

**International Astronautical Federation**

**UPDATE OF THE TECHNICAL PROGRAMME AS OF DECEMBER 11, 2007**

**TECHNICAL PROGRAMME**

**IAC 2008 — Glasgow**

**A1. SPACE LIFE SCIENCES SYMPOSIUM**

The symposium will cover all topics of space life sciences including human physiology and psychology, risk mitigation, radiation health, life support and astrobiology and gravitational biology.

**Coordinator**

John D. Rummel  
National Aeronautics and Space Administration (NASA)/Headquarters — UNITED STATES  
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**A1.1. Behavior, Performance and Psychosocial Issues in Space**

The session will deal with psychological, interpersonal, cultural, cognitive, circadian/sleep, and human factors issues and countermeasures related to human spaceflight and space exploration.

**Chairman**

Dietrich Manzey  
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Nick Kanas  
University of California and Veterans Affairs Medical Center — UNITED STATES  
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**Rapporteur**

Vadim Gushin  
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**A1.2. Integrative Human Physiology and Countermeasures**

The session focuses on all aspects of human physiological responses to spaceflight and ground analogs and on new approaches to countermeasures.

**Chairman**

Inessa Kozlovskaya  
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## **International Astronautical Federation**

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University Space Research Association — UNITED STATES  
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### **Rapporteur**

Satoshi Iwase  
Aich Medical University — JAPAN  
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### **A1.3. Exploration Missions: Human Health and Performance Risk Management**

This session will focus on a broad spectrum of activities relating to human health and performance risk management on exploration missions, including assessment, prevention and mitigation strategies.

### **Chairman**

Kathleen Laurini  
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Anatoly I. Grigoriev  
Institute for Biomedical Problems — RUSSIA  
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### **Rapporteur**

Peter Graef  
Deutsches Zentrum für Luft und Raumfahrt e.V. (DLR) — GERMANY  
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### **A1.4. Radiation Health Issues in Human Spaceflight**

Radiation effects on biological systems, the characterization of the radiation environment and protection from space radiation are the topics of this session.

### **Chairman**

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Guenther Reitz  
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### **Rapporteur**

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### **A1.5. Environmental Control and Life Support Systems**

This session will deal with strategies and technologies to supply needs for humans while exploring deep space and lunar planetary surfaces.

#### **Chairman**

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— GERMANY

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#### **Rapporteur**

Paivi Jukola

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### **A1.6. Astrobiology and Gravitational Biology**

This session will address current threads in the search for life elsewhere in the Universe, and life's behavior in conditions of altered gravitation.

#### **Chairman**

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François Raulin

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#### **Rapporteur**

Catharine A. Conley

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### **A1.7.-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 biological 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, bio-fluids under microgravity, habitats and life support systems, exploration of planetary resources, biochemical analysis, environmental resource utilisation.

#### **Chairman**

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UNITED

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### Rapporteur

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## A2. 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.

### Coordinator

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Marcus Dejmek

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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.

### Chairman

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### Rapporteur

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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.

### Chairman

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### Rapporteur

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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.

### Chairman

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Ziad Saghir  
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### Rapporteur

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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.

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### **Rapporteur**

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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).

### **Chairman**

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### **Rapporteur**

Peter Hofmann  
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### **A2.6. Microgravity Sciences onboard the International Space Station and Beyond**

Aimed to the presentation of results obtained from large orbital platforms, in particular the ISS, as well as preparation scenarios for further long term flight opportunities. The session includes description and performance of ground and in-orbit infrastructures.

### **Chairman**

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Kenol Jules  
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### **Rapporteur**

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### **A2.7.-A1.7. 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 biological 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, bio-fluids under microgravity, habitats and life support systems, exploration of planetary resources, biochemical analysis, environmental resource utilisation.

#### **Chairman**

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### **A2.1. Interactive Session on Microgravity Sciences and Processes**

#### **Chairman**

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**A3. SPACE EXPLORATION SYMPOSIUM**

This Symposium covers the current and future robotic missions and material plans for initiatives in the exploration of the Universe from Space. The emerging field of Astrobiology or origins of the Universe and Solar Systems are included in all sessions where appropriate.

**Coordinator**

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Christian Sallaberger  
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**A3.1. Space Exploration Overview**

This Session covers Space Exploration strategies and architectures, as well as technology roadmaps. Papers of both national and international perspectives are invited.

**Chairman**

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**Rapporteur**

Douglas A. O'Handley  
— UNITED STATES  
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**A3.2. 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.

**Chairman**

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**Rapporteur**

William H. Siegfried  
The Boeing Company (retired) — UNITED STATES  
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**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 aspects of the search for evidence of extant or extinct Martian life, and forward and backward contamination are particularly welcome.

**Chairman**

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**Rapporteur**

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**A3.4. Space Based Astronomy**

This Session is devoted to innovative new ideas and concepts for current and future missions for observing the Universe from space.

**Chairman**

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**Rapporteur**

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### A3.5. Small Bodies Missions and Technologies

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

#### Chairman

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#### Rapporteur

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Zhengxin Liu  
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### A3.6. 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. Papers covering both new mission concepts as well as the associated specific technologies are invited.

#### Chairman

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Junichiro Kawaguchi  
Japan Aerospace Exploration Agency (JAXA) / ISAS — JAPAN  
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### A3.1. Interactive Session on Space Exploration

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## **A4. 37th 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 extra-terrestrial 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.

### **Coordinator**

Claudio Maccone  
Member of the International Academy of Astronautics — ITALY  
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Seth Shostak  
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### **A4.1. SETI I – SETI Science and Technology**

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

### **Chairman**

H. Paul Shuch  
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### **Rapporteur**

Seth Shostak  
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## **International Astronautical Federation**

### **A4.2. SETI II - Interdisciplinary Aspects of SETI**

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.

#### **Chairman**

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Leeds Metropolitan University — UNITED KINGDOM  
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#### **Rapporteur**

Alexander Ollongren  
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## **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.

#### **Coordinator**

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George Morgenthaler  
University of Colorado at Boulder — UNITED STATES  
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### **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.

#### **Chairman**

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### **Rapporteur**

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### **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.

### **Chairman**

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### **Rapporteur**

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### **A5.3. The Next Steps for Human Space Exploration: What are the Alternatives?**

### **Chairman**

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### **Rapporteur**

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### **A5.I. Interactive Session on Human Exploration of the Moon and Mars**

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### **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.

