Stations Assembly and Operations

This session covers current experiences and stepping stone approaches to future human endeavours related to assembly and operations of space stations. Papers addressing government and private initiatives are encouraged.

Chairs:
Luigi d’Emiliano
Altec S.p.A. - ITALY
Email: demiliano.luigi@spacegate-altec.it

Carlo Mirra
EADS Space Transportation – THE NETHERLANDS
Email: carlo.mirra@space.eads.net

Rapporteur:
James F. Buchi
United Space Alliance – USA
Email: james.f.buchi@usaspaceops.com

B3.4. Space Stations and Human Spacecraft Utilization

This session covers current experiences and stepping stone approaches to future human endeavours related to the utilization of space stations and human spacecraft. Both government and private initiatives will be included.

Chairs:
John-David Bartoe
NASA (retired) – USA
Email: john-david@bartoe.net

Sergei K. Shaevich
Khrunichev State Research & Production – RUSSIA
Email: shaevichs@khrunichev.com

Rapporteur:
Rainer Willnecker
DLR – GERMANY
Email: rainer.willnecker@dlr.de

B3.5. Future Human Space Endeavours

This session will address new concepts and plans for possible future human space endeavours. This includes endeavours of exploration, tourism and manufacturing.

Chairs:
Geneviève Gargir
CNES - FRANCE
Email: genevieve.gargir@cnes.fr

Anthony R. Gross
NASA Ames Research Center – USA
Email: anthony.r.gross@nasa.gov

Rapporteur:
Rudolf Monti
University of Naples Federico II – ITALY
Email: monti@unina.it

B4. SMALL SATELLITE MISSIONS SYMPOSIUM

This Symposium addresses Small Satellite programmes encompassing space science and earth observation missions and focusing on lessons learned, results achieved, and next generation missions. The Symposium also addresses four areas across the entire spectrum of small satellite missions – design and technology, planning for and executing cost-effective operations, affordable and reliable space access, and implementing small satellite programmes in developing countries.

Coordinators:
Rhoda S. Hornstein
NASA Headquarters – USA
Email: rhoda.hornstein@hq.nasa.gov

Rainer Sandau
DLR – GERMANY
Email: rainer.sandau@dlr.de

B4.1. 8th UN/IAA Workshop on Small Satellite Programmes at the Service of Developing Countries

This workshop is organized jointly by the United Nations Office for Outer Space Affairs (UN/OOSA) and the International Academy of Astronautics (IAA). It shall review the needs that could be satisfied by developing nations by using small satellites, with a particular emphasis on the Indo-Asian region. Following subjects shall be open for discussion:

• the progress in small satellite programme implementation and development
• experience gained with existing programmes and challenges for new projects
• results and benefits achieved by small satellites already in orbit

Consideration shall be given to education, training and international cooperation.

Chairs:
Sergio Chernikov
United Nations Office of Vienna – AUSTRIA
Email: sergei.chernikov@unvienna.org

Sias Mostert – FRANCE
Email: mostert@un.ac.za

Rapporteurs:
Petr Lada
Czech Space Office - CZECH REPUBLIC
Email: petr@lada-web.cz

Pierre Molette – FRANCE
Email: pierre.molette@centraliens.net

B4.2. Small Space Science Missions

This session will address the current and near-term approved small missions whose objective is to achieve scientific returns in the fields of Earth science, solar, interplanetary, planetary, astronomy/astrophysics observations, and fundamental physics. Emphasis will be given on results achieved, new technologies such as formation flying, and novel management techniques.

Chairs:
S. H. Krimigis
The Johns Hopkins University – USA
Email: tom.krimigis@huapl.edu

Denis Moura
CNES - FRANCE
Email: denis.moura@cnes.fr
**B4.3. Small Satellite Operations**

This session covers the planning for and execution of cost-effective approaches for Small Satellite Operations, with emphasis on missions recently accomplished and lessons learned. Papers that discuss the application of novel technology to mission operations, such as autonomy and autonomy, constraint resolution, and timeline planning are welcomed. A discussion of life-cycle costing vs. life-cycle effectiveness is invited. Papers addressing new business opportunities, innovative management techniques, and international cooperation in support of Small Satellite Operations are also encouraged.

**Chairs:**
- Rhoda S. Hornein
  NASA Headquarters - USA
  Email: rhoda.hornein@hq.nasa.gov
- Peter Allan
  Rutherford Appleton Laboratory – UK
  Email: p.m.allan@rl.ac.uk

**B4.4. Small Satellites for Earth Observation – Lessons Learned & New Generation Missions**

This session solicits presentations on a broad range of topics of interest to decision makers, scientists, engineers and managers who have dealt with small satellite missions or who are considering how to use small satellites for Earth observations. The goal is to provide a forum for lessons learned and new ideas that can enable the next generation of cost-effective Earth observation missions. The focus is on that particular class of issues, approaches, and technologies that is best suited to missions under about 1000 kg in spacecraft mass.

**Chairs:**
- Larry Paxton
  The Johns Hopkins University – USA
  Email: larry.paxton@jhuapl.edu
- Annan Ginati
  ESA/ESTEC – THE NETHERLANDS
  Email: annan.ginati@esa.int

**Rapporteur:**
- Klaus Briess
  Institut für Luft- und Raumfahrt - GERMANY
  Email: klaus.briess@ilr.tu-berlin.de

**B4.5. Design and Technology for Small Satellites**

This session covers the design and technology required and developed for small satellites and small satellite systems, including micro and nano-satellites. Real-life examples are particularly encouraged.

**Chairs:**
- Richard Holdaway
  Rutherford Appleton Laboratory – UK
  Email: r.holdaway@rl.ac.uk
- Phil Davies
  Surrey Satellite Technology Ltd. – UK
  Email: p.davies@sstl.co.uk

**B4.6. Small Spacecraft Launch, Injection, and Orbit Transfer Systems**

A key challenge facing the viability and growth of the small satellite community is affordable and reliable space access. This is achieved through small launchers, ride-shares, piggyback launches, and spacecraft propulsion technologies to reach final operational orbit. Topics of interest for this session include existing and conceptual launch platforms for small spacecraft; launcher and small spacecraft component and sub-system development that will enable efficient small spacecraft access to orbit and orbit change (e.g., propulsion systems, separation and dispenser systems, upper stages); and lessons learned from users on technical and programmatic approaches.

**Chairs:**
- Alex da Silva Curiel
  Surrey Satellite Technology Ltd. – UK
  Email: a.da-silva-curiel@ssl.co.uk
- Jeffery L. Emdee
  The Aerospace Corporation - USA
  Email: jeffery.l.emdee@aero.org

**B4.7. Interface Standards for Small Space Systems**

Interface standards are important for the inter-compatibility of space systems. Currently, interfaces such as RS422, MIL-STD 1553, and others are broadly used for interfacing spacecraft electrical systems. Mechanical interfaces between a launch vehicle and spacecraft are defined for each individual launch vehicle type. Today however, plug-and-play interface standards can be further defined and used to simplify the integration and test of elements of a system. For instance, an instrument or component can be connected in such a way as to become immediately recognizable to the overall system, whether through mechanical alignment locators, or through software drivers. Small spacecraft are ideal proving grounds for testing new plug-and-play interfaces. This session explores available or planned interface standards (mechanical, electrical, data systems, and fluids) across all interfaces of small space systems, whether for Earth observation Space Science, or Exploration applications.

**Chairs:**
- Jaime Esper
  NASA Goddard Space Flight Center – USA
  Email: jaime.esper@nasa.gov
- Marco D’Errico
  Dipartimento di Ingegneria Aerospaziale e Meccanica
  Secondo Università di Napoli – ITALY
  Email: marco.derrico@unina2.it

**Rapporteur:**
- Luisella Giulicchi
  ESA/ESTEC – THE NETHERLANDS
  Email: luisella.guilocchi@esa.int

**CATEGORY C – TECHNOLOGY**

**Common Technologies to Space Systems Including Astrodynamics, Structures, Power and Propulsion**

**C1. ASTRODYNAMICS SYMPOSIUM**

**C2. MATERIALS AND STRUCTURES SYMPOSIUM**

**C3. SPACE POWER SYMPOSIUM**

**C4. SPACE PROPULSION SYMPOSIUM**

**C1. ASTRODYNAMICS SYMPOSIUM**

This Symposium addresses advances in orbital mechanics, attitude dynamics, guidance, navigation, control, operations and robotics in space.

**Coordinators:**
- Arun Mira
  McGill University - CANADA
  Email: arun.mira@mcgill.ca
- Erick Lassard
  Alcatel Alenia Space – FRANCE
  Email: erick.lassard@alcatelalenia.space.com

**C1.1. Attitude Control, Sensors and Actuators**

This session deals with developments in the field of attitude sensors and actuators, robust control, adaptive control, identification and stabilization of flexible systems including design, validation, simulation, and experiments.

**Chairs:**
- Amalfi Finzi
  Politecnico di Milano - ITALY
  Email: amalia.finzi@polimi.it
- Michael Ochenskov
  Keldysh Institute of Applied Mathematics – RUSSIA
  Email: avchenni@keldysh.ru

- Phil Davies
  Surrey Satellite Technology Ltd. – UK
  Email: p.davies@sstl.co.uk

**C1.2. Multibody Dynamics**

The session will cover topics in dynamic simulations and controls of multiple rigid and flexible bodies including tethered systems space robots.

