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65TH INTERNATIONAL ASTRONAUTICAL CONGRESS

65th IAC

International Astronautical Congress

29 September - 3 October 2014
Toronto, Canada

Call for Papers & Registration of Interest

"Our World Needs Space"

Host

Partner Organisations

Contents

Message from the President of the IAF

I have great pleasure in inviting you to attend the 65th International Astronautical Congress in the exciting city of Toronto, Canada.

The IAC is returning to Canada for the third time, after the 42nd and 55th IACs in Montreal and Vancouver respectively.

Canada has always been, and continues to be a key player on the global space stage, from iconic technologies such as the ISS's Canadarm, to space personalities such as Chris Hadfield, who captured the public's attention and admiration during his stay on the ISS. As far back as 1962, Canada became the third country to design and build its own satellite when Alouette 1 was placed in orbit. Over 50 years later, the Canadian Government continues to be a driver of space progress, investing in space exploration and industry innovation.

Canada has in the past proved to be a hugely successful IAC location, and I am sure that Toronto will be no exception. This vibrant city is also a technological hub, boasting impressive higher education research facilities and an energetic community of technology start-ups.

Our Hosts in Canada, the Canadian Aeronautics and Space Institute (CASI), are committed and dynamic partners and we are already hard at work on the technical and plenary programmes, and wide array of associated events that make the IAC the lively and varied congress it has come to be.

While the economic situation for the space community continues to be challenging, I am confident that through the superb innovation and ideas arising from ventures such as the IAC, the sector will continue to grow and prosper.

My very best wishes for an enjoyable and successful 65th IAC, we look forward to seeing you in Toronto

Kiyoshi Higuchi
President, International Astronautical Federation

Message from the Local Organising Committee

We are delighted to have this opportunity to welcome you to IAC 2014 in Toronto, Canada. Situated on the north shore of Lake Ontario, Toronto is the largest of Canada's vibrant cities. It is the hub of the nation's commercial, financial, industrial, and cultural life, and is the capital of the Province of Ontario. Toronto was founded in 1793, became the City of Toronto in 1834, and through its subsequent evolution and expansion the city has emerged as one of the most liveable and multicultural urban places in the world today.

The Canadian Aeronautics and Space Institute is your host for IAC 2014. CASI celebrates its 60th anniversary next year and has hosted two previous Congress, both to great acclaim: the 42nd IAC in 1991 in Montreal, and the 55th IAC in Vancouver in 2004.

The Local Organizing Committee of IAC 2014 will present a Congress that showcases the global and collaborative nature of our industry, with a special focus on the capabilities and accomplishments of the two North American space-faring nations – the United States and Canada.

Canada has earned a reputation for excellence in space activities, from our first satellite Alouette launched in 1962 to the iconic Canadarm, the robotic remote manipulator system that makes possible many of the vital tasks carried out on the International Space Station and the Shuttles. Canadian astronauts also have made important contributions to our knowledge and understanding of the space environment, most recently Chris Hadfield who popularized space in an unprecedented way during his 6-month mission aboard the ISS.

"Our World Needs Space" is the theme of IAC 2014, and we are certain that every delegate will wholeheartedly agree with this sentiment. The Congress will capture and reflect the countless ways that our daily lives depend on space technology and applications. It will be a forum where representatives of industry, government, academia and the general public come together, network, exchange ideas, see demonstrations of leading-edge technology, identify opportunities for collaboration, renew old acquaintances and forge new relationships.

As co-Chairs of IAC 2014 in Toronto it is our great privilege to invite you to share a week with your global space colleagues in the spectacular city of Toronto, Canada.

Sincerely,

Ron Holdway, COM DEV
IAC 2014 co-Chair

Mag Iskander, MDA
IAC 2014 co-Chair

Message from the IPC Co-Chairs

The 65th International Astronautical Congress will take place in the beautiful, modern and multicultural city of Toronto. The theme of IAC 2014 is "Our World Needs Space". Applications originating from space-based data have become essential for our daily living, and the theme of this conference is chosen to highlight this feature of space in our lives. Papers are solicited under various Symposia and for various technical sessions as noted in this brochure.

A number of world class plenary sessions will be organized with the participation of space industry and space agency leaders and international experts on topics of current interest. In addition to this, a number of highlight lectures and late breaking news sessions will also be organized. The Congress is open to participants from all nations who wish to attend or present a paper.

IAC 2014 will offer you an unparalleled opportunity to present your recent research and new findings, as well as to gather new knowledge and information in your field of interest. Just as important, the week will be replete with opportunities to forge new relationships and renew existing ones.

We hope that this Call for Papers will encourage you to submit an abstract for presentation at the 65th International Astronautical Congress. The robust Accompanying Persons Program will ensure that your travelling companion will have the opportunity to meet and get to know others, and to share activities together such as a sightseeing bus trip, a museum visit or a walking tour of Toronto.

We look forward to extending a warm Canadian welcome to you at IAC 2014!

Virendra Jha
IPC Co-Chair

Igal Patel
IPC Co-Chair

Message from the President of the International Academy of Astronautics

The International Academy of Astronautics (IAA) is pleased to invite you to attend the IAA symposia throughout the week. In addition to organising around 20 conferences a year, worldwide, the Academy is organising 13 symposia at this year's IAC in Toronto, representing one third of the IAC programme, and will co-host some thrilling sessions with the IAF and the IISL.

Gopalan Madhavan Nair
President of the International Academy of Astronautics

Message from the President of the International Institute of Space Law

On behalf of the International Institute of Space Law, I am pleased to invite you to attend our 57th Colloquium on the Law of Outer Space. The IISL selected several topical issues that will be addressed and debated by the world's finest space lawyers, and we will again co-host some exciting sessions with the IAF and the IAA.

We will welcome university students from Africa, the Asia Pacific, Europe and North America to the World Finals of the 23rd Manfred Lachs Space Law Moot Court Competition, judged by members of the International Court of Justice. Students and young professionals also have their own session during our Colloquium.

With the era of privatisation and commercialisation of space activities advancing rapidly, new legal issues arise and require attention. In this context, the IISL is pleased to contribute to the programme of the IAC, as it is important to address these questions together with scientists, engineers and other space professionals.
We look forward to welcoming you in Toronto!

Tanja Masson-Zwaan
President of the International Institute of Space Law

International Astronautical Federation (IAF)

Founded in 1951, the International Astronautical Federation is the world's leading space advocacy body. It has 246 members in over 60 countries countries, including all leading space agencies, companies, societies, associations and institutes worldwide.

Following its theme - "A space-faring world cooperating for the benefit of humanity" - the Federation advances knowledge about space and fosters the development and application of space assets by advancing global cooperation.

As organiser of the annual International Astronautical Congress (IAC), and other meetings on specific subjects, the IAF actively encourages the development of astronautics for peaceful purposes and supports the dissemination of scientific and technical information related to space.

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International Academy of Astronautics (IAA)

The international community of leading experts committed to expanding the frontiers of space, the newest realm of human activity. To foster the development of astronautics, the Academy undertakes a number of activities, including the recognition of outstanding contributors through elections and awards. It also facilitates professional communication, develops and promotes new ideas and initiatives, engages the public and fosters a sense of community among the members. The IAA is a unique non-governmental organisation established in 1960 and recognised by the United Nations in 1996.

It is an honorary society with an action agenda. With 1200 elected members and corresponding members from 87 nations, it works closely with space agencies, industry, the academic community and the national science and engineering academies to determine needs and objectives and to help shape policy and forge cooperation by means of studies, position papers, conferences and publications.
The IAA has published 52 studies to date and is engaged in the preparation of 40 others. The Academy also publishes the journal ActaAstronautica containing refereed papers.

The Academy now organises 20 conferences per year and regional meetings focused on the development and promotion of new initiatives. This activity also includes, in cooperation with the International Astronautical Federation and the International Institute of Space Law, the traditional contribution to the International Astronautical Congress (IAC), where the Academy sponsors 13 Symposia. The Academy also continues to enjoy its participation in the COSPAR Assemblies by sponsoring and co-sponsoring symposia. Although the IAA has many connections to these and other similar organisations, it is distinctive as the only international Academy of elected members in the broad area of astronautics and space.

PRESIDENT:
Gopalan Madhavan Nair,
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International Institute of Space Law

Founded in 1960, the International Institute of Space Law (IISL) is an independent non-governmental organisation dedicated to fostering the development of space law. The membership of the Institute is composed of individuals and institutions from more than forty countries elected on the basis of their contributions to the field of space law or other social sciences related to space activities. In addition, prospective membership is open to students and young professionals with a demonstrated interest in space law.

The IISL holds an annual Colloquium at the International Astronautical Congress. During this Colloquium the Nandasiri Jasentuliyana Keynote lecture takes place, as well as a special session for Young Scholars. In addition the Institute organises a variety of conferences on space law throughout the year in locations all over the world. It publishes an annual volume of IISL Proceedings with papers and reports of all activities during the year.

Since 1992, the IISL organizes the annual Manfred Lachs Space Law Moot Court Competition. The competition is based on a hypothetical space law case, written by IISL members, in which around sixty student teams from universities in North America, Europe, Asia Pacific and Africa participate. Members of the International Court of Justice judge the World Finals of the competition, making it unique in the world.

The IISL is an officially recognized observer at sessions of the United Nations Committee on the Peaceful Uses of Outer Space, and its Scientific & Technical and Legal Subcommittees. In cooperation with the European Centre for Space Law (ECSL), the IISL organizes an annual space law symposium for the delegates and staff attending the sessions of the UNCOPUOS Legal Subcommittee.

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Introduction to the Technical Programme

The IAC Technical Programme, which forms the core of the International Astronautical Congress, evolves continually in response to thechanging nature of space science, technology and its societal aspects – and the programme for the 2014 IAC in Toronto is no exception.

As usual, the symposia are grouped into five Categories: A. **Science and Exploration**; B. **Applications and Operations**; C. **Technology**; D.**Infrastructure**; and E. **Space and Society** with the addition of the **Young Professionals Virtual Forums**. The IAF Technical Committees, IAACommissions and IISL Programme Committees plan the coverage of the symposia and, under the auspices of the International Programme Committee, which selected the papers that will be presented.

The technical programme for the 2014 Congress is shown on the following pages. I encourage you to consider the sessions to which you might make a contribution and to submit abstracts for consideration.The International Astronautical Congress is the world's premier spaceconference. As a forum for the world's space profession, the 65th IAC, in the wonderful city of Toronto, promises to be one of the best yet.