#### **Coordinator**

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National Aeronautics and Space Administration (NASA) — UNITED STATES  
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#### **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 meteoroids. This includes space surveillance concepts, their implementation and operation, and the establishment and maintenance of space object catalogs.

#### **Chairman**

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#### **Rapporteur**

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### 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.

#### Chairman

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#### Rapporteur

Ailyam S. Ganeshan  
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### A6.3. Hypervelocity Impacts and Protection

The session will address passive protection, shielding and damage predictions. Shielding aspects will be supported by experimental and computational results of HVI tests.

#### Chairman

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#### Rapporteur

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### A6.4. 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.

#### Chairman

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### **Rapporteur**

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### **A6.1. Interactive Session on Space Debris**

#### **Rapporteur**

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## **B1. EARTH OBSERVATION SYMPOSIUM**

This Symposium focuses on space missions which deal with collecting information about the Earth and its environment. Session topics deal with all aspects of Earth Observation missions including the policy and infrastructure of international cooperation and coordination, the emergence of commercial systems to satisfy market needs, the technical descriptions of new missions and sensors to be used, data processing and GIS, environmental applications and global change studies and the use of space-based technologies.

### **Coordinator**

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### **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.

## **International Astronautical Federation**

### **Chairman**

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### **Rapporteur**

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### **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.

### **Chairman**

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### **Rapporteur**

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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.

### **Chairman**

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### **Rapporteur**

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**B1.4. Earth Observation Data Management Systems**

Earth Observation Data Acquisition, Communication, Processing, Dissemination and Archiving.

**Chairman**

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**Rapporteur**

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**B1.5. Earth Observation Applications and Economic Benefits**

Earth Observation value-added products.

**Chairman**

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— ITALY  
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**Rapporteur**

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**B1.6. Global Earth Observation System of Systems (GEOSS)**

**Chairman**

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**International Astronautical Federation**

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**Rapporteur**

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**B1.I. Interactive Session on Earth Observation**

**Chairman**

Andrew Court  
TNO — THE NETHERLANDS  
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**B2. SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM**

This 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.

**Coordinator**

Joe M. Straus  
The Aerospace Corporation — UNITED STATES  
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Otto Koudelka  
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**B2.1. Advanced Systems**

Advanced satellite communications concepts and systems will be presented.

**Chairman**

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Robert D. Briskman  
Sirius Satellite Radio — UNITED STATES  
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**Rapporteur**

## **International Astronautical Federation**

Ying W. Sit  
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### **B2.2. 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.

#### **Chairman**

Calin Rosetti  
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Ryutaro Suzuki  
Advanced Telecommunications Research Institute International — JAPAN  
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### **B2.3. 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.

#### **Chairman**

Ramon P. De Paula  
National Aeronautics and Space Administration (NASA)/Headquarters — UNITED STATES  
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Manfred Wittig  
European Space Agency/ESTEC — THE NETHERLANDS  
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#### **Rapporteur**

Patrick T. Anglin  
Sirius Satellite Radio — UNITED STATES  
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### **B2.4. Advanced Technologies**

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

#### **Chairman**

Edward W. Ashford  
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## **International Astronautical Federation**

Elemer Bertenyi  
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### **Rapporteur**

Patrick Agnieray  
Thales Alenia Space — FRANCE  
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### **B2.5. 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.

### **Chairman**

MG Chandrasekhar  
DEVAS Multi Media Pvt Ltd., — UNITED STATES  
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A. Bhaskaranarayana  
Indian Space Research Organisation (ISRO) — INDIA  
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### **Rapporteur**

Jean-Paul Hoffmann  
SES-GLOBAL — LUXEMBURG  
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### **B2.6. 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.

### **Chairman**

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Desaraju Venugopal  
Advanced Space Technologies and Services — INDIA  
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### **Rapporteur**

## **International Astronautical Federation**

Otto Koudelka  
Graz University of Technology — AUSTRIA  
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### **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.

#### **Coordinator**

Carlo Mirra  
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Mag Iskander  
MDA — CANADA  
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#### **B3.1. Human Space Endeavour: Overview**

This session will include the status of the International Space Station partners programmes. It also covers planning and programs under way in preparation for the next era of human space exploration beyond and Earth orbit. Papers are encouraged from government and private sectors.

#### **Chairman**

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Terrence G. Reese  
National Aeronautics and Space Administration (NASA)/Headquarters — UNITED STATES  
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#### **Rapporteur**

Maria Stella Lavitola  
ThalesAlenia Space Italia S.p.A. — ITALY  
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#### **B3.2.-D2.7. Joint Session on Human Space Transportation Systems**

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, experienced with existing vehicles and peculiarities of long duration flight.

#### **Chairman**

## **International Astronautical Federation**

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Luigi Bussolino  
— ITALY  
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### **Rapporteur**

Patrick M. McKenzie  
Lockheed Martin Space Systems — UNITED STATES  
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### **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.

#### **Chairman**

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Todd Fox  
Odyssey Space Research — UNITED STATES  
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#### **Rapporteur**

Gene Rice  
RWI - Rice Wigbels Int'l — UNITED STATES  
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### **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.

#### **Chairman**

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## **International Astronautical Federation**

John-David F. Bartoe  
NASA (retired) — UNITED STATES  
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### **Rapporteur**

Li-wei Yang  
China Astronaut Research and Training Center — CHINA  
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### **B3.5. Future Human Space Endeavours**

This session will address new concepts and plans for possible future human space endeavours. This includes activities such as space exploration, industrial processes in space, space tourism and other commercial initiatives in which humans would play a critical role.

### **Chairman**

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Paul Eckert  
The Boeing Company — UNITED STATES  
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### **Rapporteur**

Tai Nakamura  
JAXA — JAPAN  
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### **B3.6. The Role of Humans and Machines in the Future of Space Endeavours**

This session will consider how the roles of Humans and intelligent systems are likely to evolve towards complex missions of space exploration and commercial endeavours. In particular, how decisions will be made and how complex tasks will be allocated to humans and intelligent machine systems.