**Chairs:**
- Elbert N. Macau
  INPE/LAC – BRAZIL
  Email: elbert@lac.inpe.br
- Yasuhiro Morita
  ISAS/JAXA – JAPAN
  Email: morita@newslan.isas.jaxa.jp

**Rapporteur:**
- Andre P. Mazzoleni
  North Carolina State University – USA
  Email: a_mazzoleni@ncsu.edu
C1.3. Optimization
Optimization of trajectories including launch, orbital transfer, rendezvous, atmospheric reentry, manoeuvring and station keeping will be covered in this session.

Chairs:
David C. Folta
NASA Goddard Space Flight Center – USA
Email: david.c.folta.1@gsfc.nasa.gov

Moshe Guelman
Technion, I.I.T. – ISRAEL
Email: aerglm@aerodyne.technion.ac.il

Rapporteur:
Jean-Paul Aguttes
CNES – FRANCE
Email: jean-paul.aguttes@cnes.fr

C1.4. Orbital Dynamics
All aspects of satellite orbital dynamics under perturbing, and control forces including all phases of the mission will be covered in this session.

Chairs:
Robert Melton
The Pennsylvania State University – USA
Email: rgmelton@psu.edu

An-Ming Wu
National Space Organization – TAIWAN, CHINA
Email: amwu@nspa.org.tw

Chairs:
Colin R. McInnes
University of Strathclyde – UK
Email: colin.mcinnes@strath.ac.uk

C1.5. Mission Operations
Discussed in this session will be all aspects of design, implementation and control of single or multi satellite systems, taking into account optimisation and autonomy of on-board and ground operations as well as the emerging technologies.

Chairs:
Thérèse Donath
ONERA - FRANCE
Email: therese.donath@onera.fr

Veniamin Malyshev
Moscow Aviation Institute – RUSSIA
Email: mai604@online.ru

Chairs:
Constantinos P. Stavrinidis
ESA/ESTEC – THE NETHERLANDS
Email: constantinos.stavrinidis@esa.int

Pavel M. Trivailo
RMIT University (Royal Melbourne Institute of Technology) – AUSTRALIA
Email: trivailo@rmit.edu.au

C1.6. Guidance and Control
Studies and Applications related to guidance and control of spacecrafts and rockets, including rendez-vous and docking.

Chairs:
Werner Enderle
The Engineers Australia - AUSTRALIA
Email: w.endeke@qut.edu.au

Jun’ichiro Kawaguchi
ISAS/JAXA – JAPAN
Email: kawaguchi.jun@jaxa.jp

Chairs:
Antonia F. Bertachini Almeida Prado
INPE - BRAZIL
Email: prado@almeida.inpe.br

Miguel Bella Mora
DEIMOS Space S.L. – SPAIN
Email: deimos@deimos-space.com

C1.7. Mission and Constellation Design
This session deals with mission, constellation and formation flying with emphasis on studies and experiences related to current and future projects while taking into account mission constraints and implementation problems.

Chairs:
Antonia F. Bertachini Almeida Prado
INPE - BRAZIL
Email: prado@almeida.inpe.br

Miguel Bella Mora
DEIMOS Space S.L. – SPAIN
Email: deimos@deimos-space.com

Rapporteur:
Erick Lonsard
Alcatel Alenia Space – FRANCE
Email: erick.lonsard@alcatelalenia.space.com

C1.8. Attitude Dynamics, Modelling and Determination
This session deals with all aspects of spacecraft attitude, modelling, simulation of large flexible spacecraft and attitude stabilization.

Chairs:
Uwe Feucht
ESA – Germany
Email: uwe.feucht@esa.int

Colin R. McInnes
University of Strathclyde – UK
Email: colin.mcinnes@strath.ac.uk

Rapporteur:
Paolo Teofilatto
University of Rome La Sapienza – ITALY
Email: paolo.teofilatto@uniroma1.it

C2. MATERIALS AND STRUCTURES SYMPOSIUM
This Symposium provides an international forum for recent advancements in assessment of the latest technology achievements on space structures, structural dynamics and materials. The Symposium addresses the design and development of space vehicle structures and mechanical/thermal/fluidic systems. Future advances in a number of space systems applications for space power, space transportation, astrodynamics, space exploration, space propulsion and space station will depend increasingly on the successful application of innovative materials and the development of structural concepts, particularly those relating to very large deployable (and assembled) space structures.

For these applications to occur, increased dialog between these technology communities, and discussion among technologists and mission planners, must be pursued. Substantial improvements in a wide range of current technologies, including nanotechnologies, must occur; projected costs must be reduced, potential scientific returns must be increased from respective mission system applications.

Papers in this symposium will review the projected advances in materials and large space structures in this domain for advanced space systems applications.

Coordinators:
Constantinos P. Stavrinidis
ESA/ESTEC – THE NETHERLANDS
Email: constantinos.stavrinidis@esa.int

Pavel M. Trivailo
RMIT University (Royal Melbourne Institute of Technology) – AUSTRALIA
Email: trivailo@rmit.edu.au

C2.1. Space Structures I - Development and Verification (Space Vehicles and Components)
The following topics will be included: Analysis versus test results for spacecraft, launch vehicles and their components (e.g. pressurized structures, tanks, load introductions, primary structures, fluidic equipment, control surfaces); examination of both on-ground and in-orbit testing, launch dynamic environments as related to structural design, development and verification, such as sine, random and acoustic vibration and lessons learned.

Chairs:
Andreas Rittweger
EADS Space Transportation - GERMANY
Email: andreas.rittweger@space.eads.net
C2.2. Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures)
The following topics will be included: Analysis versus test results for deployable and/or dimensionally stable structures (e.g., reflectors, telescopes, antennas); examination of both on-ground and in-orbit testing; thermal dynamics, shape control, structural design, development and verification; lessons learned.

Chairs:
Jean-Alain Massoni
Alcatel-Airbus Space - FRANCE
Email: jean-alain.massoni@alcatel-aerospacemps.com
Paola Gasbarri
University of Rome La Sapienza - ITALY
Email: paola.gasbarri@uniroma1.it

Rapporteur:
Piero Racchù
C3L / University of Liège - BELGIUM
Email: prochu@ulg.ac.be

C2.3. Space Structures - Dynamics and Microdynamics
Topics included in this session are: dynamics analysis and testing, modal identification, landing and impact dynamics, pyrotech, test facilities, vibration suppression techniques, damping. micro-dynamics, in-orbit dynamic environment, wave structural propagation, excitation sources and in-orbit testing.

Chairs:
Pietro M. Baimun
Howard University - USA
Email: pmbaimun@mac.howard.edu
Igor M. Da Fonseca
INPE (National Institute for Space Research) - BRAZIL
Email: igor@dnm.inpe.br

Rapporteur:
Harjana Djopadharjo
UNP (National Polytechnic University) - INDONESIA
Email: harjana@ipd.unp.ac.id

C2.4. New Materials and Structural Concepts
Topics of discussion in this session will be: advanced materials and structural concepts applied in expendable and future reusable transportation systems and space vehicles. Of main interests are high temperature and cryogenic materials, nano-materials, composites, and ceramics including their structural application.

Chairs:
Dalef Alves
DLR (German Aerospace Center) – GERMANY
Email: dalef.alves@dlr.de
Marc Lacoste
Sneumo Propulsion Solide - FRANCE
Email: marc.lacoste@sneumo.fr

Rapporteur:
Yury Mazhukin
Yuzhnoye State Design Office - UKRAINE
Email: info@yuzhnoye.com

C2.5. Smart Materials and Adaptive Structures
The focus of the session will be an application of smart materials to spacecraft and launch vehicle systems, novel sensor and actuator concepts and new concepts for multi-functional and intelligent structural systems. Also included in the session will be new control methods for vibration suppression and shape control using adaptive structures as well as comparisons of predicted performance with data from ground and in-orbit testing.

Chairs:
Junjiro Onoda
ISAS/JAXA - JAPAN
Email: onoda.junjiro@jaxa.jp
Michael J. Eiden
ESA/ESTEC - THE NETHERLANDS
Email: michael.eiden@esa.int

Rapporteur:
Paola Gaudenzi
University of Rome La Sapienza - ITALY
Email: paola.gaudenzi@uniroma1.it

C2.6. Space Environmental Effects and Spacecraft Protection
In this session space environmental effects will be covered. For example, the effects of radiation, atomic oxygen, spacecraft charging, thermal cycling, dissociation, meteors, space debris and vacuum on space systems, microelectronics, materials and structures will be discussed. Protective and shielding technologies, including debris impact simulation, testing and susceptibility of Commercial-Off-The-Shelf (COTS) micro-electronics to space radiation will be presented.

Chairs:
Murray Hirschbein
NASA Headquarters – USA
Email: mhirschbei@hq.nasa.gov
Akira Meguro
NTT Network Innovation Laboratories - JAPAN
Email: meguro.akira@lab.ntt.co.jp

Rapporteur:
Frédéric Leleu
EADS Astrium - FRANCE
Email: frederic.leleu@space.eads.net

C2.7. Space Vehicles – Mechanical/Thermal/Fluidic Systems
Discussed in this session are novel technical concepts for mechanical/thermal subsystems of launchers, manned and unmanned spacecraft, re-entry vehicles and small satellites. Also included in this session will be cost effectiveness and reliability, material selection, new theoretical approaches, low cost manufacturing and test verification. Advanced subsystems and design for future exploration missions will also be included.