Maria Antonietta Perino
IAF Vice-President, Technical Activities

Technical Programme

Category A

SCIENCE AND EXPLORATION

Systems sustaining missions, including life, microgravity, space exploration, space debris and SETI

A1 SPACE LIFE SCIENCES SYMPOSIUM
A2 MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM
A3 SPACE EXPLORATION SYMPOSIUM
A4 43RD SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) - THE NEXT STEPS
A5 HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM
A6 SPACE DEBRIS SYMPOSIUM
A7 SYMPOSIUM ON TECHNOLOGICAL REQUIREMENTS FOR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS

Category coordinated by Christophe Bonnal, *Senior Expert - Launch systems; Centre National d'Etudes Spatiales (CNES)*

A1 SPACE LIFE SCIENCES SYMPOSIUM

This symposium jointly organised by the International Academy of Astronautics (IAA) and the International Astronautical Federation (IAF) addresses all aspects of space life sciences research and practice in human and robotic spaceflight, from Low Earth Orbit (LEO) to the universe beyond, and from the Big Bang to the lives of future explorers on other planets of our solar system.

Coordinators

Ronald J. White
South Dakota School of Mines and Technology – USA

Nicole Buckley
Canadian Space Agency (RETD) — CANADA

A1.1 Behaviour, Performance and Psychosocial Issues in Space

This session considers psychosocial, interpersonal, cultural, cognitive, sleep, circadian rythm and human factors issues and countermeasures related to human spaceflight and space exploration.

Co-Chairs

Nick Kanas
University of California, San Francisco — UNITED STATES

Peter Suedfeld
University of British Columbia — CANADA

Rapporteurs

Gro M. Sandal
University of Bergen — NORWAY

Vadim Gushin
Institute for Biomedical Problems — RUSSIA

A1.2 Human Physiology in Space

This session focuses on space physiological research that relates to human health and to the countermeasures employed to maintain health and performance.

Co-Chairs

Satoshi Iwase
Aichi Medical University — JAPAN

Inessa Kozlovskaya
Institute for Biomedical Problems — RUSSIA

Rapporteurs

Thais Russomano
Microgravity Centre — BRAZIL

Hanns-Christian Gunga
Charité - University Medicine Berlin — GERMANY

A1.3 Medical Care for Humans in Space

This session focuses on medical care for astronauts, including operational medicine aspects, countermeasure development and applications as well as needs for future care for astronauts during long term stays in space and missions to and on the Moon and Mars. A further focus will lie on medical care for passengers and operators of commercial suborbital and orbital space flights.

Co-Chairs

Oleg Orlov
Institute for Biomedical Problems — RUSSIA

Jeffrey Davis
University of Alberta — CANADA

Rapporteurs

Marlene Grenon
University of California, San Francisco — UNITED STATES

Richard Hughson
University of Waterloo — CANADA

A1.4 Radiation Fields, Effects and Risks in Human Space Missions

The major topics of this session are the characterisation of the radiation environment by theoretical modelling and experimental data, radiation effects on physical and biological systems, countermeasures to radiation and radiation risk measurement.

Co-Chairs

Brent Lewis
Royal Military College — CANADA

Rapporteur

Yai-Ping Mimi Shao
Florida Hospital Cancer Institute — UNITED STATES

A1.5 Astrobiology and Exploration

A new era of space exploration will soon expand into a global endeavour to achieve highly ambitious goals such as establishing human bases on the Moon, journeys to Mars and the construction of new infrastructures in space. Astrobiology plays a key role in the strategic search for organic compounds and life on Mars and other planetary objects in our solar system and can provide support in the preparation of human exploration endeavours. The session invites papers of astrobiological content supporting future robotic and human

Co-Chairs

Petra Rettberg
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Victoria Hipkin
Canadian Space Agency — CANADA

Rapporteur

Cora Thiel
University of Zurich — SWITZERLAND

A1.6 Life Support and EVA Systems

This session will address strategies, solutions and technologies in providing for human requirements during future deep space and planetary/lunar surface exploration.

Co-Chairs

Klaus Slenzka
OHB System AG — GERMANY

Lowell Misener
— CANADA

Rapporteurs

Peter Hofmann
Kayser-Threde GmbH — GERMANY

Philip Ferguson
Magellan Aerospace Corporation — CANADA

A1.7 Biology in Space

This session focuses on all aspects of biology and biological systems related to gravity in ground-based and space flight experiments as well as on topics not covered by other sessions of this symposium.

Co-Chairs

Nicole Buckley
Canadian Space Agency (RETD) — CANADA

Peter Graef
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur

Luchino Cohen
Canadian Space Agency — CANADA

A1.8 Multidisciplinary Space Life Sciences Research

This session focuses on various types of multidisciplinary space life sciences research in physiology and biology.

Co-Chairs

Willam Paloski
University of Houston — UNITED STATES

Patrik Sundblad
ESA — SWEDEN

Rapporteurs

Jean-Marc Comtois
Canadian Space Agency — CANADA

Jancy McPhee
USRA — UNITED STATES

A1.9 D6.2 Joint Session on Private Human Access to Space: Sub-Orbital and Orbital Missions

This session is co-sponsored by IAA Commission III and will address topics such as systems, technical solutions, legal aspects, market analysis, insurance, regulatory constraints, spaceports.

Co-Chairs

Jens Lassmann
Astrium Space Transportation — GERMANY

Douglas O. Stanley
National Institute of Aerospace — UNITED STATES

Rapporteur

Julio Aprea
European Space Agency (ESA) — France

A2 MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM

The objective of the Microgravity Science and Processes Symposium is to highlight and discuss the state of the art in microgravity (reduced-gravity) physical sciences and processes, as well as to prepare for future orbital infrastructure. Session topics cover all microgravity science disciplines (material science, fluid physics, combustion science, fundamental physics), current results and research perspectives, together with relevant technology developments.

Coordinator

Marcus Dejmek
Canadian Space Agency — Canada

Vice-Coordinator

Kenol Jules
National Aeronautics and Space Administration (NASA) — United States

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 and plasma crystals.

Co-Chairs

Francois Gonzalez
Centre National d'Etudes Spatiales (CNES) — FRANCE

Joachim Richter
RWTH Aachen — GERMANY

Rapporteur

Qi KANG
National Microgravity Laboratory, Institute of Mechanics, Chinese Academy of Sciences. — CHINA

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 and space experiments.

Co-Chairs

Raimondo Fortezza
Telespazio — ITALY

Nickolay N. Smirnov
Moscow Lomonosov State University — RUSSIA

Rapporteur

Jean-Claude Legros
Université Libre de Bruxelles — BELGIUM

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 aircraft, sounding rockets and capsules.

Co-Chairs

Ziad Saghir
Ryerson University — CANADA

Raffaele Savino
— ITALY

A2.4 Science Results from Ground Based Research

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

Co-Chairs

Valentina Shevtsova
Université Libre de Bruxelles — BELGIUM

Antonio Viviani
Second University of Naples, SUN — ITALY

Rapporteur

Nickolay N. Smirnov
Moscow Lomonosov State University — RUSSIA

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).

Co-Chairs

Marcus Dejmek
Canadian Space Agency — CANADA

Rainer Willnecker
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur

Peter Hofmann
Kayser-Threde GmbH — GERMANY

A2.6 Microgravity Sciences Onboard the International Space Station and Beyond – Part 1

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

Co-Chairs

Kenol Jules
National Aeronautics and Space Administration (NASA) — UNITED STATES

Bernard Zappoli
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Christoph Puetz
Astrium Space Transportation — GERMANY

A2.7 Microgravity Sciences Onboard the International Space Station and Beyond - Part 2

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

Co-Chairs

Peter Hofmann
Kayser-Threde GmbH — GERMANY

Christoph Puetz
Astrium Space Transportation — GERMANY

Rapporteur

Gabriel Pont
Centre National d'Etudes Spatiales (CNES) — FRANCE

A3 SPACE EXPLORATION SYMPOSIUM

This symposium covers the current and future robotic missions and material plans for initiatives in the exploration of the Solar System.

Coordinators

Christian Sallaberger
MDA Corporation — CANADA

Bernard Foing
ESA/ESTEC — The Netherlands

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, as are papers dealing with the emerging area of commercial space exploration activities.

Co-Chairs

Christian Sallaberger
MDA Corporation — CANADA

Luc Frécon
Thales Alenia Space France — FRANCE

Rapporteurs

Keyur Patel
National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratory — UNITED STATES

Norbert Frischauf
ORF — AUSTRIA

A3.2A Moon Exploration – Part 1

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.

Co-Chairs

Bernard Foing
ESA/ESTEC — THE NETHERLANDS

David Korsmeyer
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

William H. Siegfried
The Boeing Company — UNITED STATES

Sylvie Espinasse
European Space Agency (ESA) — THE NETHERLANDS

A3.2B Moon Exploration – Part 2

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.

Co-Chairs

Bernard Foing
ESA/ESTEC — THE NETHERLANDS

David Korsmeyer
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteurs

William H. Siegfried
The Boeing Company — UNITED STATES

Sylvie Espinasse
European Space Agency (ESA) — THE NETHERLANDS

A3.2C Moon Exploration – Part 3

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.

Co-Chairs

Bernard Foing
ESA/ESTEC — THE NETHERLANDS

David Korsmeyer
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteurs

William H. Siegfried
The Boeing Company — UNITED STATES

Sylvie Espinasse
European Space Agency (ESA) — THE NETHERLANDS

A3.2D Moon Exploration – Poster session

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.

Co-Chairs

Bernard Foing
ESA/ESTEC — THE NETHERLANDS

David Korsmeyer
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteurs

William H. Siegfried
The Boeing Company — UNITED STATES

Sylvie Espinasse
European Space Agency (ESA) — THE NETHERLANDS

A3.3A Mars Exploration – Part 1

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.

Co-Chairs

Vincenzo Giorgio
Thales Alenia Space Italia — ITALY

Pierre W. Bousquet
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteurs

Cheryl Reed
The Johns Hopkins University Applied Physics Laboratory — UNITED STATES

Amalia Ercoli Finzi
Politecnico di Milano — ITALY

A3.3B Mars Exploration – Part 2

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.