### **Chairman**

Anthony R. Gross  
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John Uri  
National Aeronautics and Space Administration (NASA)/Johnson Space Center — UNITED STATES

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### **Rapporteur**

## **International Astronautical Federation**

Rainer Willnecker  
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### **B4. SMALL SATELLITE MISSIONS SYMPOSIUM**

This Symposium addresses Small Satellite programmes for Science & Technology, encompassing space science, earth observation, and lunar exploration missions; and focusing on results achieved, as well as plans for new missions. The Symposium also addresses five areas across the entire spectrum of small satellite missions – design and technology, cross-platform compatibility, planning for and executing cost-effective operations, affordable and reliable space access, and implementing small satellite programmes in developing countries.

#### **Coordinator**

Rainer Sandau  
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Rhoda Shaller Hornstein  
National Aeronautics and Space Administration (NASA) — UNITED STATES  
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#### **B4.1. 9th 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 and results achieved by developing nations through using small satellites.

#### **Chairman**

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Sergei Chernikov  
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#### **Rapporteur**

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Pierre Molette  
— FRANCE  
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### **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.

#### **Chairman**

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Tom Krimigis  
The John Hopkins University — UNITED STATES  
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### **B4.3. Small Satellite Operations**

This session covers the planning for, and execution of, cost-effective approaches for Small Satellite Operations, with emphasis on new missions with new models of operation. Papers addressing innovation, an entrepreneurial approach to new business opportunities, novel finance and business models, management techniques, and international cooperation in support of Small Satellite Operations are particularly encouraged. Papers that discuss the application of novel technology to mission operations, such as automation and autonomy, constraint resolution, and timeline planning, as well as reports on missions recently accomplished and lessons learned, are also welcomed.

#### **Chairman**

Peter M. Allan  
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Karen McBride  
National Aeronautics and Space Administration (NASA) — UNITED STATES  
Email: kmcbride@nasa.gov

### **B4.4. Small Satellites Potential for Future Integrated Applications and Services**

Small satellite missions in the different disciplines and with new partnership models including earth observations are enabling services that are now a familiar part of the commercial and government sector. Data from space missions are collected and distributed through space and ground-based systems. The goal of an integrated system is to provide the right information at the right place and at the right time in a cost-effective manner. Including a space-based element in an integrated application may enable that application or provide a unique and powerful enhancement to the services provided. This session seeks contributions that address new satellite missions, instruments, lessons learned, or plans for future small satellites, instruments, or missions. Contributions that address the need to go beyond the traditional mission oriented (or vertical) organization and provide a service that integrates information from ground and space-based sources (the horizontal or distributed domain) are particularly encouraged.

#### **Chairman**

## **International Astronautical Federation**

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Larry Paxton  
The John Hopkins University Applied Physics Laboratory — UNITED STATES  
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### **Rapporteur**

Klaus Briess  
Technical University of Berlin — GERMANY  
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### **B4.5. 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.

### **Chairman**

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Alex da Silva Curiel  
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### **B4.6. 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.

### **Chairman**

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Philip Davies  
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### **B4.7. Space Systems and Architectures Featuring Cross-Platform Compatibility**

Ideas are solicited for Modular, Reconfigurable, Adaptable systems (spacecraft, ground systems and networks) that feature cross-platform compatibility. Applications are sought in Science, Exploration, Commerce, and other areas requiring fast system design, build, integration, test and flight. System-enabling plug-and-play interface definitions (mechanical, electrical, software and fluids) are particularly desirable.

#### **Chairman**

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Marco D'Errico

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#### **Rapporteur**

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### **B4.8. Hitchhiking to the Moon**

The next few decades involve a dramatically increased interest in lunar exploration for the purpose of developing a permanent human and robotic presence on the Moon, both for science and space exploration objectives. This renewed interest is broad and international, involving space agencies from the USA, Europe, China, India, Japan, Russia, Germany, England, and others.

Recently, ISRO's Chandrayaan spacecraft offered its platform as an opportunity to fly international instruments to the Moon; NASA's Lunar Reconnaissance Orbiter (LRO) spacecraft provided an opportunity for a secondary payload to the Moon, in the form of the LCROSS lunar impactor mission. In the future, it is expected that there will be more opportunities for ride-sharing or secondary or tertiary payload opportunities to be flown to the Moon. This session provides a forum for the exchange of ideas for such small payloads to be demonstrated at the Moon, by 'Hitch-hiking a ride' to the Moon.

Examples of such payloads or missions include: micro-spacecraft orbiters, CubeSats, small probes, penetrators, micro-landers, hard-landers, micro-rovers, secondary payload surface science instruments, distributed network landers, and many more. The focus of this session is on mission concepts, technology readiness and ride-sharing requirements.

#### **Chairman**

Rock Jeng-Shing Chern

China Institute of Technology — TAIWAN, CHINA

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Leon Alkalai

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**International Astronautical Federation**

**C1. ASTRODYNAMICS SYMPOSIUM**

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

**Coordinator**

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Erick Lansard  
ThalesAlenia Space — FRANCE  
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**C1.1. Multibody Dynamics**

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

**Chairman**

Yasuhiro Morita  
Japan Aerospace Exploration Agency (JAXA) / ISAS — JAPAN  
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Elbert E.N. Macau  
Instituto Nacional de Pesquisas Espaciais (INPE) — BRAZIL  
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**Rapporteur**

Andr  Mazzoleni  
North Carolina State University — UNITED STATES  
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**C1.2. Optimization**

Optimization of trajectories including launch, orbital transfer, rendez-vous, atmospheric reentry, manoeuvring and station keeping will be covered in this session.

**Chairman**

David C. Folta  
National Aeronautics and Space Administration (NASA)/Goddard space Flight Center —  
UNITED  
STATES

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Moshe Guelman  
IIT — ISRAEL  
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## International Astronautical Federation

### C1.3. 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.

#### Chairman

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Rock Jeng-Shing Chern  
China Institute of Technology — TAIWAN, CHINA  
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#### Rapporteur

Colin R. McInnes  
University of Strathclyde — UNITED KINGDOM  
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### C1.4. 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.

#### Chairman

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Thérèse Donath  
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#### Rapporteur

Ming Li  
China Academy of Space Technology (CAST) — CHINA  
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### C1.5. Guidance and Control

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

#### Chairman

Junichiro Kawaguchi  
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## **International Astronautical Federation**

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### **Rapporteur**

Brij Agrawal  
Naval Postgraduate School — UNITED STATES  
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### **C1.6. 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.