Chairs:
Mario Marchetti
University of Rome “La Sapienza” – ITALY
Email: mario.marchetti@uniroma1.it
Oleg M. Alifanov
Moscow Aviation Institute – RUSSIA
Email: afk@cosmos.com.ru

Rapporteur:
Gualang Mao
Beijing Institute of Aerodynamics – CHINA
Email: glmia@ sina.com

C2.8. Specialized Technologies, including Nanotechnology
Specialized material and structures technologies are explored in a large variety of space applications both to enable advanced exploration or science/observation mission scenarios and to perform test verifications relying on utmost miniaturization of devices or highest capabilities in structural, thermal, electrical, electro-mechanical/optical performances offered by the progress in Nanotechnology. Examples are the exceptional performances at nano-scale in strength, electrical, thermal conduction of carbon nanotubes which are experiencing first applications at macro-scale such as nano-composite structures, high efficiency energy storage wheels, MEMS and MOEMS devices. Molecular nanotechnology and advances in manipulation at nano-scale offer the road to molecular machines, ultra-compact sensors for science applications and mass storage devices. The Session encourages presentations of specialized technologies, in particular of nano-material related techniques and their application in devices offering unprecedented performances for space applications.

Chairs:
Mario Marchetti
University of Rome “La Sapienza” – ITALY
Email: mario.marchetti@uniroma1.it
Pierre Racchù
C3L / University of Liège – BELGIUM
Email: prochu@ulg.ac.be

Rapporteur:
Pavel M. Trivailo
RMIT University (Royal Melbourne Institute of Technology) – AUSTRALIA
Email: trivailo@rmit.edu.au

C2.9. Posters Session on Materials and Structures
Rapporteur:
Michael J. Eiden
ESA/ESTEC – THE NETHERLANDS
Email: michael.eiden@esa.int
C3. SPACE POWER SYMPOSIUM
The successful future exploration and development of space depends on the research into and deployment of new, more affordable and more reliable energy sources of diverse types ranging from the very small to the extraordinarily large. Moreover, the continuing support of government-sponsored space activities by the public will require that these activities serve human needs in obvious ways. One visionary way to achieve the latter goal is to provide non-polluting, economical power to the Earth from space. The Space Power Symposium will thus address space power systems for use in space and on the Earth. It will include topics such as: nuclear systems for spacecraft power and propulsion; systems using solar energy, and matters of storage, energy management, conversion, transmission and distribution. The Symposium will also examine the prospects of using space-based energy on the Earth and the use of key enabling technologies such as wireless power transmission for both space and terrestrial applications.

Coordinator:
John Mankins
Artemis Innovation – USA
Email: john.c.mankins@yahoo.com

C3.1. Space Power Systems, Concepts and Architectures
General topics bearing on the use of space-based power for the Earth are the subject of this session. It will address needs and benefits of space-based power, policy, economic, general technical and architectural issues, as well as environmental and societal aspects of the acquisition and use of space power on the Earth.

Chairs:
Nabuyuki Kaya
Kobe University - JAPAN
Email: kaya@kobe-u.ac.jp

Leopold Summerer
ESA/ESTEC - THE NETHERLANDS
Email: leopold.summerer@esa.int

Rapporteur:
Harvey J. Willenberg
Independent Consultant - USA
Email: harvey@willenberg.com

C3.2. Space Power Technologies and Components
This session will discuss component and systems technologies to meet the needs of future space missions including solar, nuclear, thermal energy conversion, thermal management, energy storage and other topics.

Chairs:
Henry W. Brandhorst
Auburn University - USA
Email: brandh@auburn.edu

Sussu Saeki
ISAS/JAXA - JAPAN
Email: saeki@isas.jaxa.jp

Rapporteur:
Frank Steinseik
EADS Space Transportation – GERMANY
Email: frank.steinseik@space.aads.net

C3.3. Experiments and Demonstrations for Advanced Space Power
Diverse new technologies will be needed to enable the development of future large space power systems. This session will discuss a range of needed technology demonstrations and flight experiments to validate these new concepts.

Chairs:
Nabuyuki Kaya
Kobe University – JAPAN
Email: kaya@kobe-u.ac.jp

Harvey J. Willenberg
Independent Consultant - USA
Email: harvey@willenberg.com

Rapporteurs:
Alain Calaste
Université de la Réunion - FRANCE
Email: calaste@univ-reunion.fr

Joe T. Howell
NASA Marshall Space Flight Centre – USA
Email: joe.howell@nasa.gov

This session will encompass exceptionally novel concepts for space power as enablers for visionary space missions in the far future.

Chairs:
John Mankins
Artemis Innovation – USA
Email: john.c.mankins@yahoo.com

Leopold Summerer
ESA/ESTEC - THE NETHERLANDS
Email: leopold.summerer@esa.int

Rapporteurs:
Ivan Bokay
Bokay Designs, Inc. – USA
Email: ibokay@cox.net

Wolfgang Seboldt
DLR - GERMANY
Email: wolfgang.seboldt@dlr.de

C3.5/C4.7. Joint session on Nuclear Propulsion and Power
This session addresses all issues of nuclear power in space applications.

Chairs:
Claudio Bruno
University of Rome “La Sapienza” – ITALY
Email: claudio.bruno@uninroma1.it

Harvey J. Willenberg - USA
Email: harvey@willenberg.com

Rapporteur:
Paul A. Czyz
Hypertech – USA
Email: paulczyz@abcglobal.net

C4. SPACE PROPULSION SYMPOSIUM
Propose, report on and include all propulsion systems, including those for Earth-to-orbit, orbital control and interplanetary missions.

Coordinators:
Dana G. Andrews
Andrews Space & Technology – USA
Email: danandrews@andrews-space.com

Giorgio Saccoccia
ESA/ESTEC - THE NETHERLANDS
Email: giorgio.saccoccia@esa.int

C4.1. Propulsion Systems I
This session is dedicated to all aspects of Liquid rocket Engines.

Chairs:
Masahiro Atumi
Mitsubishi Heavy Industries, Ltd. - JAPAN
Email: Masahiro_atumi@mhi.co.jp

Max Calabro
The Inner Arch - FRANCE
Email: max.calabro@free.fr

Rapporteur:
Marcel Pauliquen
SAFRAN – FRANCE
Email: marcel.pauliquen@safranma.com

C4.2. Propulsion Systems II
This session is dedicated to all aspects of Solid and Hybrid Propulsion.

Chairs:
Jean-François Guery
SNPE Matériel Energetiques – FRANCE
Email: jf.guery@snpe.com

John Harlow
Consultant - UK
Email: john@harlow.fsnet.co.uk

Rapporteur:
I-Shih Chang
The Aerospace Corporation – USA
Email: I-Shih.Chang@aerospace.com

C4.3. Propulsion Technology
This session includes all science and technology supporting all aspects of space propulsion.

Chairs:
Francesca Lillo
Aero - Propulsione Aerospaziale – ITALY
Email: francesca.lillo@avio.org

Gennaro Russo
C.I.R.A. – ITALY
Email: g.russo@cira.it
C4.4. Electric Propulsion
This section is dedicated to propulsion based on electricity as prime mover.

Chairs:
- Gary A. Papay
  RIAME MAI - RUSSIA
  Email: riam@titude2000.ru
- Giorgio Saccoccia
  ESA/ESTEC - THE NETHERLANDS
  Email: giorgio.saccoccia@esa.int

Rapporteur:
- Oleg A. Gorbunov
  Keldysh Research Center - RUSSIA
  Email: kgor@2000.ru

C4.5. Hypersonic and Combined Cycle Propulsion
This section includes papers dealing with use of air in earth to orbit propulsion. It is a joint ISOABE/IAF session.

Chairs:
- Francois Falempin
  EADS/MBDA - FRANCE
  Email: francois.falempin@mbda.fr
- Nobuhito Tanatsugu
  The Muroran Institute of Technology – JAPAN
  Email: tanatsugu@inho.muroran-it.ac.jp

Rapporteur:
- Shigeru Aso
  Kyushu University - JAPAN
  Email: aso@barea.kyushu-u.ac.jp

C4.6. Advanced Propulsion - Non Chemical, non Electric
All aspects of innovative propulsion technology systems are included.

Chairs:
- Timothy J. Lawrence
  USAFA - USA
  Email: timothy.lawrence@usafa.af.mil
- Vladimir Prisniakov
  Academy of Science of Ukraine - UKRAINE
  Email: kp@teleport.com

Rapporteur:
- Marcel Pouliquen
  SAFRAN – FRANCE
  Email: marcel.pouliquen@safran.com

C4.7. Joint session on Nuclear Propulsion and Power
This section addresses all issues of nuclear power in space applications.

Chairs:
- Claudia Bruno
  University of Rome “La Sapienza” - ITALY
  Email: claudio.bruno@unina1.it
- Harvey J. Willenberg - USA
  Email: harvey@willenberg.com

Rapporteur:
- Paul A. Czysz
  Hypertech – USA
  Email: paulczysz@higlobal.net
D1.3. System Engineering Tools, Processes & Training

This session will focus on state-of-the-art system engineering methodologies, design techniques, tools, processes, and training that reduce the time and cost, and improve the quality of space system designs. Special interest are multi-disciplinary methods, tools, and processes including modeling and simulation used to define system architectures to improve risk management; safety, reliability, testability, quality of life cycle cost estimates, and to improve the training of system engineers.

Chairs:
- Jean-Paul Aguttes
  CNES - FRANCE
  Email: jean-paul.aguttes@cnes.fr
- Wiley Larson
  CEI - USA
  Email: wiley.larson@adalphi.net

Rapporteur:
- Tibor S. Balint
  NASA Jet Propulsion Laboratory - USA
  Email: tibor.balint@jpl.nasa.gov

D1.4. Space Systems Architectures

The subject of this session is current and future space system architectures to increase performance, efficiency, reliability, and flexibility of application. Topics of interest include the design of flight and ground system (hardware & software) architectures and the partitioning of functions between them, small satellite constellations and formations (swarms), and the use of on-board autonomy and autonomous ground operations.