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Vincenzo Giorgio
Thales Alenia Space Italia — ITALY

Pierre W. Bousquet
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteurs

Cheryl Reed
The John Hopkins University Applied Physics Laboratory — UNITED STATES

Amalia Ercoli Finzi
Politecnico di Milano — ITALY

A3.3C Mars Exploration – Part 3

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.

Co-Chairs

Vincenzo Giorgio
Thales Alenia Space Italia — ITALY

Pierre W. Bousquet
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteurs

Cheryl Reed
The John Hopkins University Applied Physics Laboratory — UNITED STATES

Amalia Ercoli Finzi
Politecnico di Milano — ITALY

A3.4 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.

Co-Chairs

Susan McKenna-Lawlor
Space Technology (Ireland) Ltd. — IRELAND

Stephan Ulamec
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteurs

Marc D. Rayman
Jet Propulsion Laboratory - California Institute of Technology — UNITED STATES

Norbert Frischauf
ORF — AUSTRIA

A3.5 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.

Co-Chairs

Junichiro Kawaguchi
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Mariella Graziano
GMV Aerospace & Defence SAU — SPAIN

Rapporteur

William H. Siegfried
The Boeing Company — UNITED STATES

A4 43RD SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps

This symposium organised by the IAA 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 kinds of radiation. The interdisciplinary aspects include all societal implications, risk communication and philosophical considerations of any kind of discovery or contact.

Coordinator

Claudio Maccone
International Academy of Astronautics (IAA) — ITALY

A4.1 SETI 1: SETI Science and Technology

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

Co-Chairs

H. Paul Shuch
The SETI League, Inc. — UNITED STATES

Geoff Marcy
— UNITED STATES

Rapporteur

Stephane Dumas
SETI League — CANADA

A4.2 SETI 2: SETI and Society

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

Co-Chairs

Fengyuan Zhuang
Beihang University — CHINA

Kathryn Denning
York University — CANADA

Rapporteur

Lori Walton
Tigerstar Geoscience — CANADA

A5 HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM

This Symposium covers the strategic plans, architectural concepts and technology development for future human exploration of the Moon, Mars, Lagrangian Points and NEOs.

Coordinators

Christian Sallaberger
MDA Corporation — CANADA

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

A5.1 Human Exploration of the Moon and Cislunar Space

This session will examine the scenarios and infrastructure required to support human exploration of the Moon and Cislunar space. Papers are invited to discuss technology roadmaps as well as interfaces to allow international cooperation.

Co-Chairs

William H. Siegfried
The Boeing Company — UNITED STATES

Nadeem Ghafoor
MDA — CANADA

Rapporteur

Uwe Apel
Hochschule Bremen — GERMANY

A5.2 Human Exploration of Mars

This session will examine the scenarios and infrastructure required to support human exploration of Mars and the moons of Mars. Papers are invited to discuss technology roadmaps as well as interfaces to allow international cooperation.

Co-Chairs

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

Nadeem Ghafoor
MDA — CANADA

Rapporteur

Norbert Frischauf
ORF — AUSTRIA

A5.3 B3.6 Joint session on Human and Robotic Partnerships to Realize Human Spaceflight Goals

This session seeks papers on new systems and technologies for current human spaceflight and exploration programmes, and the role of human and robotic partnerships in areas such as onboard robotic assistants, habitat / infrastructure construction support, human mobility support systems (e.g. EVA mobility aids, rovers); and robotic precursor activities to human spaceflights for test, validation, and demonstration of systems. This session also welcomes papers considering how the roles of humans, machines and intelligent systems are likely to evolve in the coming years and the corresponding impact on complex mission design, implementation, and operations.

Co-Chairs

Christian Sallaberger
MDA Corporation — CANADA

Pierre Jean
Canadian Space Agency — CANADA

Rapporteurs

M. Hempsell
The British Interplanetary Society — UNITED KINGDOM

A5.4 D2.8 Human Missions to Libration points and NEO's

This session will explore heavy-lift launch capabilities for human deep space exploration missions, program architectures, technology demonstrations as well as the issues of scientific and political motivations and international cooperation.

Co-Chairs

Ernst Messerschmid
University of Stuttgart — GERMANY

Charles Cockell
Open University — UNITED KINGDOM

Rapporteurs

Gerhard Schwehm
European Space Agency (ESA) — SPAIN

Steve Creech
NASA Marshall Space Flight Center — UNITED STATES

A6 SPACE DEBRIS SYMPOSIUM

This symposium will address the complete spectrum of technical issues of space debris: measurements, modelling, risk assessment in space and on the ground, reentry, hypervelocity impacts and protection, mitigation and standards, and Space Surveillance.

Coordinators

Nicholas L. Johnson
National Aeronautics and Space Administration (NASA) — UNITED STATES

Christophe Bonnal
Centre National d'Etudes Spatiales (CNES) — FRANCE

A6.1 Measurements

This session will address advanced ground and space-based measurement techniques, related processing methods and results of space debris characterisation.

Co-Chairs

Thomas Schildknecht
Astronomical Institute University of Bern (AIUB) — SWITZERLAND

Vladimir Agapov
— RUSSIA

Rapporteur

Eugene Stansbery
National Aeronautics and Space Administration (NASA) — UNITED STATES

A6.2 Modelling and Risk Analysis

This session will address the characterisation 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 catalogues, and active avoidance.

Co-Chairs

Luciano Anselmo
ISTI-CNR — ITALY

Mark Matney
National Aeronautics and Space Administration (NASA)/Johnson Space Center — UNITED STATES

Rapporteur

Toshiya Hanada
Kyushu University — JAPAN

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. Use of HVI techniques for debris mitigation.

Co-Chairs

Alessandro Francesconi
University of Padova — ITALY

Sen Liu
China Aerodynamics Research and Development Center — CHINA

Rapporteur

Frank Schaefer
Fraunhofer - Institut für Kurzzeitdynamik, Ernst-Mach-Institut (EMI) — GERMANY

A6.4 Mitigation and Standards

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

Co-Chairs

Fernand Alby
Centre National d'Etudes Spatiales (CNES) — FRANCE

Heiner Klinkrad
European Space Agency (ESA) — GERMANY

Rapporteur

Michael Yakovlev
Central Research Institute of Machine Building (FSUE/TSNIIMASH) — RUSSIA

A6.5 Space Debris Removal Technologies

This session will address active removal techniques "ground and space based"and identify implementation difficulties and maturity of proposed technologies.

Co-Chairs

Fabrizio Piergentili
University of Rome "La Sapienza" — ITALY

V. Adimurthy
Indian Space Research Organisation (ISRO) — INDIA

Rapporteur

John Hussey
Consultant — UNITED STATES

A6.6 Space Debris Removal Concepts

This session will address active removal techniques "ground and space based"and identify innovative solutions and the steps for developing the concepts into reality.

Co-Chairs

Phillip Anz-Meador
ESCG/Jacobs — UNITED STATES

Satomi Kawamoto
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

Christophe Bonnal
Centre National d'Etudes Spatiales (CNES) — FRANCE

A6.7 Operations in Space Debris Environment, Situational Awareness

This session will address the multiple aspects associated with safe operations in space dealing with Space Debris, including operational assessment from observations, catalogue build-up and maintenance, data aggregation from different sources, relevant data exchange standards and conjunction analyses.

Co-Chairs

T.S. Kelso
Center for Space Standards and Innovation — UNITED STATES

Holger Krag
European Space Agency (ESA) — GERMANY

A6.8 (Joint session with Space Security Committee): Policy, legal, Institutional and Economic Aspects of Space Debris Mitigation and Removal

This session will deal with the non-technical aspects of space debris detection, mitigation and removal. Policy, legal and institutional aspects includes role of IADC and UNCOPUOS and other multilateral bodies. Economic issues including insurance, financial incentives and funding for space debris mitigation and removal. The role of international cooperation in addressing these issues will be considered.

Co-Chairs

Kazuto Suzuki
Hokkaido University — JAPAN

Darren McKnight
Integrity Applications Incorporated (IAI) — UNITED STATES

Rapporteur

Charlotte Mathieu
European Space Agency (ESA) — FRANCE

A6.9 Measurements

This session will address advanced ground and space-based measurement techniques, related processing methods, and results characterization of orbital and physical properties of space debris.

Co-Chairs

Thomas Schildknecht
Astronomical Institute University of Bern (AIUB) — SWITZERLAND

Vladimir Agapov
— RUSSIA

Rapporteur

Eugene Stansbery
National Aeronautics and Space Administration (NASA) — UNITED STATES

A7 SYMPOSIUM ON TECHNOLOGICAL REQUIREMENTS FOR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS

In the current difficult economic situation resulting in serious uncertainties in the planning of the major (flagship) missions of the future, space agencies also offer opportunities for small and medium-size missions in support of the scientific community. NASA re-emphasised the Explorer and Discovery lines of medium-size missions, JAXA promotes a small mission programme and ESA released calls for small and medium missions. Not to mention the programmes of other space agencies consisting mainly of such medium/small missions. In order to achieve a good balance between the various classes of missions and to avoid unnecessary duplication in planning missions worldwide, from small to large scale, addressing the same science questions, it is of utmost importance to coordinate planning activities internationally at an early stage and to promote international collaboration. Therefore, it seems appropriate to arrange an international symposium involving the main actors of this field of space research, the scientific community, space industry and space agencies. Capitalising on the science and technology driven road maps at worldwide level, such as the recently released COSPAR Astronomy Roadmap for the post 2015 decade, the broad objective of the symposium will be to promote the exchange of information and ideas related to new technologies for all the space astronomy and solar-system missions of the future.
The symposium will consist of both invited talks and contributed papers. The programme will cover the major scientific priorities in space astronomy and solar-system research worldwide and prospects for future missions including space agency and academia updated plans and will also address associated technology needs for both instruments and platforms. In the initial session the prime scientific motivations and needs in different fields will be reviewed with the various types of missions required. This will be followed by invited and contributed talks on the space-agency long-term views on a mix of small, medium and large-scale missions, including updates on their science programs. The following sessions will see invited talks on the required technology plans and challenges. Next sessions will focus on different scientific topics identifying also in this case the required technological developments for future payloads. For each topic, ample time will be devoted to contributed talks on the related technology studies and developments within industry and research laboratories.

Coordinator

Jacobus van Zyl
SunSpace — SOUTH AFRICA

Willem Hermsen
Netherlands Institute for Space Research (SRON) — THE NETHERLANDS

A7.1 **Scientific Motivation and Requirements for Future Space Astronomy and Solar System Science Missions**
In this session the prime scientific motivations and needs in different fields of space astronomy and solar-system science missions will be reviewed with the various types of missions required. There will be room for presentations of road maps proposed for the research fields addressed in this event.