#### **Chairman**

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Miguel Bello Mora  
DEIMOS Space S.L. — SPAIN  
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#### **Rapporteur**

Gerard Gymez Muntanñ  
University of Barcelona — SPAIN  
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### **C1.7. Attitude Dynamics, Modelling and Determination**

This session deals with all aspects of spacecraft attitude, modelling, simulation of large flexible spacecraft and attitude stabilization.

#### **Chairman**

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Colin R. McInnes  
University of Strathclyde — UNITED KINGDOM  
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### **C1.8. 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.

#### **Chairman**

## **International Astronautical Federation**

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Amalia Ercoli Finzi  
Politecnico di Milano — ITALY  
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### **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.

#### **Coordinator**

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Pavel M. Trivailo  
Royal Melbourne Institute of Technology (RMIT) — AUSTRALIA  
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#### **C2.1. Space Structures I - Development and Verification (Space Vehicles and**

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.

#### **Chairman**

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**International Astronautical Federation**

**Rapporteur**

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**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 distortion and shape control, structural design, development and verification; lessons learned.

**Chairman**

Jean-Alain Massoni  
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**Rapporteur**

Pierre Rochus  
Centre Spatial de Liège — BELGIUM  
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**C2.3. Space Structures - Dynamics and Microdynamics**

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

**Chairman**

Peter M. Bainum  
Howard University — UNITED STATES  
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Ijar M. Da Fonseca  
Instituto Nacional de Pesquisas Espaciais (INPE) - MCT — BRAZIL  
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**Rapporteur**

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Universitas Al Azhar Indonesia — INDONESIA  
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## International Astronautical Federation

### **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.

#### **Chairman**

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Yuriy Moshnenko  
Yuzhnoye State Design Office — UKRAINE  
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#### **Rapporteur**

Luigi Scatteia  
C.I.R.A. Italian Aerospace Research Centre — ITALY  
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### **C2.5. Smart Materials and Adaptive Structures**

The focus of the session will be on 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.

#### **Chairman**

Michael J. Eiden  
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Junjiro Onoda  
Japan Society for Aeronautics and Space Sciences (JSASS) — JAPAN  
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#### **Rapporteur**

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## **International Astronautical Federation**

### **C2.6. Space Environmental Effects and Spacecraft Protection**

In this session space environment effects will be covered. For example, the effects of radiation, atomic oxygen, spacecraft charging, thermal cycling, dissociation, meteoroids, 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.

#### **Chairman**

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Akira Meguro

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### **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 efficiency 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.

#### **Chairman**

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#### **Rapporteur**

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## **International Astronautical Federation**

### **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.

#### **Chairman**

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#### **Rapporteur**

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### **C2.I. Interactive Session on Materials and Structures**

#### **Chairman**

Michael J. Eiden  
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**International Astronautical Federation**

**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 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 for 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**

**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, including policy, economics, general technical and architectural issues, as well as environmental and societal aspects of the acquisition and use of space power on the Earth.

**Chairman**

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Leopold Summerer  
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**Rapporteur**

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**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.

**Chairman**

Henry W. Brandhorst  
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## International Astronautical Federation

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Frank Steinsiek  
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### C3.3. Experiments and Demonstrations for Advanced Space Power

Diverse new technologies must be developed and validated 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.

### Chairman

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### Rapporteur

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Alain Celeste  
Université de la Réunion — FRANCE  
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### C3.4. Terrestrial Applications and Benefits of Space Power

Power technologies and systems developed for space missions have had yielded significant opportunities and benefits in terrestrial markets; solar cells and fuel cells are particular examples. This session will discuss past, present and projected future applications and benefits of space power in terrestrial systems and markets. Specific examples could include solar arrays, thermoelectrics, fuel cells, batteries, thermal management systems, and other space power technologies.

### Chairman

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**Rapporteur**

**C3.5.-C4.7. Joint session on Nuclear Propulsion and Power**

This session includes papers addressing all issues of nuclear power and propulsion in space applications.

**Chairman**

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**Rapporteur**

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**C4. SPACE PROPULSION SYMPOSIUM**

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

**Coordinator**

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Randy C. Parsley  
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**C4.1. Propulsion Systems I**

This session is dedicated to all aspects of Liquid rocket Engines.

**Chairman**

## **International Astronautical Federation**

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Max Calabro  
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### **Rapporteur**

Walter Zinner  
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### **C4.2. Propulsion Systems II**

This session is dedicated to all aspects of Solid and Hybrid Propulsion.

#### **Chairman**

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Jean-Francois Guery  
SNPE Matériaux Energetiques — FRANCE  
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#### **Rapporteur**

I-Shih Chang  
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### **C4.3. Propulsion Technology**

This session includes all science and technology supporting all aspects of space propulsion.

#### **Chairman**

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Bruno d'Andrea  
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#### **Rapporteur**

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## International Astronautical Federation

### **C4.4. Electric Propulsion**

This session is dedicated to all aspects of electric propulsion technologies, systems and applications.

#### **Chairman**

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Oleg A. Gorshkov  
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#### **Rapporteur**

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### **C4.5. Hypersonic and Combined Cycle Propulsion**

This session includes papers dealing with use of air in earth to orbit propulsion. It is a joint ISOABE/IAF session.

#### **Chairman**

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#### **Rapporteur**

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### **C4.6. Special Session on Future and Advanced Propulsion**

This session is dedicated every year to a special propulsion topic chosen by the Propulsion Technical Committee. It includes invited papers as well as unsolicited presentations.

#### **Chairman**

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## **International Astronautical Federation**

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### **Rapporteur**

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### **C4.7.-C3.5. Joint session on Nuclear Propulsion and Power**

This session includes papers addressing all issues of nuclear power and propulsion in space applications.

### **Chairman**

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Harvey J. Willenberg  
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### **Rapporteur**

Paul A. Czysz  
Hypertech — UNITED STATES  
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## **D1. SPACE SYSTEMS SYMPOSIUM**

Innovative Space Systems for Future and Current Missions and Applications.

### **Coordinator**

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Lawrence Dale Thomas  
National Aeronautics and Space Administration (NASA)/Marshall Space Flight Center —  
UNITED  
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### **D1.1. Innovative and Visionary Space Systems Concepts**

Dreams of yesterday are a reality today. Dreams of tomorrow need to be looked at today to make them real in the future. With emerging new technologies, it is now possible to conceptualise new and innovative space systems and new potential applications for the future. This session will explore innovative technologies, services, software and concepts for space systems for the future.