Chairs:
- Erick Lansard
  Alcatel Alenia Space - FRANCE
  Email: erick.lansard@alcatelalienspace.com
- Alan Willith
  Georgia Institute of Technology - USA
  Email: willith@seat.miss.org

Rapporteur:
- Genesio Hubscher
  INPE – LIT - BRAZIL
  Email: genesio@lit.insp.br

D1.5. Lessons Learned in Space Systems

Experiences, both positive and negative, that have been encountered in space systems (hardware & software) design, development and operation. End-to-end lessons learned and impacts on cost, schedule and performance, in the areas of (among others): international cooperation, the use of COTS products, partitioning of functions between flight and ground systems, the extent and fidelity of simulations, integration, test and operations.

Chairs:
- Todd Fox
  The Boeing Company – USA
  Email: todd.fox@boeing.com
- Genesio Hubscher
  INPE – LIT - BRAZIL
  Email: genesio@lit.insp.br

Rapporteur:
- Erick Lansard
  Alcatel Alenia Space - FRANCE
  Email: erick.lansard@alcatelalienspace.com

D1.P. Interactive Session on Space Systems

Rapporteurs:
- Todd Fox
  The Boeing Company – USA
  Email: todd.fox@boeing.com
- Moshe Gueldner
  Technion, I.I.T., Israel Institute of Technology - ISRAEL
  Email: oeygelm@eas.technion.ac.il

D2. SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

Topics should address worldwide space transportation solutions and innovations. The goal is to foster understanding and cooperation amongst the world’s space-faring organizations.

D2.1. Launch Vehicles in Service or in Development

Review of current and planned launch vehicles, launch services, and facilities currently in use in the world or under short term development.

Chairs:
- Ray F. Johnson
  The Aerospace Corporation - USA
  Email: ray.f.johnson@aero.org
- Christian Dujarric
  ESA Headquarters – FRANCE
  Email: christian.dujarric@esa.int

Rapporteur:
- Terry Reese
  NASA Headquarters – USA
  Email: terry.reese-1@nasa.gov

D2.2. Indian Launchers Overview

Review of the current and planned launch vehicles, launch services, operations and facilities currently in India.

Chairs:
- Ulf Palmwas
  Volvo Aero Corporation - SWEDEN
  Email: ulf.palmwas@volvo.com
- S.S. Balakrishnan
  Bangalore - INDIA
  Email: s.s.balakrishnan@yahoo.com

Rapporteur:
- Douglas O. Stanley
  National Institute of Aerospace - USA
  Email: stanley@nianet.org

D2.3. Upper Stages, Space Transfer, Reentry and Landing Systems

Discussion of existing, planned or new advanced concepts for cargo and human orbital transfer. Includes current and near term transfer, re-entry and landing systems as well as technologies for transferring spacecraft crew cargo in space.

Chairs:
- Dana G. Andrews
  Andrews Space – USA
  Email: dandrews@andrews-space.com
- Shoichiro Asada
  Mitsubishi Heavy Industries Ltd. - JAPAN
  Email: shoichiro.asada@mhi.co.jp

Rapporteur:
- Pier De Matteis
  CIRA, Italian Aerospace Research Center – ITALY
  Email: p.de.matteis@cira.it

D2.4. Future Space Transportation Systems

Discussion of future system designs and operational concepts for both expendable and reusable systems for Earth-to-orbit transportation and beyond, with breathing or rocket propulsion.

Chairs:
- Patrick M. McKenzie
  Lockheed Martin Space Systems Company - USA
  Email: pat.m.mckenzie@lmco.com
- Ralf Klaedtke
  EADS – Space Transportation - GERMANY
  Email: ralf.klaedtke@space.eads.net

Rapporteur:
- Walter Fautloner
  Johns Hopkins University Applied Physics Laboratory - USA
  Email: walter.fautloner@jhuapl.edu
D2.5. Future Space Transportation Systems Technologies
Discussion of technologies enabling new reusable or expendable launch vehicles and in-space transportation systems. Emphasis is on hardware verification.

Chairs:
Yoshifumi Inatani
JAXA – JAPAN
Email: inatani.yoshifumi@jaxa.jp

Gianni Russo
CIRA, Italian Aerospace Research Center – ITALY
Email: g.russo@cira.it

Rapporteur:
David Glass
NASA Langley Research Center – USA
Email: david.a.glass@nasa.gov

D2.6. Future Space Transportation Systems Technologies In-Flight Experimentation
Discussion of experimental vehicles and flight demonstrators enabling new expendable or reusable launch vehicles.

Chairs:
Laurent Bouaziz
NGL Prime SpA – ITALY
Email: laurent.bouaziz@nglauncher.net

John P. Sumrall
NASA – Marshall Space Flight Center – USA
Email: john.p.sumrall@nasa.gov

Rapporteur:
Shigeru Aso
Kyushu University – JAPAN
Email: aso@aoe.kyushu-u.ac.jp

D2.7. Requirements for New Space Transportation Systems
Discussion of technical and operational requirements for future missions, coming from planetary exploration, space power systems, space tourism, defense applications, disaster monitoring, security and sounding rockets.

Chairs:
Luigi Busalone
Busalone & Associates – ITALY
Email: luigi.busalone@virgilio.it

Michael L. Burris
NASA Marshall Space Flight Center – USA
Email: michael.l.burris@nasa.gov

Rapporteur:
Norbert Pfitzmann
DLR – GERMANY
Email: norbert.pfitzmann@dlr.de

D2.P: Interactive Session on Space Transportation Innovations and Solutions
Rapporteurs:
Debra Facktor Lepore
Air Launch LLC – USA
Email: dfl@aarl.aero

Vladimir P. Plokhikh
TsAGI – RUSSIA
Email: plskhikh@tsagi.ru

D3. SYMPOSIUM ON STEPPING STONES TO THE FUTURE: STRATEGIES, ARCHITECTURES, CONCEPTS AND TECHNOLOGIES
The international discussion of future directions for space exploration and utilization is fully underway, including activities involving all major space-faring nations. Discussions are now being made that will set the course for space activities for many years to come. New approaches are needed that establish strategies, architectures, concepts and technologies that will lead to sustainable human and robotic space exploration and utilization during the coming decades. This Symposium will examine the possible paths, beginning with current capabilities such as the International Space Station, which may lead to ambitious future opportunities for space exploration, discovery and benefits.

Coordinators:
John Mankins
Artemis Innovation – USA
Email: john.c.mankins@yahoo.com

Dietrich Venneman
ESA/ESTEC – THE NETHERLANDS
Email: dietrich.venneman@esa.int

D3.1. Strategies and Architectures to Establish a “Stepping Stone” Approach to our Future in Space
Future scenarios for sustainable space exploration and utilization will unfold in the context of global conditions that vary greatly from those of the 1950s-1970s. It is likely that space-faring countries will pursue their goals and objectives in a step-wise fashion, rather than through massive, geopolitically driven programs (such as those that typified the Moon race of the 1960s). As a result, it is important that the international community engage in an ongoing discussion of strategies to establish a “stepping stone” approach to our future in space. Such a strategy should involve sustainable budget levels and multiple-purpose system-of-systems capabilities that lead to a diverse range of future activities of broad benefit to humanity and would represent a substantial departure from past models for major space programs. Moreover, nearer term developments, such as those in the Earth’s neighborhood (e.g., in support of the 2004 U.S. Vision for Space Exploration), should be structured to best support later evolution and reconfiguration to pursue still more ambitious missions—such as continuing robotic exploration of the Solar System, human and robotic exploration of Mars and targets beyond, and the search of Earth-like planets around nearby stars. This session will address strategies and approaches that may allow a new paradigm—a “stepping stone” approach—to be established among the space-faring countries. Papers are solicited in these and related areas.

Chairs:
John Mankins
Artemis Innovation – USA

Rapporteur:
William H. Siegfried
The Boeing Company (retired) – USA
Email: wmsiegfried@comcast.net

D3.2. Novel Concepts and Technologies for the Exploration and Utilization of Space
In order to realize future, sustainable programs of space exploration and utilization, a focused suite of transformational new systems concepts and supporting technologies must be advanced during the coming decade. The technical objectives to be pursued should be drawn from the broad panoply of potential technologies and systems, but must be sufficiently well-focused to allow tangible progress—and dramatic improvements over current systems—to be realized in the foreseeable future. This session will address cross-cutting considerations in which a number of discipline research topics and technologies may be successfully synthesized to enable a transformational new systems concept to be realized. Papers are solicited in these and related areas.

Chairs:
Lionel Suchet
CNES – FRANCE
Email: lionel.suchet@cnes.fr

Nantel Suzuki
NASA Headquarters – USA
Email: nantel.s.suzuki@nasa.gov

Rapporteur:
Maria Antonietta Perino
Alenia Spazio S.p.A – ITALY
Email: maperino@to.alespazio.it

D3.3. Requirements for New Space Transportation Systems
Discussion of technical and operational requirements for future missions, coming from planetary exploration, space power systems, space tourism, defense applications, disaster monitoring, security and sounding rockets.

Chairs:
Luigi Bussalone
Busalone & Associates – ITALY
Email: luigi.bussalone@virgilio.it

Michael L. Burris
NASA Marshall Space Flight Center – USA
Email: michael.l.burris@nasa.gov

Rapporteur:
Norbert Pfitzmann
DLR – GERMANY
Email: norbert.pfitzmann@dlr.de

D3.4. Archiving and Utilization of Space Data
Discussion of experimental vehicles and flight demonstrators enabling new expendable or reusable launch vehicles.