A7.2 **Space-Agencies Long-Term Views**
In this session will be presented in invited and contributed talks, the space-agencies long-term views on a mix of small, medium and large-scale missions addressing space astronomy and solar system science, including updates on their science programs.

A7.3 **Technology Needs for Future Missions, Platforms**
This session addresses the technologies required for future space astronomy and solar system science missions with the plans of, and challenges for industry and research institutes to realize the required functionalities of e.g. platforms.

A7.4 **Technology Needs for Future Scientific Payloads**
This session will focus on different topics in space astrophysics and solar system science identifying the required technological developments for future payloads. Related technology studies and developments within industry and research laboratories can be presented in this session.

Category B

APPLICATIONS AND OPERATIONS

On-going and future operational applications, including Earth observation, communication, navigation, human space endeavours and small satellites

B1 EARTH OBSERVATION SYMPOSIUM
B2 SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM
B3 HUMAN SPACE ENDEAVOURS SYMPOSIUM
B4 21ST SYMPOSIUM ON SMALL SATELLITE MISSIONS
B5 SYMPOSIUM ON INTEGRATED APPLICATIONS
B6 SPACE OPERATIONS SYMPOSIUM

Category coordinated by Otto Koudelka, *Graz University of Technology (TU Graz)*

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.

Coordinators

John Hussey
Consultant — UNITED STATES

Pierre Ranzoli
Eumetsat — GERMANY

B1.1 International Cooperation in Earth Observation Missions

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.

Co-Chairs

John W. Hussey
Consultant — UNITED STATES

Pierre Ranzoli
Eumetsat — GERMANY

Rapporteur

David Brent Smith
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES

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.

Co-Chairs

Benoit Boissin
Centre National d'Etudes Spatiales (CNES) — FRANCE

Gilles Corlay
Sodern — FRANCE

Rapporteur

Gunter Schreier
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

B1.3 Earth Observation Sensors and 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.

Co-Chairs

Andrew Court
TNO — THE NETHERLANDS

Ralph Girard
Canadian Space Agency — CANADA

Rapporteur

Yean Joo Chong
National University of Singapore — REP. OF SINGAPORE

B1.4 Earth Observation Data Management Systems

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

Co-Chairs

Carlo Ulivieri
University of Rome "La Sapienza" — ITALY

Gunter Schreier
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur

Bruce K. Quirk
U.S. Geological Survey — UNITED STATES

B1.5 Earth Observation Applications and Economic Benefits

Earth Observation value-added products.

Co-Chairs

Luigi Bussolino
Bussolino and Associates — ITALY

Paul Kamoun
Thales Alenia Space France — FRANCE

Rapporteur

Yean Joo Chong
National University of Singapore — REP. OF SINGAPORE

B1.6 Monitoring Change in the Arctic

Focus is on current and future instruments, systems and data that provide information on the changing Arctic environment.

Co-Chairs

Jan Kolar
Czech Space Office — CZECH REPUBLIC

David Brent Smith
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES

Rapporteur

Simonetta Cheli
European Space Agency (ESA) — ITALY

B2 SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM

This symposium examines developments in technology, applications and systems as they relate to fixed and mobile communication services, satellite broadcasting, position determination, navigation and timing, and interactive multimedia provisioning.

Coordinator

Otto Koudelka
Joanneum Research — AUSTRIA

Manfred Wittig
European Space Agency (ESA) retired — THE NETHERLANDS

B2.1 Joint Session on Dual Use (civil and military) Aspects of Telecommunications and GNSS

This session, organised jointly by the Space Communication & Navigation Committee and the Space Security Committee ("Dual Use" Subcommittee), will address the dual use (civil and military) aspects of telecommunications and GNSS missions at programmatic, organisational and technical levels. Emphasis will be given to the lessons learned from programmes under development or in operation, particularly the bridges and barriers, and on future opportunities of such a dual approach in future programmes.

Co-Chairs

Kristian Pauly
OHB System AG — GERMANY

Agnieszka Lukaszczyk
Secure World Foundation — BELGIUM

Rapporteur

Stephanie Wan
Space Generation Advisory Council (SGAC) — UNITED STATES

B2.2 Space-Based Navigation Systems and Services

New and emerging systems for satellite-based position, navigation and timing will be presented, including end user applications.

Co-Chairs

Rita Lollock
The Aerospace Corporation — UNITED STATES

Cédric Balty
Thales Alenia Space France — FRANCE

Rapporteur

Norbert Frischauf
ORF — AUSTRIA

B2.3 Near-Earth and Interplanetary Communications

Systems with relative motion between space and ground segments, in both near-Earth and interplanetary environments, will be discussed with particular emphasis on unique concepts, techniques and technologies.

Co-Chairs

Manfred Wittig
European Space Agency (ESA) retired — THE NETHERLANDS

Ramon P. De Paula
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Dipak Srinivasan
The Johns Hopkins University Applied Physics Laboratory — UNITED STATES

B2.4 Advanced Technologies for Space Communications and Navigation

Future promising space communication and navigation technologies will be presented, as applied to existing and developing systems.

Co-Chairs

Edward W. Ashford
Delft University of Technology — THE NETHERLANDS

Elemer Bertenyi
E. Bertenyi & Associates Inc. — CANADA

Rapporteur

Vignesh Chandrasekaran
Manipal Institute of Technology — INDIA

B2.5 Advanced Space Communications and Navigation Systems

Advanced satellite communications and applications will be presented.

Co-Chairs

Robert Prevaux
Space Systems/Loral — UNITED STATES

Morio Toyoshima
National Institute of Information and Communications Technology — JAPAN

Rapporteur

Amane Miura
National Institute of Information and Communications Technology — JAPAN

B2.6 Fixed and Broadcast Communications

Advances in fixed and broadcast systems will be presented, including Ka band operation and radio/television direct-to-user applications.

Co-Chairs

Joe M. Straus
The Aerospace Corporation — UNITED STATES

Desaraju Venugopal
Devas Multimedia Pvt. Ltd. — INDIA

Rapporteur

Moon-Beom Heo
Korea Aerospace Research Institute — KOREA, REPUBLIC OF

B2.7 Mobile Satellite Communications and Navigation Technology

New and emerging technologies for mobile and personal satellite communications and navigation will be presented.

Co-Chairs

Robert D. Briskman
Sirius XM Radio — UNITED STATES

Jean-Paul Aguttes
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Kevin Shortt
Canadian Space Society — CANADA

B2.8 V.3 Space Communications and Navigation Young Professionals Virtual Forum

A virtual session to present and discuss developments in a wide range of satellite communication topics, including fixed, mobile, broadcasting, and data relay technologies and services, as well as those for satellite based position determination, navigation, and timing. Both Earth orbital and interplanetary space communications topics can be addressed. This session is co-sponsored by the Space Communications and Navigation Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Edward W. Ashford
Delft University of Technology — THE NETHERLANDS

Kevin Shortt
Canadian Space Society — CANADA

B3 HUMAN SPACE ENDEAVOURS SYMPOSIUM

The symposium addresses all practical aspects of human spaceflight including the design, development, operations, utilization and future plans of space missions involving humans. The scope covers actual past, present and future space missions and programmes.

Coordinators

Cristian Bank
EADS Astrium Space Transportation GmbH — GERMANY

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

B3.1 Overview Session (Present and Near-Term Human Space Flight Programmes)

The session provides the forum for "Overview" presentations on present and evolving governmental Human Space programs. This Session will include the latest status of human space flight programs and the spacecraft being developed to support them, including the International Space Station and the Chinese Space Station. Emerging nations' manned spaceflight programmes, evolution concepts (e.g. ISS 2020 and beyond) and governmental manned exploration initiatives are also addressed in this session.

Co-Chairs

Carlo Mirra
EADS Astrium — THE NETHERLANDS

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

Rapporteur

Rainer Willnecker
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

B3.2 Commercial Human Spaceflight Programs

This session provides a forum for papers describing commercial human orbital and sub-orbital spacecraft and stations in development, as well as human-rated launch vehicles and human-tended modules. Topics include the status of development, testing, and operations; the architecture and performance of various systems; launch infrastructure development; and other pertinent areas of commercial human spaceflight development. Programs such as Atlas 5, B330, CST-100, Cygnus, Dream Chaser, Dragon, Falcon 9, Lynx, New Shepard, Spaceplane, SpaceShipTwo, WhiteKnightTwo, and others are appropriate for this session.

Co-Chairs

Sergey K. Shaevich
Khrunichev State Research & Production Space Center — RUSSIA

Michael W. Hawes
Lockheed Martin Corporation — UNITED STATES

B3.3 Utilization & Exploitation of Human Spaceflight Systems

This session addresses the utilization and exploitation of space stations and human spacecraft and provides the opportunity to discuss achievements, plans and outlooks. Topics for discussion include proposed or available payload facilities, experiments, research, manufacturing, and other on-orbit activity and its related planning, accommodation, and implementation. Additional items appropriate for discussion include scientific and industrial utilization applications and engineering research and technology demonstrations, as well as uses of space stations (ie. International Space Station and Tjangong) and other manned vehicles as test beds for exploration.

Co-Chairs

Kevin Foley
The Boeing Company — UNITED STATES

Maria Stella Lavitola
Thales Alenia Space Italia — ITALY

Rapporteur

Shannon Ryan
Defence Science and Technology Organisation (DSTO) — AUSTRALIA

B3.4 B6.5 Flight & Ground Operations of HSF Systems – Joint Session of the Human Spaceflight and Space Operations Symposia

This session addresses key challenges and their solutions related to flight and ground operations in governmental and commercial human spaceflight, their systems and elements. Topics include operational problems and solutions, cost reduction, new and proposed ground facilities or infrastructure, and ground segment operations and planning. Also included are logistics and mission planning, ground transportation, and sustainment. would be topics such as logistics and logistics planning, transportation, sustainment, and the geopolitical value as a tool for promoting international cooperation.