## International Astronautical Federation

### Chairman

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Moshe Guelman  
IIT — ISRAEL  
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### Rapporteur

Marco Guglielmi  
European Space Agency/ESTEC — THE NETHERLANDS  
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### D1.2. Enabling Technologies for Space Systems

This session will focus on innovative, technological developments that are usually high risk, but which have the potential to significantly enhance the performance of existing and new space systems. Enabling innovative technologies for space applications often result from “spin-ins” which will be discussed during the session, together with potential spin-offs. Examples include instrumentation, biotechnology, components, micro- and nano-technology, MEMS, advanced new structures and software techniques.

### Chairman

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Jean-Paul Aguttes  
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### Rapporteur

Anne Bondiou-Clergerie  
GIFAS — FRANCE  
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### 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 design. Of special interest are multi-disciplinary methods, tools, and processes including modelling 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.

### Chairman

## International Astronautical Federation

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### Rapporteur

Ming Li  
China Academy of Space Technology (CAST) — CHINA  
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### 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.

### Chairman

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Alan Wilhite  
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### Rapporteur

Wiley Larson  
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### 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.

### Chairman

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### **Rapporteur**

Takashi Hamazaki  
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### **D1.6.-D2.9. Joint Session on Status of the Ares I and V Launch Vehicles**

This joint SE/Space Transportation session will update the international community on the progress NASA has achieved on the design of the Ares I and Ares V Launch Vehicles. Focus will be on state-of-the-art system engineering methodologies, design techniques, tools, processes, and training that reduce the time and cost, to improve the quality of the Ares I and Ares V Launch Vehicles and related subsystems. Of special interest are multi disciplinary methods, tools and processes used to define the system architectures to improve risk management, safety, reliability, testability, and life cycle cost estimates.

### **Chairman**

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### **Rapporteur**

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### **D1.1. Interactive Session on Space Systems**

### **Chairman**

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### **Rapporteur**

**International Astronautical Federation**

Todd Fox  
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**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.

**Coordinator**

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Centre National d'Etudes Spatiales (CNES) — FRANCE  
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Richard Tyson  
National Aeronautics and Space Administration (NASA)/Marshall Space Flight Center —  
UNITED STATES  
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**D2.1. Launch Vehicles in Service or in Development**

Review of up to date status of launch vehicle currently in use in the world or under short term development.

**Chairman**

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Christian Dujarric  
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**Rapporteur**

Shayne Swint  
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**D2.2. Launch services, Missions, Operations and Facilities**

Review of the current and planned launch services and support, including economics of Space Transportation Systems, financing, insurance, licensing. Advancements in ground infrastructure, ground operations, mission planning and mission control for both expendable and reusable launch services.

**Chairman**

## International Astronautical Federation

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### Rapporteur

Dana G. Andrews

Andrews Space & Technology — UNITED STATES

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### 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.

#### Chairman

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#### Rapporteur

Pier De Matteis

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### 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 exploration missions.

#### Chairman

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#### Rapporteur

## **International Astronautical Federation**

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### **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 development.

#### **Chairman**

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#### **Rapporteur**

David E. Glass  
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### **D2.6. Future Space Transportation Systems Verification and In-Flight Experimentation**

Discussion of qualification of systems and technologies for Future Space Transportation Systems. Emphasis is on experimentation/verification.

#### **Chairman**

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#### **Rapporteur**

Shigeru Aso  
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### **D2.7.-B3.2. Joint Session on Human Space Transportation Systems**

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

## International Astronautical Federation

### Chairman

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— ITALY

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### Rapporteur

Patrick M. McKenzie

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### D2.8. New missions enabled by Extra-large launchers

The session will address new science and human exploration missions enabled by new extra-large vehicles already planned (Ares V) or under study.

The session will also deal with worldwide needs and requirements for extra-large launchers.

### Chairman

John Horack

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### Rapporteur

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### D2.9.-D1.6. Joint Session on Status of the Ares I and V launch vehicles

This joint SE/Space Transportation session will update the international community on the progress NASA has achieved on the design of the Ares I and Ares V Launch Vehicles. Focus will be on state-of-the-art system engineering methodologies, design techniques, tools, processes, and training that reduce the time and cost, to improve the quality of the Ares I and Ares V Launch Vehicles and related subsystems. Of special interest are multi disciplinary methods, tools and processes used to define the system architectures to improve risk management, safety, reliability, testability, and life cycle cost estimates.

### Chairman

## **International Astronautical Federation**

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### **Rapporteur**

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### **D2.I. Interactive session on Space Transportation**

#### **Chairman**

Harry Cikanek

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### **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.

#### **Coordinator**

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## International Astronautical Federation

### **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, geographically 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 Mars and targets beyond, and the search for 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.

#### **Chairman**

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#### **Rapporteur**

William H. Siegfried  
The Boeing Company (retired) — UNITED STATES  
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### **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 a broad, forward looking view of the technologies and systems needed, but must be sufficiently well focused to allow tangible progression—and dramatic improvements over current capabilities—to be realized in the foreseeable future. This session will address cross cutting considerations in which a number of discipline research topics and/or technologies may be successfully synthesized to enable a transformation new systems concept to be achieved. Papers are solicited in these and related areas.

#### **Chairman**

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## **International Astronautical Federation**

### **Rapporteur**

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### **D3.3. Infrastructures and Systems to Enable Ambitious Future Exploration and Utilization of Space**

Although innovation 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 include the following: (1) infrastructures that enable affordable and reliable access to space for both exploration systems and logistics; (2) infrastructures for affordable and reliable transportation in space, including access to/from lunar and planetary surfaces for crews, robotic and supporting systems and logistics; (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.

### **Chairman**

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## International Astronautical Federation

### D3.4.-E5.4. Joint Session on Space Technology and Systems Management Practices and Tools” – Part I

The effective management on space technology and systems development is critical to our future success in space exploration and utilization. This joint session (new in 2007) in two parts provides a unique international forum to further the development of a family of ‘best practices’ in this important field. Specific areas of potential interest include: (1) Technology Management Methodologies and Best Practices; (2) R&D Management Software Tools and Databases; (3) Systems Analysis Methods and Tools; and, (4) Particular Topics could include: Technology Readiness Levels (TRLs), Technology Readiness Assessments, Technology R&D Risk Management, etc. Either more theoretical discussions, or examples of applications of R&D management tools to specific R&D programs and projects are of interest for the session.