Chairs:
Laurent Bouaziz
NGL Prime SpA – ITALY
Email: laurent.bouaziz@nglauncher.net

John P. Sumrall
NASA – Marshall Space Flight Center – USA
Email: john.p.sumrall@nasa.gov

Rapporteur:
Shigeru Aso
Kyushu University – JAPAN
Email: aso@aoe.kyushu-u.ac.jp

D3.5. Future Space Transportation Systems Technologies In-Flight Experimentation
Discussion of experimental vehicles and flight demonstrators enabling new expendable or reusable launch vehicles.

Chairs:
Laurent Bouaziz
NGL Prime SpA – ITALY
Email: laurent.bouaziz@nglauncher.net

John P. Sumrall
NASA – Marshall Space Flight Center – USA
Email: john.p.sumrall@nasa.gov

Rapporteur:
Shigeru Aso
Kyushu University – JAPAN
Email: aso@aoe.kyushu-u.ac.jp

D3.6. Future Space Transportation Systems Technologies
Discussion of experimental vehicles and flight demonstrators enabling new expendable or reusable launch vehicles.

Chairs:
Laurent Bouaziz
NGL Prime SpA – ITALY
Email: laurent.bouaziz@nglauncher.net

John P. Sumrall
NASA – Marshall Space Flight Center – USA
Email: john.p.sumrall@nasa.gov

Rapporteur:
Shigeru Aso
Kyushu University – JAPAN
Email: aso@aoe.kyushu-u.ac.jp

D3.7. Requirements for New Space Transportation Systems
Discussion of technical and operational requirements for future missions, coming from planetary exploration, space power systems, space tourism, defense applications, disaster monitoring, security and sounding rockets.

Chairs:
Luigi Bussalone
Busalone & Associates – ITALY
Email: luigi.bussalone@virgilio.it

Michael L. Burris
NASA Marshall Space Flight Center – USA
Email: michael.l.burris@nasa.gov

Rapporteur:
Norbert Pfitzmann
DLR – GERMANY
Email: norbert.pfitzmann@dlr.de

D3.P: Interactive Session on Space Transportation Innovations and Solutions
Rapporteurs:
Debra Facktor Lepore
Air Launch LLC – USA
Email: dfl@aarl.aero

Vladimir P. Plokhikh
TsAGI – RUSSIA
Email: plskhikh@tsagi.ru

D3. SYMPOSIUM ON STEPPING STONES TO THE FUTURE: STRATEGIES, ARCHITECTURES, CONCEPTS AND TECHNOLOGIES
The international discussion of future directions for space exploration and utilization is fully underway, including activities involving all major space-faring nations. Decisions are now being made that will set the course for space activities for many years to come. New approaches are needed that establish strategies, architectures, concepts and technologies that will lead to sustainable human and robotic space exploration and utilization during the coming decades. This Symposium will examine the possible paths, beginning with current capabilities such as the International Space Station, which may lead to ambitious future opportunities for space exploration, discovery and benefits.

Coordinators:
John Mankins
Artemis Innovation – USA
Email: john.c.mankins@yahoo.com

Dietrich Venneman
ESA/ESTEC – THE NETHERLANDS
Email: dietrich.venneman@esa.int
D3.3. Infrastructures and Systems to Enable Ambitious Future Exploration and Utilization of Space

Although innovative systems concepts and technologies are critical to future space activities, these systems cannot succeed if they are used in “one-at-a-time” mission approaches. Instead, the emergence of novel “system-of-systems” infrastructures will also be needed to enable ambitious scenarios for sustainable future space exploration and utilization. New, reusable space infrastructures must emerge in various areas, including the following: (1) infrastructures that enable affordable, reliable access to space for both exploration systems and logistic; (2) infrastructures for affordable, reliable transportation in space, including access to/from lunar and planetary surfaces, for crew, robotic and supporting systems and logistic; (3) infrastructures that allow sustained, affordable and highly effective operations on the Moon, Mars and other destinations; and, (4) supporting in-space infrastructures that provide key services (such as communications, navigation, etc.). Papers are solicited in these and related areas.

Chairs:
- William H. Siegrist
  The Boeing Company (retired) – USA
  Email: wseigrist@comcast.net
- Yoshiroda Takizawa
  JAXA – JAPAN
  Email: takizawa.yoshiroda@jaxa.jp

Rapporteurs:
- Scott Hawland
  ESA/ESTEC – THE NETHERLANDS
  Email: scott.hawland@esa.int
- Gordon Woodcock
  Space America Inc. – USA
  Email: gwn@mindspring.com

D3.4./C3.4. Joint Session on Advanced Concepts for Space Power: Enabling Ambitious Space Exploration and Utilization

The session will encompass exceptionally novel concepts for space power as enablers for visionary space missions in the far future.

Chairs:
- John Mankins
  Artemis Innovation – USA
  Email: john.c.mankins@yahoo.com
- Leopold Summerer
  ESA/ESTEC – THE NETHERLANDS
  Email: leopold.summerer@esa.int

Rapporteurs:
- Ivan Ibaray
  Ibaray Designs, Inc. – USA
  Email: ibaray@cox.net
- Wolfgang Sebold
  DLR – GERMANY
  Email: wolfgang.sebold@dlr.de

D3.5./E5.5. Joint Session on Space Technology and Systems Management Practices and Tools

This session will focus on how to ensure that knowledge and quality are maintained throughout a project’s lifecycle through case studies and approaches related to:

- Analysis and case studies of successful projects and innovations in the application of quality and knowledge management processes and technologies;
- Risk management and opportunity management approaches;
- Solutions used for anomaly resolution and tracking systems, such as fault tree analysis and FMECA;
- Analysis and case studies of successful projects and innovations in the application of quality and knowledge management processes and technologies;
- Risk management and opportunity management approaches;
- Solutions used for anomaly resolution and tracking systems, such as fault tree analysis and FMECA;
- Analysis and case studies of successful projects and innovations in the application of quality and knowledge management processes and technologies;
- Risk management and opportunity management approaches;
- Solutions used for anomaly resolution and tracking systems, such as fault tree analysis and FMECA.

Chairs:
- John Mankins
  Artemis Innovation – USA
  Email: john.c.mankins@yahoo.com
- Peter Swan
  SouthWest Analytic Network – USA
  Email: dr-swan@cox.net

Rapporteurs:
- Paui Jukola
  Finnish Astronautical Society – FINLAND
  Email: pauv.jukola@fatsi-saff.fi
- Christopher Moore
  NASA – USA
  Email: Christopher.moore@nasa.gov

D4. SYMPOSIUM ON THE FAR FUTURE: RENEWED VISIONS

Coordinators:
- George Morganfrank
  University of Colorado at Boulder – USA
  Email: morganfr@colorado.edu
- Hans Hoffmann
  OIRCom LLC – GERMANY
  Email: hans.e.hoffmann@oneline.de

D4.1. Space Elevator System and its Applications

The Space Elevator is a revolutionary means of access to space that has attracted attention from a variety of space agencies and corporations. It is currently envisioned as a 104,000 km ribbon of carbon nanotubes with one end attached to Earth. The Space Elevator will ferry satellites, spacecrafts, and pieces of space stations into space using electric lifts clamped to the ribbon. This session will review recent activities and where it is going. The applications of the Space Elevator will enable the program to go forward. This will include near term and far term concepts.

Chairs:
- Peter Swan
  SouthWest Analytic Network – USA
  Email: dr-swan@cox.net

Rapporteur:
- David Raith
  ESA/ESTEC – THE NETHERLANDS
  Email: david.raith@esa.int

D4.2. Space Elevators and Advanced Tethers – Technologies and Strategies

The Space Elevator, currently envisioned as a 104,000 km ribbon of carbon nanotubes, can have many applications and will have a tremendous impact upon industry and society when launch-to-orbit costs are reduced to some $100/lb. This session will cover the technologies necessary to construct the space elevator in a timely manner. In addition, this session will ensure that the strategies of development recognize the necessary technological breakthrough’s required for a near term success story.

Chairs:
- Peter Swan
  SouthWest Analytic Network – USA
  Email: dr-swan@cox.net

Rapporteur:
- Eric Shaw
  NASA Marshall Space Flight Center – USA
  Email: eric.shaw@msfc.nasa.gov

D5. 40th SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES

The Symposium addresses management approaches, methods, design solutions and regulations to improve the quality and efficiency of space activities. All aspects are considered: risk from space environment, complexity of systems and operations, human factors, economical constraints, international cooperation, norms and standards.

Coordinator:
- Max Grimard
  EADS Space – FRANCE
  Email: max.grimard@eads.net

D5.1. Quality and Knowledge Management

Current and planned projects pose many technical, cost, and schedule challenges for today’s aerospace civil and defence sectors. This, in turn, mandates innovative approaches, processes, and tools that build upon the lessons of past successes and the expertise of the people within the aerospace community. This session will focus on how to ensure that knowledge and quality are maintained throughout a project’s lifecycle through case studies and approaches related to:

- Analysis and case studies of successful projects and innovations in the application of quality and knowledge management processes and technologies;
- Risk management and opportunity management approaches;
- Solutions used for anomaly resolution and tracking systems, such as fault tree analysis and FMECA;
- Capture of technical expertise and lessons learned from previous successful projects that are applicable to new programs;
- Failure recovery and preventative measures that relate to the application of quality and knowledge management practices.

Chairs:
- Jeanne Holm
  NASA Jet Propulsion Laboratory – USA
  Email: jeanne.holm@jpl.nasa.gov

Rapporteur:
- Max Grimard
  EADS Space – FRANCE
  Email: max.grimard@eads.net
**D5.2. Assessing the Space Environment and its Effects**

Space environment is part of the constraining requirements for near Earth and outer space programs, and must be taken into account at each step of a development, from requirements definition to operations. This session will deal with:

- Engineering tools for better specification and design
- Qualification, calibration and validation (ground and in-flight)
- Anomaly analysis and lessons learned.