Co-Chairs

Maria Stella Lavitola
Thales Alenia Space Italia — ITALY

Helmut Luttmann
Astrium Space Transportation — GERMANY

Rapporteur

Rachid Amekrane
Astrium GmbH — GERMANY

B3.5 Astronaut Training, Accommodation, and Operations in Space

This session concentrates on all aspects of spaceflight that are unique to the presence of astronauts. It encompasses astronaut activities such as selection, training, workload management, and task division between flight and ground segments. It includes spacecraft systems and robotic tools; interfaces; international command, control and communications; payloads; research; and utilization. It addresses the unique spacecraft systems required to safely accommodate astronauts during intravehicular and extravehicular activities. The session includes astronaut pre-mission, mission, and post mission support of technological and scientific space based research and utilization of human space complexes and the space environment.

Co-Chairs

Igor V. Sorokin
S.P. Korolev Rocket and Space Corporation Energia — RUSSIA

Alan T. DeLuna — *UNITED STATES*

Rapporteur

Tai Nakamura
Japan Aerospace Exploration Agency (JAXA) — JAPAN

B3.6 A5.3 Joint session on Human and Robotic Partnerships to Realize Human Spaceflight Goals

This session seeks papers on new systems and technologies for current human spaceflight and exploration programmes, and the role of human and robotic partnerships in areas such as onboard robotic assistants, habitat / infrastructure construction support, human mobility support systems (e.g. EVA mobility aids, rovers); and robotic precursor activities to human spaceflights for test, validation, and demonstration of systems. This session also welcomes papers considering how the roles of humans, machines and intelligent systems are likely to evolve in the coming years and the corresponding impact on complex mission design, implementation, and operations.

Co-Chairs

Christian Sallaberger
MDA Corporation — CANADA

Pierre Jean
Canadian Space Agency — CANADA

Rapporteur

M. Hempsell
The British Interplanetary Society — UNITED KINGDOM

B3.7 Advanced Systems, Technologies, and Innovations for Human Spaceflight

This session is designed to examine and identify the potential evolution of key elements of Human Spaceflight missions, especially those driven by advanced technologies and innovations. Papers are solicited that address how to shape the future subsystems, technologies, innovations, logistics, processes, procedures, etc. to enable or significantly improve future human space mission objectives that will include exploration, commercial initiatives, tourism, and industrial undertakings. Also, lessons learned from past missions and their application to future missions are essential topics in this session.

Co-Chairs

Martin Zell
European Space Agency (ESA) — THE NETHERLANDS

Lionel Suchet
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Gi-Hyuk Choi
Korean Aerospace Research Institute — KOREA, REPUBLIC OF

B3.8 E7.7 Joint IAF-IISL Session on the Legal Framework for Collaborative Space Activities

This session hosts papers on topics related to the legal framework governing collaborative space programmes, in particular governmental LEO and Exploration programmes. For the IAC 2014, the session will put special emphasis on highlighting the impact of ITAR and similar export control regimes on the development and operation phases of collaborative international space programmes, including lessons learned.

Co-Chairs

Cristian Bank
EADS Astrium Space Transportation GmbH — GERMANY

Lesley Jane Smith
Leuphana University of Lüneburg/ Weber-Steinhaus & Smith — GERMANY

Rapporteur

Luise Weber-Steinhaus
Member Women in Aerospace (WIA-Europe) — GERMANY

B3.9 V.1 Human Space Endeavours Young Professionals Virtual Forum

The Human Space Endeavours Young Professionals Virtual Forum is targeting individuals and organisations with the objective of sharing best practices, future projects, research and issues for the future of Human Space Endeavours. The is a virtual session co-sponsored by the Human Space Endeavours Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Cristian Bank
EADS Astrium Space Transportation GmbH — GERMANY

Guillaume Girard
INSYEN AG — GERMANY

Rapporteur

Alexandra Kindrat
International Space University (ISU) — CANADA

B4 21ST SYMPOSIUM ON SMALL SATELLITE MISSIONS

"Small Satellite Missions" refers to the class of missions conducted using satellites weighing less than 1000 kg. For clarity, we further classify small satellites as microsats if they weigh less than 100 kg; nanosats or cubesats if they weigh less than 10 kg; and picosats if they weigh less than 1 kg. This Symposium, organised by the International Academy of Astronautics (IAA), addresses Small Satellite missions and projects in Science, Exploration, and Technology for government, industry, and academic programmes. The Symposium scope encompasses space science (B4.2), earth observation (B4.4), and exploration (B4.8) missions, as well as the cross-cutting topics of small satellite programmes in developing countries (B4.1), cost-effective operations (B4.3), affordable and reliable space access (B4.5), emerging and promising technologies (B4.6A and B4.6B), and cross-platform compatibility applications and standards (B4.7A). For IAC 2014, the Symposium is continuing the topic of Small Distributed Space Missions (B4.7B), to be held in cooperation with B4.7A as a possible implementation of modular, reconfigurable, rapid systems. Abstracts highlighting ingenuity or innovation are preferred. Where possible, abstracts should have a wide interest in the community and include transferable knowledge or lessons learned. This is in keeping with our commitment to meeting the needs of the small satellite community. This Symposium will be accepting submissions for oral presentations only.

Coordinator

Rhoda Shaller Hornstein
National Aeronautics and Space Administration (NASA) — UNITED STATES

Alex da Silva Curiel
Surrey Satellite Technology Ltd — UNITED KINGDOM

B4.1 15th 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. National space plans and examples of application results and benefits shall be included. Small satellite programmes in the Americas would be of particular interest to the session. The workshop shall also review the results of international cooperation, technology transfer, lessons learned and the extent to which these efforts have contributed to the space maturity of developing countries.

Co-Chairs

Sias Mostert
Space Commercial Services Holdings (Pty) Ltd — SOUTH AFRICA

Sergei Chernikov
United Nations Office at Vienna — AUSTRIA

Rapporteurs

Pierre Molette — *FRANCE*

Danielle Wood
John Hopkins University — UNITED STATES

B4.2 Small Space Science Missions

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

Co-Chairs

Stamatios Krimigis
The John Hopkins University — UNITED STATES

Larry Paxton
The Johns Hopkins University Applied Physics Laboratory — UNITED STATES

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 to reduce mission lifecycle costs and to minimise the cost impact of mission extensions. 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 welcome. For papers not addressing small satellites, please refer to Symposium B6.

Co-Chairs

Peter M. Allan
Rutherford Appleton Laboratory — UNITED KINGDOM

Karen McBride
University of California, Los Angeles — UNITED STATES

B4.4 Small Earth Observation Missions

We call for papers that will present information to decision makers, scientists, engineers, and managers about cost-effective small satellite missions, instruments, technologies, and designs of both current and planned Earth- and near-Earth missions. This session addresses the technologies, applications and missions achieved through the use of small, cost-effective satellites to observe the Earth and near-Earth space. Innovative cost-effective solutions to the needs of the science and applications communities are sought. Satellite technologies suited for use on small satellites including those in the single to multiple cubesat range are particularly encouraged. Satellite or technology development efforts that use of innovative launch opportunities such as the developing space tourism market hold significant promise: papers addressing these evolving opportunities would be welcomed.

Co-Chairs

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

Amnon Ginati
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Carsten Tobehn
European Space Agency (ESA) — THE NETHERLANDS

B4.5 Access to Space for Small Satellite Missions

A key challenge facing the viability and growth of the small satellite community is affordable and reliable space access. Topics of interest for this session include utilization of dedicated launches, ride-share systems, auxiliary payload systems, separation and dispenser systems, and small spacecraft sub-system development that will enable efficient small satellite access to space and orbit change (e.g., propulsion systems). Includes lessons learned from users on technical and programmatic approaches. For a discussion of small launchers concepts and operations, please refer to session D2.7.

Co-Chairs

Alex da Silva Curiel
Surrey Satellite Technology Ltd — UNITED KINGDOM

Jeffery Emdee
The Aerospace Corporation — UNITED STATES

B4.6A Generic Technologies for Small/Micro Platforms

This session covers emerging and promising generic technologies for small and micro platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (next 3 years).

Co-Chairs

Nicholas Waltham
Rutherford Appleton Laboratory — UNITED KINGDOM

Philip Davies
Surrey Satellite Technology Ltd — UNITED KINGDOM

B4.6B Generic Technologies for Nano/Pico Platforms

This session covers emerging and promising generic technologies for nano and pico platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (next 3 years).

Co-Chairs

Nicholas Waltham
Rutherford Appleton Laboratory — UNITED KINGDOM

Philip Davies
Surrey Satellite Technology Ltd — UNITED KINGDOM

Rapporteur

Joost Elstak
ISIS - Innovative Solutions In Space B.V. — THE NETHERLANDS

B4.7A 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 as a way to achieve mission lifecycle effectiveness. Applications are sought in Science, Exploration, Commerce, and other areas requiring rapid but stable system design and deployment. System-enabling plug-and-play interface definitions and recommendations for standardisation (mechanical, electrical, software and fluids) are particularly desirable.

Co-Chairs

Jaime Esper
National Aeronautics and Space Administration (NASA) — UNITED STATES

Marco D'Errico
Seconda Universita' di Napoli — ITALY

Rapporteur

Massimiliano Pastena
SSBV — UNITED KINGDOM

B4.7B Small Distributed Space Missions

The session will be a forum for space missions relying on synergic use of small space vehicles, thus including constellations and formations, in either the cases of allocation of different functions on different vehicles or of distribution of all functions all across the system. Various aspects of distributed space missions will be addressed, including: new arising applications; design, integration and operation of distributed sensors; relative GNC; advanced concept of spacecraft design (modularity, autonomy, standardisation, plug & play components) to achieve adequate performance at an acceptable cost; novel specific technologies. It is recommended that, in addition to discussing relevant theoretical aspects, potential contributors focus on practical challenges and potential solutions. Therefore, examples of missions or projects implementing in full or in part the distributed mission concept are particularly welcome.

Co-Chairs

Marco D'Errico
Seconda Universita' di Napoli — ITALY

Jaime Esper
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Giancarmine Fasano
University of Naples "Federico II" — ITALY

B4.8 Small Spacecraft for Deep-Space Exploration

This session focuses on innovative small spacecraft designs, systems, missions and technologies for the exploration of space beyond Earth orbit. Target destinations for these miniaturized space probes include the Earth's Moon, Mars, small bodies and other deep-space destinations, as well as near Earth vicinity for necessary development and technology demonstration missions. Small exploration probes covered by this session may come in many different forms, including special-purpose miniature spacecraft, standard format small platforms such as cubesats, or other microsats, nanosats, picosats, etc. Topics include new and emerging technologies in miniaturized subsystems including propulsion, avionics, guidance navigation & control, power supply, communication, thermal management, and sensors and instruments. Main aspect on this session is on new and emerging systems and mission applications for deep-space exploration using small spacecraft.