#### Chairman

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### D3.5.-E5.5. Joint Session on Space Technology and Systems Management Practices and Tools – Part II

The effective management on space technology and systems development is critical to our future success in space exploration and utilization. This joint session in two parts (new in 2007) provides a unique international forum to further the development of a family of ‘best practices’ in this important field. Specific areas of potential interest include: (1) Technology Management Methodologies and Best Practices; (2) R&D Management Software Tools and Databases; (3) Systems Analysis Methods and Tools; and, (4) Particular Topics could include: Technology Readiness Levels (TRLs), Technology Readiness Assessments, Technology R&D Risk Management, etc. Either more theoretical discussions, or examples of applications of R&D management tools to specific R&D programs and projects are of interest for the session.

#### Chairman

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### **D4. SYMPOSIUM ON THE FAR FUTURE: RENEWED VISIONS**

Concepts for the Far Future are developed, refined, forgotten and re-discovered. The key for this symposium is the identification of technologies and concepts that will serve the development of humankind in the expansion toward the stars; near term and far distant – for the participants to determine.

#### **Coordinator**

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Hans E.W. Hoffmann  
ORBComm Inc — GERMANY  
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#### **D4.1. Space Elevator System Infrastructures**

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 conceived as a 104.000km ribbon of carbon nanotubes with one end attached to Earth. The Space Elevator will ferry satellites, spaceships, and pieces of space stations into space using electric lifts clamped to the ribbon. This session will review the concepts of infrastructure supporting the customers. Comparisons of proposed systems architectures will be made as well as comparisons of major components.

#### **Chairman**

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#### **Rapporteur**

Lachlan Thompson  
RMIT University, Australia — AUSTRALIA  
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#### **D4.2. Space Elevators and Advanced Tethers – Roadmaps to the Future**

This session will cover the concepts being refined for space elevators or space tethers in various orbital locations. In addition, a comparison of technology maturity levels for components will be assessed. The question on the table is... "What can be accomplished in the near future?"

#### **Chairman**

**International Astronautical Federation**

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**Rapporteur**

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**D5. 41ST 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 programs. 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 Astrium — FRANCE  
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**D5.1. Safety of Space Tourism and Associated Regulations**

Opening space to ordinary citizens is both a great economic and human outlook and a great challenge. One of the main requirements is to deal properly with all safety issues.

The goal of the session is to take part in the case for space tourism safety, by identifying, evaluating, illustrating the various aspects contributing to it.

Examples are welcome from the aeronautics sector, which brings an interesting lighting of certification and implementation of international and local regulations.

**Chairman**

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## International Astronautical Federation

### D5.2. Quality and Knowledge Management in Aerospace Companies

Working on complex space missions requires virtual teaming, learning lessons from the past, transferring knowledge from experts to younger generations, and developing deep expertise within an organization.

- How are aerospace companies managing the ability to control quality and share knowledge?
- What solutions are in place to work across corporate and international boundaries?
- How is knowledge captured, shared, and used to drive innovation?

This session focuses on the processes and technologies that companies (and agencies) are using to sustain, energize and invigorate their ability to learn, innovate, achieve quality and share knowledge.

Case studies and defined approaches will discuss:

- Analysis of successful projects and innovations in the application of quality and knowledge management
- Approaches to risk and opportunity management
- Capture of technical expertise and lessons learned from previous successful projects that are applicable to new programs and focus on driving innovation
- Solutions used for anomaly resolution and tracking systems, such as fault tree analysis and FMECA
- Failure recovery and preventative measures that relate to the application of quality and knowledge management practices.

#### Chairman

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#### Rapporteur

Max Grimard  
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### D5.3. Avoiding in Orbit Failures by a better Knowledge of the Environment

An increasing number of anomalies and failures observed on operating spacecraft are due to space environment causes.

A better prevention requires actions in various fields which will be addressed by the session:

- Analysis of the observed failures (lessons learned)
- Better knowledge of the space environment by on-board measurements
- Good engineering tools: environment models, software for prediction of the effects, etc.
- Space weather activities.

#### Chairman

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### D5.4.

## 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  
Centre National d'Etudes Spatiales (CNES) — FRANCE  
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### 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.

### Chairman

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### Rapporteur

Jayesh Hirani  
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES  
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### E1.2. Structures for Space Education

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

### Chairman

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## **International Astronautical Federation**

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### **Rapporteur**

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### **E1.3. Educational Outreach**

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

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#### **Rapporteur**

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### **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.

#### **Chairman**

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#### **Rapporteur**

Gulnara T. Omarova  
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## **International Astronautical Federation**

### **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.

#### **Chairman**

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Piero Messina  
European Space Agency/Headquarters — FRANCE  
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### **E2. 38th STUDENT CONFERENCE**

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

#### **Coordinator**

Rachid Amekrane  
EADS Astrium — GERMANY  
Email: rachid.amekrane@astrium.eads.net

#### **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 38th International Student Competition.

French, German, US, and British students submitting abstracts for the sessions E2.1 and E2.2 shall apply via the national coordinators:

for France: Bénédicte Escudier at: benedicte.escudier@supaero.fr  
for Germany: Rachid Amekrane at: rachid.amekrane@space.eads.net  
for USA: Jayesh Hirani at: jayeshh@aiaa.org  
for Great Britain: Roger T. Moses at: r.t.moses@bristol.ac.uk

Guidelines for competition available on [www.iafastro.org](http://www.iafastro.org) as from 15 November 2007.

#### **Chairman**

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Bénédicte Escudier  
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## International Astronautical Federation

### Rapporteur

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### 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 38th International Student Competition.

French, German, US, and British students submitting abstracts for the sessions E2.1 and E2.2 shall apply via the national coordinators:

for France: Bénédicte Escudier at: benedicte.escudier@supaero.fr

for Germany: Rachid Amekrane at: rachid.amekrane@space.eads.net

for USA: Jayesh Hirani at: jayeshh@aiaa.org

for Great Britain: Roger T. Moses at: r.t.moses@bristol.ac.uk

### Chairman

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### Rapporteur

Valerie Anne Casasanto  
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### 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 authors (three or more students).

Students presenting in this session will compete for the Hans von Muldau Team Award.

For further guidelines, please refer to [www.iafastro.org](http://www.iafastro.org) as from December 2007.