An associated Interactive Session will be focused on ground facilities description, as a first contribution to a world-wide catalog of space environment simulation facilities.

**CATEGORIES E – SPACE AND SOCIETY**

**Interaction of Space with Society Including Education, Policy and Economics, History and Law.**

**E1. SPACE EDUCATION AND OUTREACH SYMPOSIUM**

**E2. 37th STUDENT CONFERENCE**

**E3. SPACE BENEFITS - OPPORTUNITIES FOR MANKIND: POLICY AND ECONOMIC ASPECTS**

**E4. 41ST HISTORY OF ASTRONAUTICS SYMPOSIUM**

**E5. 18th SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY**

**E6. 50th INTERNATIONAL COLLOQUIUM ON LAW OF OUTER SPACE (IISL)**

**E1. SPACE EDUCATION AND OUTREACH SYMPOSIUM**

The Symposium deals with methods and techniques for space education and outreach. Contributions reporting on programmes/activities that have already taken place will usually be received more favorably than those reporting on future concepts and plans. Similarly, more weight will be given to contributions that include some measures of critical assessment and clearly identify relevant target groups, benefits, lessons learned, good practice, etc.

**Coordinator:**

Pierre-Louis Contreras  
CNES - FRANCE  
Email: pierre.contreras@cnes.fr

**E1.1. “Hands-On” Space Education**

This session will focus on space education projects that use physical, practical and/or interactive activities as their primary means of engaging with their participants.

**Chairs:**

Pierre-Louis Contreras  
CNES - FRANCE  
Email: pierre.contreras@cnes.fr

Fernanda Stancato  
Metropolitana-IESB - BRAZIL  
Email: stancato@ump.edu.br

**Rapporteur:**

Stephen Brock  
AIAA - USA  
Email: stephenb@aiaa.org

**E1.2. Structures for Space Education**

This session will focus on formalised, higher-level strategies, structures, methods and systems for space education and outreach.

**Chairs:**

Yolanda Berenguer  
UNESCO - FRANCE  
Email: y.berenguer@unesco.org

Valerie Cassanto  
NASA Goddard Space Flight Center - USA  
Email: v.cassanto@nps.nasa.gov

**Rapporteurs:**

Benedicte Escudier  
ENSEA/SUPAERO - FRANCE  
Email: benedicte.escudier@supaero.fr

**E1.3. Educational Outreach**

This session will focus on activities that promote both space and space education activities through engagement with the general public.

**Chairs:**

Carsten Holze  
Mach! Wissen DE AG - GERMANY  
Email: carsten.holze@machwissen.de

Olga Zhidoneva  
Space Technology Consultant - RUSSIA  
Email: navigator@mail.ru

**Rapporteur:**

Victorina Mayorova  
Bauman Moscow State Technical University - RUSSIA  
Email: vika210@online.ru

**E1.4. Innovative and Informal Space Education**

This session will focus on novel and non-standard ways of communicating space in non-traditional areas and to non-traditional target groups.

**Chairs:**

Jean-Daniel Dessimox  
HESSO-EIVD - SWITZERLAND  
Email: jean-daniel.dessimox@eivd.ch

Victoria Mayorova  
Bauman Moscow State Technical University - RUSSIA  
Email: vika210@online.ru

**Rapporteur:**

Gulnara Amarova  
Observatory, Almaty, Kazakhstan  
Email: omarova@mtc.gov.kz

**E1.5. Space Exploration Education**

This session will focus on educational and outreach activities, regardless of age range, that leverage the inspirational value of space exploration and aim to prepare today’s students and future generations to be actively involved in turning space exploration visions into a real and sustainable endeavour.

**Chairs:**

Piero Messina  
ESA Headquarters - FRANCE  
Email: piero.messina@esa.int

Lyn Wigbels  
RWI – USA  
Email: lyn.wigbels@cox.net

**Rapporteur:**

Christine Legault  
Ecole Des Métiers de l’Aérospatiale De Montréal - CANADA  
Email: legaultc@csdm.qc.ca

**E2. 37th STUDENT CONFERENCE**

Presentation of space-related papers by undergraduate and graduate students who participate in an international student competition.

**Coordinators:**

Rachid Amekrane  
EADS-ST GmbH - GERMANY  
Email: rachid.amekrane@space.eads.net

Stephen J. Brock  
AIAA - USA  
Email: stephenb@aiaa.org
E2.1. Student Conference I
Undergraduate and graduate level students (no more than 28 years of age) present papers on any subject related to space sciences, industry or technology. These papers will represent the work of the author(s) (no more than two students). The students presenting in this session will compete in the 37th International Student Competition.
For further guidelines, please refer to www.iafastro.org as from April 2007.
Chairs:
Stephen J. Brock
AIAA - USA
Email: stephenb@aiaa.org

Bénédicte Escudier
ENSEE / SUPAERO - FRANCE
Email: benedictescudier@supaero.fr

Rapporteur:
Carsten Holze
Macht Wissen DE AG - GERMANY
Email: carsten.holze@machtwissen.de

E2.2. Student Conference II
Undergraduate and graduate level students (no more than 28 years of age) present papers on any subject related to space sciences, industry or technology. These papers will represent the work of the author(s) (no more than two students). The students presenting in this session will compete in the 37th International Student Competition.
For further guidelines, please refer to www.iafastro.org as from April 2007.
Chairs:
Rachid Ameurkane
EADS-ST GmbH - GERMANY
Email: rachid.ameurkane@space.eads.net

Fernando Stancato
Metropolitana-IESB - BRAZIL
Email: stancato@ump.br

Rapporteur:
Chris Welch
Kingston University, School of Engineering – UK
Email: C.S.Welch@kingston.ac.uk

E2.3. Student Conference III
Undergraduate and graduate level students (no more than 28 years of age) present papers on any subject related to space sciences, industry or technology. These papers will represent the work of the author(s) (no more than two students). Students presenting in this session will compete for the Hans van Middau Team Award.
For further guidelines, please refer to www.iafastro.org as from April 2007.
Chairs:
Carsten Holze
Macht Wissen DE AG - GERMANY
Email: carsten.holze@machtwissen.de

Katie Blanding
Office of Education, NASA Headquarters – USA
Email: katie.blanding@nasa.gov

E3. SPACE BENEFITS - OPPORTUNITIES FOR MANKIND: POLICY AND ECONOMIC ASPECTS
The purpose of the symposium is to review the policy and economic aspects of space systems applications to a sustainable, secure and better world for its inhabitants, with a special focus on satisfying the requirements of developing countries.
Coordinators:
Gérard Brachet
Chair IAA Commission V – France
Email: sicurt@wanadoo.fr

Karl-Owe Schragl
DLR – GERMANY
Email: karl-ove.schragl@dlr.de

E3.1. Socio-Economic Benefits of Space Activities for Developing Countries
Water and land resources management, support to education programs, support to health and medicine, training in advanced technology.
Chairs:
M.Y.S. Prasad
ISRO - INDIA
Email: myps@isac.isro.gov.in

Harjono Djipodjahrjo
Universitas Al Azhar – INDONESIA
Email: harjono@ipodip.com

E3.2. Space Systems Benefits for Global Security
Prevention and mitigation of natural disasters, international cooperation, increased transparency.
Chairs:
Douglas Aldworth
Foreign Affairs Canada - CANADA
Email: douglas.aldworth@international.gc.ca

V.S. Hegde
ISRO Headquaters - INDIA
Email: vshedge@isro.gov.in

E3.3. Economic and Cultural Benefits of Space Systems
Communication, navigation, TV and radio broadcasting.
Chairs:
Kazuto Suzuki
University of Tsukuba - JAPAN
Email: suzuki@social.tsukuba.ac.jp

Alice Lee
UN-OOSA - AUSTRIA
Email: alice.lee@unvienna.org

E3.4. Exploration and Discovery
Role of space sciences, role of space systems in exploration.
Chairs:
Toshifumi Mukai
JAXA - JAPAN
Email: mukai@jpp.isas.jaxa.jp

Serge Plattard
ESPI – AUSTRIA
Email: serge.plattard@espi.or.at

E3.5. Scientific-Legal Roundtable
Google Earth et al. - pros and cons of an easier access to satellite imagery: Invited papers only.
Chairs:
Wendell Mendell
NASA Johnson Space Center – USA
Email: wendell.w.mendell@nasa.gov

Frans van der Dunk
International Institute of Air and Space Law, University of Leiden – THE NETHERLANDS
Email: T.G.vanderDunk@law.leidenuniv.nl

E4. 41st HISTORY OF ASTRONAUTICS SYMPOSIUM
Honouring the 50th anniversary of the Space Era (Sputnik 1 and the International Geophysical Year, IGY). History of space science, technology and development, rocketry, personal memoirs. The history of rocketry and astronautics of India. The entire spectrum of space history, at least 25 years old, is covered.
Coordinators:
Steven J. Dick
NASA Headquarters – USA
Email: steven.j.dick@nasa.gov

Christophe Rothmund
SNECMA - FRANCE
Email: christophe.rothmund@sneca.fr

Tony Springer
NASA Headquarters – USA
Email: tony.springer@hq.nasa.gov

E4.1. The International Geophysical Year, Sputnik 1 and the Space Race
Session honouring the 50th Anniversary of the Space Era. Invited papers included in the initiation and early conduct of the Soviet/Russian space programme (Sputnik 1), the International Geophysical Year (IGY) 1957-58 and the space race. The political and programmatic implications of the space race and self-biographical memoirs of “early pioneers”. Proposed papers by scholars researching the beginning of the space era.
Chairs:
Frederick I. Ordway
US Space & Rocket Center – USA
Email: ordmars@aol.com

Valery Y. Chubkov
Institute of the History of Sciences and Technology named after S.I. Vavilov, - RUSSIA
Email: postmaster@ihst.ru

Rapporteurs:
Ake Ingemar Skoog - GERMANY
Email: ake.ingemar.skoog@online.de
E4.2. Memoirs

Autobiographical and biographical memoirs of individuals who have made significant original contributions to the development and application of astronautics and rocketry.