Co-Chairs

Leon Alkalai
National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratory — UNITED STATES

Rene Laufer
Baylor University — UNITED STATES

Rapporteur

Amanda Stiles
SpaceX — UNITED STATES

B5 SYMPOSIUM ON INTEGRATED APPLICATIONS

Space systems are more and more involved in the delivery of global utilitarian services to end-users. The concept of Integrated Applications encompasses the simultaneous use of basic space services and technologies. This symposium will address various aspects of integrated applications. Integrated applications combine different space systems (Earth observation, navigation, telecommunications, etc) with airborne and ground-based systems to deliver solutions to local, national and global needs. They exploit the synergies between different data sources to provide the right information at the right time to the right user in a cost-effective manner and deliver the data to users in a readily usable form. The goal of the symposium is to enable the development of end-to-end solutions by connecting the communities that are driving toward end-to-end solutions with those that are developing enabling technologies for integrated applications. For the purposes related to the small satellites, please refer also to the session B4.4.

Coordinators

Amnon Ginati
European Space Agency (ESA) — THE NETHERLANDS

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

B5.1 Integrated Applications End-to-End Solutions

The session will be a forum for end-to-end solutions, including case studies, proof-of-concept missions, and current projects that provide, or could provide, innovative user-driven solutions. Applications that combine ground- and space-based data sources with models to address specific user requirements will be presented. These examples can cover a variety of domains, like disaster/crisis monitoring and management, energy, food security, space situational awareness, transportation, health, etc. The user needs, the structure of the user communities, the value chain, the business case and the sustainability of the solutions are among the many aspects that can be considered. Examples of projects with established partnerships and fluent working relationships between space and non-space stakeholders.

Co-Chairs

David Y. Kusnierkiewicz
The John Hopkins University — UNITED STATES

Amnon Ginati
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Boris Penné
Kayser-Threde GmbH — GERMANY

B5.2 Tools and Technology in Support of Integrated Applications

The session will focus on specific systems, tools and technology in support of integrated applications and address the various issues associated with the design of space and ground systems, the kind of data they collect, how they collect data, and how the data are integrated and distributed to address key user needs. Possible topics include: ground-truthing of space data; innovative, low-cost tools for space data distribution and access; new ways of distributing integrated data products; data fusion and visualisation tools especially those using COTS systems; managing integrated applications programmes; education and outreach for integrated programmes, etc...

Co-Chairs

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

Carsten Tobehn
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

David Y. Kusnierkiewicz
The John Hopkins University — UNITED STATES

B6 SPACE OPERATIONS SYMPOSIUM

The Space Operations Symposium addresses all aspects of spaceflight operations. The sessions address both manned and un-manned space operations, from low-Earth and geosynchronous orbit, to lunar, planetary, and exploration missions. The symposium covers both flight and ground systems, and included mission planning, training, and real time operations. Particular focus is provided for commercial space operations, advanced systems, new operations concepts, and small satellite operations.

Coordinators

H. Neal Hammond
Space Bridges LLC — UNITED STATES

Manfred Warhaut
European Space Agency (ESA) — GERMANY

B6.1 Human Spaceflight Operations

This session focuses on all aspects of operations unique to human spaceflight. Papers may address any phase in the mission lifecycle including concept development, mission planning, ground operations, ascent, on-orbit and entry operations, as well as recovery and post mission analysis.

Co-Chairs

Michael McKay
European Space Agency (ESA) — GERMANY

Mario Cardano
Thales Alenia Space France — ITALY

Rapporteur

Helmut Luttmann
Astrium Space Transportation — GERMANY

B6.2 New Operations Concepts, Advanced Systems and Commercial Space Operations

This session included commercial and new space operations, and addressed advanced concepts, systems and tools for operating new types of missions, improving mission output in quality and quantity, and reducing costs in both commercial and governmental space enterprises.

Co-Chairs

Pierre LODS
Centre National d'Etudes Spatiales (CNES) — FRANCE

Thomas Kuch
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur

Akira Tsuchida
Earth-Track Corporation — JAPAN

B6.3 Mission Operations, Validation, Simulation and Training

This session addresses the broad topic of operations, from preparation through validation, simulation and training, including operations execution and lessons learned. It included concepts, methods and tools, as well as experience gained.

Co-Chairs

Paolo Ferri
European Space Agency (ESA) — GERMANY

John Auburn
VEGA Group — UNITED KINGDOM

Rapporteur

Lionel Baize
Centre National d'Etudes Spatiales (CNES) — FRANCE

B6.4 V.1 Flight Control Operations Virtual Forum

This session is a virtual forum (not a paper session) co-sponsored by the Space Operations Committee and the Workforce Development/Young Professionals Program Committee. The forum targets hands-on flight control/operations personnel from multiple international organisations with objectives of sharing best practices, lessons learned and issues.

Co-Chairs

Philip Harris
National Aeronautics and Space Administration (NASA)/Johnson Space Center — UNITED STATES

Katja Leuoth
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

B6.5 B3.4 Flight & Ground Operations of HSF Systems – Joint Session of the Human Spaceflight and Space Operations Symposia

This session addresses key challenges and their solutions related to flight and ground operations in governmental and commercial human spaceflight, their systems and elements. Topics include operational problems and solutions, cost reduction, new and proposed ground facilities or infrastructure, and ground segment operations and planning. Also included are logistics and mission planning, ground transportation, and sustainment.

Co-Chairs

Dieter Sabath
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Helmut Luttmann
Astrium Space Transportation — GERMANY

Rapporteur

Rachid Amekrane
Astrium GmbH — GERMANY

Category C

TECHNOLOGY

Common technologies to space systems, including astrodynamics, structures, power and propulsion

C1 ASTRODYNAMICS SYMPOSIUM
C2 MATERIALS AND STRUCTURES SYMPOSIUM
C3 SPACE POWER SYMPOSIUM
C4 SPACE PROPULSION SYMPOSIUM

Category coordinated by Junichiro Kawaguchi, *Japan Aerospace Exploration Agency (JAXA) - JAPAN*

C1 ASTRODYNAMICS SYMPOSIUM

This symposium addresses advances in orbital mechanics, attitude dynamics, guidance, navigation, and control of single or multi-spacecraft systems as well as space robotics.

Coordinators

Alfred Ng
Canadian Space Agency — CANADA

Anna Guerman
CAST - Centre for Aerospace Science and Technologies, University of Beira Interior — PORTUGAL

C1.1 Orbital Dynamics (1)

This theme discusses advances in the knowledge of natural motions of objects in orbit around the Earth, planets, minor bodies, Lagrangian points and more generally natural orbital dynamics of spacecraft in the Solar System. It also covers advances in orbit determination.

Co-Chairs

Johannes Schoenmaekers
European Space Operations Centre — GERMANY

Weihua Zhang
National University of Defense Technology — CHINA

Rapporteur

Antonio Prado
INPE — BRAZIL

C1.2 Orbital Dynamics (2)

This theme discusses advances in the knowledge of natural motions of objects in orbit around the Earth, planets, minor bodies, Langrangian points and more generally natural orbital dynamics of spacecraft in the Solar System. It also covers advances in orbit determination.

Co-Chairs

Josep J. Masdemont
Universitat Politecnica de Catalunya (UPC) — SPAIN

Othon Winter
UNESP - Univ Estadual Paulista — BRAZIL

Rapporteur

Shoji Yoshikawa
Mitsubishi Electric Corporation — JAPAN

C1.3 Attitude Dynamics (1)

This theme discusses advances in spacecraft attitude dynamics and control, as well as design, testing and performance of attitude sensors and actuators. This theme also covers dynamics and control of multiple interconnected rigid and flexible bodies, including tethered systems, and in-orbit assembly.

Co-Chairs

Michael Yu. Ovchinnikov
Keldysh Institute of Applied Mathematics, RAS — RUSSIA

Amalia Ercoli Finzi
Politecnico di Milano — ITALY

Rapporteur

Hao-Chi Chang
National Space Organization — TAIWAN, CHINA

C1.4 Attitude Dynamics (2)

This theme discusses advances in spacecraft attitude dynamics and control, as well as design, testing and performance of novel attitude sensors and actuators. This theme also covers dynamics and control of multiple interconnected regidi and flexible bodies, including tethered systems, an in-orbit assembly.

Co-Chairs

Kazuya Yoshida
Tohoku University — JAPAN

Simei Ji
Beijing Institute of Technology — CHINA

Rapporteur

Paolo Teofilatto
University of Rome "La Sapienza" — ITALY

C1.5 Guidance, Navigation and Control (1)

The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth-orbiting and interplanetary spacecraft and rockets, including formation flying, rendezvous and docking.

Co-Chairs

Eberhard Gill
Delft University of Technology — THE NETHERLANDS

James O'Donnell
National Aeronautics and Space Administration (NASA)/Goddard Space Flight Center — UNITED STATES

Rapporteur

Igor V. Belokonov
Samara State Aerospace University — RUSSIA

C1.6 Guidance, Navigation and Control (2)

The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth-orbiting and interplanetary spacecraft and rockets, including formation flying, rendezvous and docking.

Co-Chairs

Bernhard Lübke-Ossenbeck
OHB System AG — GERMANY

Benedicte Escudier
Institut Supérieur de l'Aéronautique et de l'Espace (ISAE) — FRANCE

Rapporteur

Fuyuto Terui
Japan Aerospace Exploration Agency (JAXA) — JAPAN

C1.7 Guidance, Navigation and Control (3)

The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth-orbiting and interplanetary spacecraft and rockets, including formation flying, rendezvous and docking.

Co-Chairs

Daniel Scheeres
University of Colorado — UNITED STATES

Arun Misra
McGill University — CANADA

Rapporteur

Yongchun Xie
Beijing Institute of Control Engineering — CHINA

C1.8 Mission Design, Operations & Optimisation (1)

The theme covers design, operations and optimisation of Earth-orbiting and interplanetary missions, with emphasis on studies and experiences related to current and future missions.

Co-Chairs

Kathleen Howell
Purdue University — UNITED STATES

Vincent Martinot
Thales Alenia Space France — FRANCE

Rapporteur

Filippo Graziani
University of Rome "La Sapienza" — ITALY

C1.9 Mission Design, Operations & Optimisation (2)

The theme covers design, operations and optimisation of Earth-orbiting and interplanetary missions, with emphasis on studies and experiences related to current and future missions.