### Chairman

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## **International Astronautical Federation**

### **Rapporteur**

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### **E3. SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS**

This symposium provides a systematic overview on the current trends in space policy, regulation and economics. It covers national as well as multilateral space policies and plans, assesses the Public-Private-Partnership model as one of the most challenging issues in the economical field and highlights the question of planetary protection, which is currently investigated under an IAA Cosmic Study project. The symposium also integrates the IAA/IISL Scientific-Legal Roundtable, which deals with “Paper Satellites”.

### **Coordinator**

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Sergio Camacho  
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#### **E3.1. New Developments in National Space Policies and Programmes**

This session provides the forum for presenting current space policies and programmes of space-faring countries.

### **Chairman**

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### **Rapporteur**

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#### **E3.2. Space Policies and Programmes of International Organizations**

This session provides the forum for presenting current space policies and programmes of international organizations with space activities.

### **Chairman**

## **International Astronautical Federation**

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Colin Hicks  
EURISY Association — UNITED KINGDOM  
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### **Rapporteur**

Wolfgang Rathgeber  
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### **E3.3. Assessing Public-Private-Partnerships for Space Projects**

Public-Private-Partnership has already been applied for a number of space activities thus joining forces of governments and private actors. This session reviews the results of PPP and discusses the future of this concept.

#### **Chairman**

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Gerard Brachet  
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#### **Rapporteur**

Anna Burzykowska  
Polish Space Office — POLAND  
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### **E3.4. Policy and Regulations Questions in the Protection of the Environment of Celestial Bodies**

IAA is currently conducting a Cosmic Study on this topic. This session will be the forum to discuss the preliminary results of this study project and to reflect on presentations concerning recent developments in this field.

#### **Chairman**

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#### **Rapporteur**

## International Astronautical Federation

Marc Haese  
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### **E3.5. Scientific-Legal Roundtable: "Paper Satellites" - Problems of Policy, Regulation and Economics (Invited Papers only)**

A large number of satellite and frequency notifications with the International Telecommunication Union (ITU) are not implemented. This session deals with the political and legal as well as the economic consequences of this severe problem.

#### **Chairman**

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Lubos Perek  
Astronomical Institute, Czech Academy of sciences — CZECH REPUBLIC  
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#### **Rapporteur**

Nicola Rohner  
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### **E4. 42ND HISTORY OF ASTRONAUTICS SYMPOSIUM**

Honouring the 50th Anniversary of the International Geophysical Year. History of space science, technology and development, rocketry and personal memoirs. The history of rocketry and astronautics of the UK. The entire spectrum of space history, at least 25 years old, is covered.

#### **Coordinator**

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## International Astronautical Federation

### E4.1. International Geophysical Year, 50th Anniversary

The political and programmatic implications on the course of international space activities due to the conduct of the International Geophysical Year (IGY) 1957-58. Invited space pioneers involved in the IGY. Autobiographical and biographical memoirs of individuals who have made significant original contributions to the creation and conduct of the IGY. Review of scientific and technical projects and their results from the IGY.

#### Chairman

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Christophe Rothmund  
Snecma — FRANCE  
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### E4.2. Memoirs and Organisational Histories

Autobiographical and biographical memoirs of individuals who have made significant original contributions to the development and application of astronautics and rocketry. History of government, industrial, academic & professional societies & organisations long engaged in astronautical endeavours.

#### Chairman

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## International Astronautical Federation

### E4.3. Scientific & Technical Reviews

Historical summaries of space programs, satellite and rocket projects, and technical and scientific achievements.

#### Chairman

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#### Rapporteur

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Charles Lundquist  
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### E4.4. History of UK Contribution to Astronautics

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

#### Chairman

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#### Rapporteur

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**International Astronautical Federation**

**E5. 19th SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY**

The symposium will review the impact and benefits of space activities on the various segments and aspects of society (eg development and structure; arts and culture; spin-offs to improve everyday life, etc.). The symposium will also consider society's expectations from space activities.

**Coordinator**

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Geoffrey Languedoc  
Canadian Aeronautics & Space Institute (CASI) — CANADA  
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**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 non-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 explore and describe not only how space technologies are being successfully transferred to the non-space sector, but also how both advanced and emerging non-space technologies can be identified and investigated at source for possible orientation of their development towards a space application – particularly for future space exploration. In addition, papers are also sought which discuss and describe the innovative technology development cycle in so far as transfer of the technology is concerned. Papers are also welcomed which discuss the return on investment in space activities and the opportunities for collaboration and new markets which utilize such innovations, as well as how access to advanced technologies improves the competitiveness of small and medium-sized enterprises.

**Chairman**

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**Rapporteur**

## **International Astronautical Federation**

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UNITED  
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### **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 particularly young people). This session will relate to this study and thus invites papers which review and 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.

#### **Chairman**

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Julie Chesley  
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Email: bandjchesley@aol.com

#### **Rapporteur**

Peter A. Swan  
Teaching Science and Technology, Inc. — UNITED STATES  
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### **E5.3. The Architecture of Space: Tools for Development In the 21st Century**

IAA Study Group 6.9, The Architecture of Space: Tools for Development in the 21st Century concludes in 2008 at the IAC in Glasgow. Continuing with the related theme from sessions at the last two Space and Society Symposia, Valencia 2006 and Hyderabad 2007, the multi-disciplinary aspects of Space Architecture and Space Tourism will be addressed. This session seeks papers on topics including, but not limited to: architecture, human factors, ergonomics, man-machine interfaces, information technology, life-support systems, entrepreneurship opportunities, psychology, art, and sociology.

#### **Chairman**

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**International Astronautical Federation**

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**Rapporteur**

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**E5.4.-D3.4. Joint Session on Space Technology and Systems Management Practices and Tools” – Part I**

The effective management on space technology and systems development is critical to our future success in space exploration and utilization. This joint session (new in 2007) in two parts provides a unique international forum to further the development of a family of ‘best practices’ in this important field. Specific areas of potential interest include: (1) Technology Management Methodologies and Best Practices; (2) R&D Management Software Tools and Databases; (3) Systems Analysis Methods and Tools; and, (4) Particular Topics could include: Technology Readiness Levels (TRLs), Technology Readiness Assessments, Technology R&D Risk Management, etc. Either more theoretical discussions, or examples of applications of R&D management tools to specific R&D programs and projects are of interest for the session.