Chairs:
Manisha Freeman
21st Century - USA
Email: knutf@knn.com

Harve Moulins
PH - FRANCE
Email: harve.moulins-hm@wanadoo.fr

Rapporteurs:
Philippa Cosyn - BELGIUM
Email: Philippa.Cosyn@vrt.be

Richard Dowling
Space Media - USA
Email: ridouling@aol.com

E4.3. Organisational, Scientific & Technical Reviews

History of government, industrial, academic and professional societies and organisations long engaged in astronautical endeavours. Historical summaries of rocket and space programmes.

Chairs:
Philippe Jung
AAAF - FRANCE
Email: philippe.jung3@free.fr

Kerrie Dougherty
Curator Space Technology - AUSTRALIA
Email: kerriid@phm.gov.au

Rapporteurs:
Emily Springer
AAIA - USA
Email: emily@aaia.org

Charles Lundquist
University of Alabama in Huntsville - USA
Email: lundqcu@email.uah.edu

E4.4. History of Indian Contributions to Rocketry and Astronautics

Special session with invited and proposed speakers. This session will cover ancient rocketry and the origins (technical and political aspects) of the modern space programme of India.

Chairs:
Offrid Liepack
Jet Propulsion Laboratory - USA
Email: offrid.liepack@jpl.nasa.gov

Manoranjan Rao
ISRO - INDIA
Email: ranjanarao@isro.isroindia.com

Rapporteurs:
George S. James
Rocket Research Institute Inc., Eastern Operations Office - USA
Email: george.james@fee.doe.gov

Yasunori Matogawa
JAXA - JAPAN
Email: matogawa.yasunori@jaxa.jp

E5.1. Innovating Through Technology Spin-in and Spin-off

Technology transfer is the process of using technology, expertise, know-how or facilities for a purpose not originally intended by the developing organization. Traditionally, technology transfer was performed at the end of a development programme, but it is now believed that the process should be started much earlier in the development cycle and continue throughout it. This would permit the identification of dual-use opportunities as well as the continual enhancement of the technology based on no-space sector (i.e. real market) feedback. It is a fact that the gap has widened between the technologies used for space applications and the technologies used everyday in terrestrial industrial or domestic applications. For instance, the level of technology and computing power embedded in some low-cost consumer products far exceeds what is implemented in today’s satellites. Equally, very sophisticated technologies and materials are currently used in many areas such as medicine, automotive engineering, computer gaming, textiles – some of which may have spin-in potential for space.

Papers are invited which explain how spin-in and spin-off of advanced and emerging no-space technologies can be used to satisfy growing technology demands in space applications. The best papers will be presented at this session.

Chairs:
David Raftt
ESA/ESTEC - THE NETHERLANDS
Email: david.raftt@esa.int

Nona Cheeks
NASA Goddard Space Flight Centre - USA
Email: nona.k.cheeks@nasa.gov

Rapporteur:
Joerg Kreisel
International Consultant – JSC – GERMANY
Email: Jk onClick.de

E5.2. Space Expectations: How the Public Views Space Activities

Space activities have historically been based upon technological successes with science and exploration leading space activities toward major projects throughout the solar system. However, periodic disconnects have occurred as the public used to seeing major successes suddenly sees failures and begins to question the value and cost of space initiatives. An IAA-sponsored study (following on from its recent study on the impact of Space Activities upon Society) is currently underway to determine the depth of understanding and backing of space activities by the general public (in particular young people). This session will relate to this study and thus invites papers which describe society’s expectations from space programmes, ascertain how society could become more involved in space exploration, or indicate how space activities could maintain the interest and excitement of tomorrow’s youth and thus be supported (both financially and intellectually) by the public.

Chairs:
Peter Swan
SouthWest Analytic Network – USA
Email: pcswan@cox.net

David Raftt
ESA/ESTEC - THE NETHERLANDS
Email: david.raftt@esa.int

Rapporteur:
Cathy Swan
SouthWest Analytic Network – USA
Email: dr.swan@cox.net

E5.3. Impact of Space Applications on Societal Issues

This session follows on from the Plenary Session in Vancouver (2004) on the Impact of Climatic Change in the Arctic and its Impact on Indigenous People. The session would address – from a space perspective – some of the many urgent issues facing society today: climate change and global warming, economic and environmental sustainability vs. resource demand and depletion, as well as the interrelated issues of national and global security strategies including space.

The session would also look at how space systems and technologies are being used to assist governments and organizations in developing countries, in particular, to better understand the environment in their regions and bring needed applications and services to local people which benefit their everyday lives. In this overall context, papers are sought which discuss these issues and challenges and how they might be solved. Papers might cover, for example:

- what are the implications of global warming and what can space offer to offset the damage;
- how Earth observation monitoring and monitoring techniques are being applied to water management in Africa, Asia and elsewhere;
- how satellite communications are bringing new hope to remote communities through telemedicine and distance education;
- how solar energy is being used to provide cheap light and power for many;
- how space-based systems can help mitigate natural disasters;
- and how space techniques can also assist indigenous populations to exist and survive in their particular circumstances.

Chairs:
David Raftt
ESA/ESTEC - THE NETHERLANDS
Email: david.raftt@esa.int

Karl Doetsch
Doetsch International Space Consultants – CANADA
Email: doetsch@1 gluca.net
E6.2. Legal Issues of Private Spaceflight and Space Tourism

Since the X-Prize was won in October 2004, plans for private spaceflight bringing tourists into outer space have rapidly grown. The session solicits papers addressing the many legal aspects of these developments, as well as the broader contexts of private spaceflight in the service of public manned missions.

Chairs:
M. V. S. Prasad
ISRO - INDIA
Email: mysl@isac.isro.gov.in

Frans von der Dunk
International Institute of Air & Space Law, Leiden University – NETHERLANDS
Email: f.g.vondervdunk@law.leidenuniv.nl

Rapporteur:
Partha Sarathi Datta
Antrix Corporation - INDIA
Email: datta@antrix.org

E6.3. New Legal Developments in the Protection of the Space Environment

This session will combine views on space debris and planetary protection. In the field of space debris mitigation, the UN is in the course of adopting guidelines and national space legislation and licensing regimes provide new means for establishing innovative regulation. In the field of planetary protection, the recent plans for space exploration have to be checked with existing and to-be-developed regulations. The session aims at providing new ideas for legal but also ethical approaches.

Chairs:
V. S. Mani
Gujarat National Law University - INDIA
Email: vsmani2002@hotmail.com

Kai-Uwe Schragl
DLR – GERMANY
Email: kai-uwe.schragl@dlr.de

Rapporteur:
Mukund Rao
ISRO - INDIA
Email: mukundr@blr.vsnl.net.in

E6.4. Legal Aspects of Satellite Navigation

Legal aspects of satellite navigation including air traffic services applications, are becoming ever more important with GAUELO shortly coming online, GPS being planned for modernization and Russia’s efforts to bring GCHASS back to full operational status. Moreover, these developments take place in a broader context such as satellite communications and remote sensing (including geographical information systems). This session intends to address the legal issues involved both at the global and national levels.

Chairs:
A. Bhaskaranarayana
ISRO - INDIA
Email: bhaskaranarayana@yahoo.com

Stephen Doyle
Clean Energy Systems - USA
Email: sedoyle@cleanenergysystems.com

Rapporteur:
Surekha Kibe - INDIA
Email: skibe@isro.gov.in

E6.5. Other Legal Matters

In this session, authors may address any other matters relating to the law of outer space, with special emphasis on recent developments.

Chairs:
Rajeev Lochan
ISRO - INDIA
Email: tchanch@isro.gov.in

Nipant Chitasombat -THAILAND
Email: chitasombat@yahoo.com

Rapporteur:
Ranjana Kaul
Dua Associates - INDIA
Email: ranjanakaul@duaassociates.com
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No extension will be granted to the above deadline date.

The Call for Hyderabad opens on-line from November 2006.

We kindly advise you to check the IAF Web Site at www.iafastro.org for potential updates to this Call for Papers. Modifications will probably occur after the Congress in Valencia, in November 2006.

<table>
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<tr>
<th>Quick look calendar of main IAC 2007 deadlines</th>
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<tr>
<td>• Opening of the Call for Abstracts</td>
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<td>• Deadline for submitting Abstracts</td>
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<td>• IPC Meeting in Paris and Author Paper Selection</td>
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<td>• Confirmation of Sponsor for the selected Students</td>
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<td>• Deadline for uploading Manuscripts</td>
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<td>• Issue of the IAC2007 2nd Announcement</td>
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<td>• Issue of the IAC2008 Call for Papers</td>
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**Novelty for Hyderabad**

As introduced during the IAC 2006 in Valencia, the “Interactive Session” is a new way to enhance the visibility and the quality of the traditional Poster Sessions. These Interactive Sessions will be given the same importance as the Lecture Sessions in the Programme of IAC 2007.

Hence, Interactive Sessions will be organised during the entire week and will be subject as for the Lecture Presentation to submission of an abstract and of a manuscript as it was the case for the Posters. The Interactive Sessions will be organised in such a way that the authors will have a closer contact with Congress participants and will be offered the possibility to display their presentation in a special Interactive Presentation area as from the first day of the Congress.