Co-Chairs

Yury Razoumny
COSMOEXPORT Aerospace Research Agency — RUSSIA

David B. Spencer
The Pennsylvania State University — UNITED STATES

Rapporteur

Richard Epenoy
Centre National d'Etudes Spatiales (CNES) — FRANCE

C2 MATERIALS AND STRUCTURES SYMPOSIUM

This symposium provides an international forum for recent advancements in assessment of the latest technology achievements in 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 interaction between these technology communities, and collaboration among technologists and mission planners needs to be pursued. Substantial improvements are essential in a wide range of current technologies, including nanotechnologies, to reduce projected costs and increase potential scientific returns from respective mission system applications. Papers in this symposium will review the projected advances in materials and space structures in this domain for advanced space systems applications.

Coordinators

Constantinos P. Stavrinidis
European Space Agency (ESA) — THE NETHERLANDS

Pavel M. Trivailo
RMIT University, Australia — AUSTRALIA

C2.1 Space Structures I - Development and Verification (Space Vehicles and Components)

The topics to be addressed include evaluation of analysis versus test results, spacecraft and launch vehicles system and subsystems, e.g. pressurised structures, tanks, loads introduction, primary structures, fluidic equipment, control surfaces; examination of both on-ground and in-orbit testing, launch dynamic environment as related to structural design, space vehicle development and launch verification such as sine, random and acoustic vibration testing, and lessons learned.

Co-Chairs

Alwin Eisenmann
IABG Industrieanlagen - Betriebsgesellschaft mbH — GERMANY

Andreas Rittweger
Astrium Space Transportation — FRANCE

Rapporteur

Jean-Alain Massoni
Thales Alenia Space France — FRANCE

C2.2 Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures)

The topics to be addressed include evaluation of analysis versus test results for deployable and 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.

Co-Chairs

Paolo Gasbarri
Universita di Roma "La Sapienza" — ITALY

Jean-Alain Massoni
Thales Alenia Space France — FRANCE

Rapporteur

Pierre Rochus
CSL, Université de Liège — BELGIUM

C2.3 Space Structures - Dynamics and Microdynamics

The topics to be addressed include 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.

Co-Chairs

Peter M. Bainum
Howard University — UNITED STATES

Ijar M. Da Fonseca
Instituto Nacional de Pesquisas Espaciais (INPE) and UNINOVE University — BRAZIL

Rapporteur

Harijono Djojodihardjo
Universitas Al Azhar Indonesia — INDONESIA

C2.4 Advanced Materials and Structures for High Temperature Applications

The topics to be addressed include advanced materials and structures for high temperature applications in space related domains. This includes carbon-carbon and ceramic matrix composites, ultra high temperature ceramics, ablative materials, ceramic tiles and insulations, together with innovative structural concepts making use of the above, for propulsion systems, launchers, hypersonic vehicles, entry vehicles, aero capture, power generation. The session covers the full spectrum of material, design, manufacturing and testing aspects.

Co-Chairs

Marc Lacoste
Herakles (Safran group) — FRANCE

David E. Glass
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Luigi Scatteia
Booz and Company — THE NETHERLANDS

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.

Co-Chairs

Junjiro Onoda
Japan Society for Aeronautics and Space Sciences (JSASS) — JAPAN

Pavel M. Trivailo
RMIT University, Australia — AUSTRALIA

Rapporteur

Paolo Gaudenzi
University of Rome "La Sapienza" — ITALY

C2.6 Space Environmental Effects and Spacecraft Protection

The focus of the session will be on space environmental effects and spacecraft protection. The effects of vacuum, radiation, atomic oxygen, spacecraft charging, thermal cycling, dissociation, meteoroids and space debris impact on space systems, materials and structures, and microelectronics will be addressed. Protective and shielding technologies, including analysis simulation and testing of debris impact, and susceptibility of Commercial-Off-The-Shelf (COTS) micro-electronics to space radiation will be covered.

Co-Chairs

Giuliano Marino
CIRA Italian Aerospace Research Centre — ITALY

Iuriy Moshnenko
Yuzhnoye State Design Office — UKRAINE

Rapporteur

Franz-Josef Kahlen
University of Cape Town — SOUTH AFRICA

C2.7 Space Vehicles – Mechanical/Thermal/Fluidic Systems

The topics to be addressed include novel technical concepts for mechanical/thermal/fluidic systems and subsystems of launchers, manned and unmanned spacecraft, re-entry vehicles and small satellites. Advanced subsystems and design of future exploration missions will be covered, considering issues arising from material selection, cost efficiency and reliability, and advancements in space vehicle development with respect to engineering analysis, manufacturing, and test verification.

Co-Chairs

Oleg Alifanov
Moscow Aviation Institute — RUSSIA

Brij Agrawal
Naval Postgraduate School — UNITED STATES

Rapporteur

Guoliang Mao
Beijing Institute of Aerodynamics — CHINA

C2.8 Specialised Technologies, Including Nanotechnology

Specialised material and structures technologies are explored in a large variety of space applications both to enable advanced exploration, and science/observation mission scenarios to perform test verifications relying on utmost miniaturisation of devices and highest capabilities in structural, thermal, electrical, electromechanical/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, ultracompact sensors for science applications and mass storage devices. The Session encourages presentations of specialised technologies, in particular
of nanomaterial related techniques and their application in devices offering unprecedented performances for space applications.

Co-Chairs

Mario Marchetti
Associazione Italiana di Aeronautica e Astronautica (AIDAA) — ITALY

Pierre Rochus
CSL, Université de Liège — BELGIUM

Rapporteur

Pavel M. Trivailo
RMIT University, Australia — AUSTRALIA

C2.9 Advancements in Materials Applications and Rapid Prototyping

The topics to be addressed include advancements in materials applications, and novel technical concepts in the rapid prototyping of mechanical systems.

Co-Chairs

Yeong-Moo Yi
Korea Aerospace Research Institute — KOREA, REPUBLIC OF

Giuliano Marino
CIRA Italian Aerospace Research Centre — ITALY

Rapporteur

Luigi Scatteia
Booz and Company — The Netherlands

C3 SPACE POWER SYMPOSIUM

Reliable energy systems continue to be key for all space missions. The future exploration and development of space depends on new, more affordable and more reliable energy sources of diverse types ranging from the very small to the extraordinarily large. Moreover, the continuing support for space activities by the public requires that these activities are increasingly inserted into the global challenge to transition current terrestrial energy systems into more environmentally friendly, sustainable ones. The space sector has traditionally served as cutting edge precursor for the development of some renewable power systems. These activities are now put into a much larger space & energy perspective. These range from joint technology development up to visionary concepts such as space solar power plants. The Space Power Symposium addresses all these aspects, covering the whole range from power generation, energy conversion & storage, power management, power transmission & distribution at system and sub-system levels including commercial considerations. It will include, but not be restricted, to topics such as advanced solar and nuclear systems for spacecraft power and propulsion, novel power generation and energy harvesting, and examine the prospects for using space-based power plants to provide energy remotely to the Earth or other planets.

Coordinator

Leopold Summerer
European Space Agency (ESA) — THE NETHERLANDS

Koji Tanaka
ISAS, JAXA — JAPAN

C3.1 Space-Based Solar Power Architectures / Space & Energy Concepts

This session deals with all aspects of architectures and concepts for space-based solar power plants and concepts integrating space and terrestrial energy activities. It will be structured in two half-sessions, one focusing on advances in the field of space solar power plant architectures and one on activities in the field of space & energy, including all types of conceptual, technical and organisational progress to better integrate space and terrestrial energy activities. It is the primary international forum for scientific and technical exchanges on this topic and thus provides a unique common platform for discussions. Topically it will include all system-level, architectural, organisational and commercial aspects, including modelling and optimisation as well as related non-technical aspects.

Co-Chairs

Leopold Summerer
European Space Agency (ESA) — THE NETHERLANDS

John C. Mankins
ARTEMIS Innovation Management Solutions, LLC — UNITED STATES

Rapporteurs

Nobuyuki Kaya
Kobe University — JAPAN

Rapporteur

Koji Tanaka
ISAS/JAXA — JAPAN

C3.2 Wireless Power Transmission Technologies, Experiments and Demonstrations

This session focuses on all aspects of wireless power transmission systems. It covers wireless power transmission technologies, including laser, microwave-based as well as novel wireless power transmission technologies from the short ranges (e.g. within spacecraft or between two surface installations) up the very large distances for space exploration and power transmission from space to ground. The session covers theoretical as well as applied and experimental results, including emitter/receiver antenna architectures and deployment.

Co-Chairs

Nobuyuki Kaya
Kobe University — JAPAN

Frank Little
Texas A&M University — United States

Rapporteurs

Massimiliano Vasile
University of Strathclyde — UNITED KINGDOM

C3.3 Advanced Space Power Technologies and Concepts

This session covers all type of advanced space power technologies and concepts. These include technologies and concepts related to power generation (solar, nuclear, other) and harvesting, power conditioning, management and distribution, energy storage, and energy generation. This session focuses on the power systems in the hundreds of watts and above, including large power systems for telecom spacecraft and novel power architectures for planetary, asteroid and lunar exploration scenarios up to MW size nuclear reactor systems.

Co-Chairs

Carla Signorini
European Space Agency (ESA) — THE NETHERLANDS

Lee Mason
National Aeronautics and Space Administration (NASA)/Glenn Research Center — UNITED STATES

Rapporteurs

Koji Tanaka
ISAS/JAXA — JAPAN

Matthew Perren
ASTRIUM EADS — FRANCE

C3.4 Small and Very Small Advanced Space Power Systems

This session is devoted to emerging concepts of very small power systems typically below the tens of watts but including micro- and milli-watt power harvesting technologies. While the space power market is still dominated by increasing power systems for large platforms, essentially telecom platforms, a dynamic market is emerging on the low power and low performance fringes of space in the form of nano, micro and mini spacecraft. This session is dedicated to power systems for such applications as well as for very low power, long-duration exploration probes and sensors.

Co-Chairs

Massimiliano Vasile
University of Strathclyde — UNITED KINGDOM

Shoichiro Mihara
Japan Space Systems (J-spacesystems) — JAPAN

Rapporteur

Alex Ignatiev
University of Houston — UNITED STATES

C3.5 C4.7 Joint Session on Nuclear Power and Propulsion

This session, organised jointly between the Space Power and the Space Propulsion Symposiums, includes papers addressing all aspects related to nuclear power and propulsion for space applications.