**Chairman**

Peter A. Swan  
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**Rapporteur**

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**E5.5.-D3.5. Joint Session on Space Technology and Systems Management Practices and Tools – Part II**

The effective management on space technology and systems development is critical to our future success in space exploration and utilization. This joint session in two parts (new in 2007) provides a unique international forum to further the development of a family of ‘best practices’ in this important field. Specific areas of potential interest include: (1) Technology Management Methodologies and Best Practices; (2) R&D Management Software Tools and Databases; (3) Systems Analysis Methods and Tools; and, (4) Particular Topics could include: Technology Readiness Levels (TRLs), Technology Readiness Assessments, Technology R&D Risk Management, etc. Either more theoretical discussions, or examples of applications of R&D management tools to specific R&D programs and projects are of interest for the session.

**Chairman**

## **International Astronautical Federation**

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### **E5.I. Interactive Session on Space and Society**

#### **Chairman**

Naomi Mathers  
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## **E6. ENTREPRENEURSHIP & INVESTMENT SYMPOSIUM**

The Symposium deals with issues and options associated with the promotion of entrepreneurial endeavour and private investment in emerging space business activities. Contributions reporting on ongoing ventures/programs/activities that have already taken place will usually be received more favourably than those reporting on notional concepts and plans. Similarly, more weight will be given to contributions that include analysis and critical thought rather than relying primarily on advocacy of particular views or approaches.

#### **Coordinator**

Paul Eckert  
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### **E6.1. Dynamics of Entrepreneurship**

This session will focus on varied roles and significant contributions of entrepreneurs, exploring a variety of perspectives and historical examples, as well as current trends.

#### **Chairman**

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Christian Sallaberger  
MDA — CANADA  
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## **International Astronautical Federation**

### **E6.2. Attracting Private Investment**

This session will examine types of investors and investments, discussing the difficulties and potential involved in attracting increased private capital to support entrepreneurial efforts.

#### **Chairman**

John White  
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Jacques Vallée  
Astrolabe Ventures — UNITED STATES  
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### **E6.3. Synergy of Entrepreneurship, Investment, Government, and Industry**

This session will focus on the benefits and challenges facing government agencies and established companies, as they attempt to interact constructively with private investors and entrepreneurial firms.

#### **Chairman**

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Clayton Mowry  
Arianespace, Inc. — UNITED STATES  
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## **E7. SYMPOSIUM ON SPACE TERMINOLOGY**

The International Academy of Astronautics has been engaged for some time in the development of a multilingual space-terminology data-base system that will contain a significant number of the terms relevant to space in as many languages as possible (presently, we have around 20 languages covered). It also hopes to incorporate definitions of the terms in English (and French) as a first step and then step-wise with other languages. The immediate goal, however, is to publish the 50th Anniversary of Space-Era Edition of IAA Multilingual Space Dictionary. This Symposium is an effort to promote the activities as well as to offer a forum to discuss language issues and related matters based on the 50 years experience in space research and development activities.

#### **Coordinator**

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Gordon P. Whitcomb  
— UNITED KINGDOM  
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## **International Astronautical Federation**

### **E7.1. Language Issues after Half a Century of Space Exploration**

This round table will consist on invited papers as well as on contributed papers. It will be an occasion to gather lexical results of half a century of space exploration and descriptions of Space terminology. It will be also aimed at proposing important directions to follow. An attempt will be made to summarize how space terminology was developed in the different countries and on the international level.

It will also focus on the current situation, dealing with emerging concepts and domains (such as life sciences, astrobiology, microgravity, communications, remote sensing, global positioning, legal aspects...), new words and their definitions.

It will include new ways of constructing and exchanging terminological data on the international level, in developing both the academic and industrial fields.

The final objective is to arrive at synthetic description/analysis of the work done and the work to be carried out in the future (including methods, processes, data exchange protocols, communication tools currently used or needed) in different countries participating or expected to participate in the international Space terminology project at IAA.

#### **Chairman**

Keiken Ninomiya

Japan Aerospace Exploration Agency (JAXA) / ISAS — JAPAN

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Gordon P. Whitcomb

— UNITED KINGDOM

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#### **Rapporteur**

Danielle Candel

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## **E8. 51st INTERNATIONAL COLLOQUIUM ON THE LAW OF OUTER SPACE (IISL)**

#### **Coordinator**

Tanja Masson-Zwaan

IISL Secretary — THE NETHERLANDS

Email: tanja@lesmasson.com

### **E8.1. Private International Law Regarding Space Activities**

Originally, space law was of a purely public nature, but today more and more matters of a private law character are involved even at the international level. For this session, the first devoted exclusively to private law issues, papers are invited to address theoretical and practical issues and present concrete cases where private international law has become relevant for space activities.

#### **Chairman**

## **International Astronautical Federation**

Francis Lyall  
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Lesley Jane Smith  
University of Lueneburg — GERMANY  
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### **E8.2. The 40th Anniversary of the Rescue Agreement: Looking Ahead**

The Rescue Agreement was drafted when the typical mission profile involved a single nation. Today's mission profile involves multiple nations. Papers are invited to address the legal aspects of applying the Agreement to international cooperative mission profiles.

#### **Chairman**

Vladimir Kopal  
Professor at Law , West Bohemen University, Pilsen — CZECH REPUBLIC  
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Sergio Marchisio  
Italian National Research Council - CNR — ITALY  
Email: segreteria@isgi.cnr.it

### **E8.3. Weaponisation of Outer Space in the Light of Article 4 of the Outer Space Treaty**

Papers are invited to address legal aspects of evolving national policies and military doctrines and international responses thereto.

#### **Chairman**

Jonathan F. Galloway  
International Institute of Space Law — UNITED STATES  
Email: jfg1939@gmail.com

Josñ Monserrat-Filho  
Brazilian Association of Air and Space Law — BRAZIL  
Email: monserrat@alternex.com.br

### **E8.4. Legal Aspects of Natural Near Earth Objects (NEO's)**

NEO's are increasingly gathering international attention, from the perspective of exploration and exploitation of natural resources and from the perspective of potential deflection in case of a collision. Papers are invited to address the legal aspects of these activities.

#### **Chairman**

Richard Tremayne-Smith  
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Maureen Williams  
International Law Association (London) — ARGENTINA  
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**International Astronautical Federation**

**E8.5. 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.

**Chairman**

Joanne Irene Gabrynowicz

National Center for Remote Sensing, Air, and Space Law - University of Mississippi School of

Law

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