**Paper Selection**

Abstracts submitted will be evaluated by the Session Chairs on the basis of technical quality and suitability. Relation to the Congress Theme will also be considered. They will be selected for lecture or interactive presentation with no distinction in quality. Their evaluation will be submitted to the responsible Symposium Coordinators, who will make acceptance recommendations to the International Program Committee which will take the final decision. Ensuring the high quality of the papers for the 58th Congress will be the primary goal of the International Program Committee.

The criteria for the selection will be defined according to the following specifications:

- Abstracts should specify: purpose, methodology, results and conclusions.
- Abstracts should indicate that substantive technical and/or programmatic content is included.
- Abstracts should clearly indicate that the material is new and original; explain why and how.
- Prospective author(s) should certify that the paper was not presented at a previous meeting and that financing and attendance of an author at the respective IAC at Hyderabad to present the paper is assured.

**International Academy of Astronautics**

Authors should follow the above general procedure. An additional suitability requirement is that the proposed topic must be related to a potential or ongoing IAA Study Group activity.

Technical Session evaluations will be submitted to their Symposium Coordinators. The Symposium Coordinator recommendations should be sent to the responsible IAA Commission who will provide the acceptance recommendations to the IPC.

**50th Colloquium on the Law of Outer Space**

Authors should follow the above instructions for the submission of their abstracts. In addition to the DVD, the papers of the Colloquium, along with other materials, will be published in the Proceedings of the 50th Colloquium on the Law of Outer Space by the American Institute of Aeronautics and Astronautics. Authors who qualify may request to be considered for the Dr. I.H. Ph. Diederiks-Verschoor Award for Best Paper. Please contact the IISL secretary for the regulations.

**Manuscript Publication**

Acceptance of abstracts (for lecture or interactive presentation) will be emailed by mid April, 2007 by the IAF. Full manuscripts must then be submitted in accordance with written instructions (available on-line as from April 2007) to be sent to the contact author accompanying the notification of acceptance. Selected papers (either lecture or interactive) may be published in special issues of Acta Astronautica, the journal of the International Academy of Astronautics. Acceptance of papers for presentation at the Congress does not imply acceptance for publication.

**Electronic Submittal Procedure**

Note: Abstracts must be of maximum 400 words and be written in English.

The following information should be prepared before the login to the Website

1. Paper Title
2. Name of contact author and current e-mail
3. Name of co-author(s)
4. Organization(s)
5. Full postal address, phone, fax and e-mail of the author and co-author(s).
6. Lecture or interactive presentation

Please go to www.iafastro.org and carefully follow the instructions related to the submission of abstracts for Hyderabad.

**START UPLOADING YOUR ABSTRACT AS SOON AS POSSIBLE FROM NOVEMBER 2006**
INTRODUCTION
Hyderabad, the city where IAC-2007 is to be held, will add value to the Congress and also derive fame from the Congress as the host city. The city of Hyderabad is a part of the twin cities of Hyderabad and Secunderabad, which are located slightly south of central part of India. With 400 years of cultural heritage, the city is known for its natural beauty, mosques and minarets, bazaars and bridges, hills and lakes. Today the city is a mix of its history, heritage, host to a number of R&D Laboratories & Industries, and a hub of Information Technology & Computer Software Development. The most attractive part of Hyderabad is a range of Handicrafts and priceless Pearls – all of them available for purchase by different income groups.

HISTORY OF THE CITY
The city of Hyderabad was born out of love – love of Mohammad Quli Qutub Shah of Qutub Shahi Dynasty with Bhagmati, a beautiful Hindu girl, in a village located across the river Musi. As the Fortress town of Golconda became overcrowded, Mohammad Quli laid foundation to the city of Bhagnagar along the Musi river, 8 km East of Golconda Fort. The city was later named Hyderabad when the Queen Bhagmati took the name of Hyder Mahal. Two centuries later, the Cantonment of East India Company was built a few kilometers away from Hyderabad, and was named Secunderabad in 1798. Today the cities of Hyderabad and Secunderabad are called Twin Cities and it is a single stretch occupying an area of 1900 sq km, with a population of 5.7 million.

HISTORICAL PLACES IN AND AROUND HYDERABAD
Charminar: Built by Mohammad Quli at the village of his love, Bhagmati, and also at the junction of two big cross roads – the square edifice Charminar is a highly distinguished piece of architecture. It was completed in 1592 and its architectural plans show precision and symmetry. It’s a perfect square with each side measuring 20 m, and with four great Arches. The Minars (Towers) have four stories and rise 54 m above the street level. In spite of being surrounded by busy markets, Charminar is beautiful especially when lit up during the nights. Today Charminar stands in dignity – a matching edifice to the Qutub Shahi Rule.

Golconda Fort: Constructed around 1150 AD on an isolated granite hill, Golconda Fort is 130 m above the city and had 3 concentric fortifications. With eight gates in the outer wall, the Fort presents an excellent panoramic view of Hyderabad city. The different structures of the Fort were so built that they deflect sound to different points within the Fort – an intelligent signaling incorporated in the construction. You can clap your hands at the entry Gate and it can be heard quite clearly at the top of the hill.

The other important historical places in Hyderabad are – Mecca Masjid the seventh largest Mosque in the world, the royal cemetery of Qutub Shahi Kings called Qutub Sahi Tombs with excellent architecture and landscaped gardens. Salarjung Museum houses one of the biggest one-man collections of Antiques – collected by Yusuf Ali Salarjung the Prime Minister of Nizam of Hyderabad. The Birla Mandir built entirely out of marble overlooking Tank Bund, presents a spectacular sight when illuminated in the night. Hyderabad is also beautified by a big statue of Buddha stands on the “Rock of Gibraltar” in the middle of Hussain Sagar Lake.

AN INDUSTRIAL, AND HITECH CENTRE
Hyderabad has grown into a city of industrial growth. Bharat Heavy Electricals Ltd (BHEL), Electronic Corporation of India Ltd. (ECIL), a number of Establishments of Defence Research and Development Organization (DRDO), the National Remote Sensing Agency (NRSA) – the Operational Remote Sensing Centre of ISRO, Dr. Reddy’s Labs and many Pharmaceutical labs including Indian Drugs and Pharmaceuticals Limited (IDPL) are all located in Hyderabad. One-third of the bulk drugs of India are produced by the Pharmaceutical Industries of Hyderabad. Satyam
Computer Services is the flagship IT Company of Hyderabad. The City emerged as a major base for Global R&D Centres, Software Development and Business Process Outsourcing (BPO). The Global giants - like IBM, Microsoft, Oracle, DELL, GE Capital, Motorola, Infosys, Wipro - all have their Units in this IT hotspot.

THE ROCK FORMATIONS
The City of Hyderabad has unique Rock Formations of huge rocks in unusual shapes. These craggy unbalanced Rock formations weathered and settled into harmony of city’s landscape and outskirts. These Rocks are older than the Grand Canyon and Himalayas. Nine Rock Formations in and around Hyderabad are declared as Protected Heritage Precincts.

HANDICRAFTS AND THE PEARLS OF HYDERABAD
You can find an excellent choice of Handicrafts in Hyderabad including embroidery in Gold and Silver threads, Glass Bangles, and Laces woven from fine threads. Hyderabad is famous for Bidri Craft which is a type of metal work, where one metal is inlaid or overlaid on another metal. Bidriware derives its beauty from the contrast between the inlaid Gold, Silver or Brass against the Black background. The most exquisite precious stones, diamonds, pearls, rubies, and jewellery studded with such stones can be found in Hyderabad in the Exhibition displaying Nizam’s treasures. This tradition continues even today. The most romantic pearls at affordable prices can be found in Hyderabad, which is biggest market for pearls in India, with more than 400 shops in the City.

CONFERENCE VENUE
The Hyderabad International Convention Center is the India’s largest and the most technologically advanced convention facility. This air-conditioned centre can accommodate over 6,000 delegates with a pre-function foray area of 6,500 sq m and 32 break out rooms. It is equipped with several automated features to facilitate diverse utilisation, including all facilities and amenities that a world standard gathering would ever have. This state-of-the-art Convention Centre of international standard with the adjacent 400 room capacity business hotel (Novotel-Hyderabad) and HITEC Exhibition Complex is an ideal integrated facility to hold our grand event, IAC 2007.

AIR CONNECTIVITY
Hyderabad is well connected with prominent international airports in Europe, US, Middle East and Southeast Asia with direct flights to and from London, Chicago, Frankfurt, Singapore, Kuala Lumpur, Bangkok, Colombo, Muscat, Sharja, Dubai, etc apart from international passage via Mumbai with 14 flights a week. Hyderabad, being located in Central India, is also well connected with all major cities of India, like Delhi, Mumbai, Chennai, Bangalore and Kolkata each having almost 10 flights a day. With a host of domestic airlines, Hyderabad is in hour’s flight from any part of India with improving flight frequency.

CUISINE
Cuisine of Hyderabad is a mix of the best of South Indian taste and Mughlai influence. Biryani, made with long grain aromatic Basmati rice and with kebabs is the best delicacy of Hyderabad. You can also have spicy Andhra food, or the most favoured Sheer Phirni. The food of various countries is available nowadays in a number of restaurants in all parts of the City.

WEATHER
Hyderabad has moderate climate which is dry and breezy throughout the year. Generally during the last week of September, the maximum Temperature will be 30 deg C and the minimum Temperature will be 22 deg C. The Humidity will be around 70-85% - a fine enjoyable weather.
REGISTRATION OF INTEREST

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