Co-Chairs

Leopold Summerer
European Space Agency (ESA) — THE NETHERLANDS

Jacques Gigou
European Space Agency (ESA) — FRANCE

Rapporteur

George Schmidt
National Aeronautics and Space Administration (NASA) — UNITED STATES

C4 SPACE PROPULSION SYMPOSIUM

The Space Propulsion Symposium addresses sub-orbital, Earth to orbit, and in-space propulsion. The general areas considered include both chemical and non-chemical rocket propulsion, air-breathing propulsion, and combined air-breathing and rocket systems. Typical specific propulsion categories of interest are liquid, sold and hybrid rocket systems, ramjet, scramjet, and various combinations of air-breathing and rocket propulsion and nuclear, electric, solar and other advanced rocket systems.
The Symposium is concerned with component technologies, the operation and application to missions of overall propulsion systems and unique propulsion test facilities.

Coordinators

Giorgio Saccoccia
European Space Agency (ESA) — THE NETHERLANDS

Richard Blott
Space Enterprise Partnerships Limited — UNITED KINGDOM

C4.1 Propulsion System (1)

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

Co-Chairs

Christophe Bonhomme
Centre National d'Etudes Spatiales (CNES) — FRANCE

Walter Zinner
Astrium GmbH — GERMANY

Rapporteur

Vanniyaperumal Narayanan
Indian Space Research Organization (ISRO) — INDIA

C4.2 Propulsion System (2)

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

Co-Chairs

Stéphane Henry
Herakles (Safran group) — FRANCE

Toru Shimada
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

Murthy
Indian Space Research Organization (ISRO) — INDIA

C4.3 Propulsion Technology

This session includes all science and technologies supporting all aspects of space propulsion. The emphasis in this session is placed in particular on components for propulsion.

Co-Chairs

Didier Boury
Herakles (Safran group) — FRANCE

Angelo Cervone
Delft University of Technology (TU Delft) — THE NETHERLANDS

Rapporteur

John Harlow
Aerojet Rocketdyne — UNITED KINGDOM

C4.4 Electric Propulsion

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

Co-Chairs

Garri A. Popov
Research Institute of Applied Mechanics and Electrodynamics — RUSSIA

Mariano Andrenucci
University of Pisa — ITALY

Rapporteur

Vanessa Vial
Snecma — FRANCE

C4.5 Propulsion Technology (2)

This session includes all science and technologies supporting all aspects of space propulsion. An objective is to attract papers from students and young professionals with a more technical rather than programmatic or organisational focus.

Co-Chairs

Giorgio Saccoccia
European Space Agency (ESA) — THE NETHERLANDS

I-Shih Chang
The Aerospace Corporation — UNITED STATES

Rapporteurs

Jacques Gigou
European Space Agency (ESA) — FRANCES

George Schmidt
National Aeronautics and Space Administration (NASA) — UNITED STATES

C4.6 New Missions Enabled by New Propulsion Technology and Systems

Many missions are precluded by limitations on current propulsion technologies and systems. The session will explore concepts for new missions that can be enabled by specific advancements in propulsion and/or integration of various propulsion technologies and systems.

Co-Chairs

Jerrol Littles
Pratt & Whitney Rocketdyne — UNITED STATES

Helen Webber
Reaction Engines Ltd. — UNITED KINGDOM

Rapporteur

Giorgio Saccoccia
European Space Agency (ESA) — THE NETHERLANDS

C4.7 C3.5 Joint Session on Nuclear Propulsion and Power

This session, organised jointly between the Space Power and the Space Propulsion Symposium, includes papers addressing all aspects related to nuclear power and propulsion for space applications.

Co-Chairs

Leopold Summerer
European Space Agency (ESA) — THE NETHERLANDS

Jacques Gigou
European Space Agency (ESA) — FRANCE

Rapporteur

George Schmidt
National Aeronautics and Space Administration (NASA) — UNITED STATES

C4.8 Advanced and Combined Propulsion Systems

The session is for the presentation of advanced propulsion concepts being studied or considered. The advanced concepts should seek to deliver breakthroughs in overcoming the limitations of propulsion systems in current use or development. For advanced concepts technologies should normally be in the range TRL 0 to TRL 2. Advanced concepts with higher TRL technologies may also be presented where a combination of propulsion technologies can lead to performance breakthroughs which cannot be achieved with a single technology. A combination can include for example both chemical and electric or solid and liquid chemical.

Co-Chairs

Jacques Gigou
European Space Agency (ESA) — FRANCE

Richard Blott
Space Enterprise Partnerships Limited — UNITED KINGDOM

Rapporteur

Constanze Syring
University of Stuttgart — GERMANY

C4.9 Hypersonic and Combined Cycle Propulsion

This session covers papers on Hypersonic and Combined Cycle Propulsion for space applications.

Co-Chairs

Patrick Danous
Snecma — FRANCE

Riheng Zheng
Chinese Society of Astronautics — CHINA

Rapporteur

Helen Webber
Reaction Engines Ltd. — UNITED KINGDOM

Category D

INFRASTRUCTURE

Systems sustaining space missions, including space system transportation, future systems and safety

D1 SPACE SYSTEMS SYMPOSIUM
D2 SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM
D3 SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT
D4 SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FAR FUTURE
D5 47TH SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES
D6 47TH SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES

Category coordinated by John-David F. Bartoe, *National Aeronautics and Space Administration (NASA) – UNITED STATES*

D1 SPACE SYSTEMS SYMPOSIUM

This symposium addresses the present and future development of space systems and technologies, with sessions on System Engineering Methods, Processes, and Tools; Enabling Technologies for Space Systems; Significant Achievements in space systems with implications for Lessons Learned and future Training and Practice; Advanced System Architectures; and Innovative and Visionary Space Systems of the future. A special session addresses the emerging technologies and potential applications in the area of supplementary payloads "hosted" on spacecraft and constellations, where the mission of the hosted payload can be unrelated to the primary mission of the hosting system.

Coordinators

Reinhold Bertrand
European Space Agency (ESA) — GERMANY

Robert L. Henderson
The Johns Hopkins University Applied Physics Laboratory — UNITED STATES

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.

Co-Chairs

Mauricio Moshe Guelman
Asher Space Research Institute, Technion, I.I.T. — ISRAEL

Jill Prince
National Aeronautics and Space Administration (NASA) /Langley Research Center — UNITED STATES

Rapporteur

Peter Dieleman
National Aerospace Laboratory (NLR) — THE NETHERLANDS

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.

Co-Chairs

Xavier Roser
Thales Alenia Space France — FRANCE

Jean-Paul Aguttes
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Eiichi Tomita
Japan Aerospace Exploration Agency (JAXA) — JAPAN

D1.3 System Engineering - Methods, Processes and Tools (1)

This session will focus on state-of-the-art system engineering methodologies - the methods, processs, and tools 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, and quality of life cycle cost estimates.

Co-Chairs

Dmitry Payson
Skolkovo Foundation — RUSSIA

Tibor Balint
Royal College of Art — UNITED KINGDOM

Rapporteur

Franck Durand-Carrier
Centre National d'Etudes Spatiales (CNES) — FRANCE

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.

Co-Chairs

Peter Dieleman
National Aerospace Laboratory (NLR) — THE NETHERLANDS

Franck Durand-Carrier
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Jill Prince
National Aeronautics and Space Administration (NASA)/Langley Research Center — UNITED STATES

D1.5 Training, Achievements and Lessons Learned in Space Systems

System engineering training, the achievement of significant mission accomplishments in the face of challenges, both expected and unexpected, and the consequent lessons learned in design, development, and operation form basis for steady improvement of space system engineering practice for ensuring missionsuccess. This session focuses on all aspects of this process, with papers on mission achievements with critical lessons learned and the application to future missions and development practice.

Co-Chairs

Klaus Schilling
University Wuerzburg — GERMANY

Eiichi Tomita
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

Marco Guglielmi
European Space Agency (ESA) — THE NETHERLANDS

D1.6 System Engineering - Methods, Processes and Tools (2)

This session will focus on state-of-the-art system engineering methodologies - the methods, processes, and tools 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, and quality of life cycle cost estimates.

Co-Chairs

Norbert Frischauf
ORF — AUSTRIA

Geilson Loureiro
National Institute for Space Research - INPE — BRAZIL

Rapporteur

Tibor Balint
Royal College of Art — UNITED KINGDOM

D1.7 Hosted Playloads - Concepts, Techniques and Challenges, Missions and Applications

Accross the space community there is increasing interest and activity in the area of hosted payloads. In this concept, one or more additional payloads are incorporated onto a main spacecraft, where the objectives of the hosted payloads are unrelated to the principal mission (e.g. commercial communications) of the main spacecraft. In this way, specialized observational, scientific, or experimental or operational payloads can be brought to orbit, even to geostationary orbit, for a fraction of the cost of building and launching independent satellites. The concept also provides for unique observational conditions, e.g. 24/7 global observation, that would be otherwise unaffordable for the instrument or payload classed under consideration. The approach presents unique challenges, that range from organisational relationships, through adaptation of mission requirements (e.g. observation geometry, RF susceptibility and emissions) to meet conditions required by the host spacecraft, to development, integration, test, and compatible on-orbit operation of divergent systems. Papers in this session will look at current missions and future opportunities and address both benefits and challenges as the world-wide space community moves into this exciting area.

Co-Chairs

Igor V. Belokonov
Samara State Aerospace University — RUSSIA

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

Rapporteur

Robert L. Henderson
The Johns Hopkins University Applied Physics Laboratory — UNITED STATES

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 organisations.

Coordinators

John M. Horack
Teledyne Brown Engineering Inc — UNITED STATES

Ulf Palmnäs
GKN Aerospace Engine Systems — Sweden

Secretary

Paulo Moraes Jr.
Instituto de Aeronáutica e Espaço (IAE) — BRAZIL

D2.1 Launch Vehicles in Service or in Development

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

Co-Chairs

Ko Ogasawara
Mitsubishi Heavy Industries, Ltd. — JAPAN

Christian Dujarric
European Space Agency (ESA) — FRANCE

Rapporteur

Ray F. Johnson
The Aerospace Corporation — UNITED STATES

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.

Co-Chairs

Igor V. Belokonov
Samara State Aerospace University — RUSSIA

Yves Gérard
Astrium Space Transportation — FRANCE

Rapporteur

Luigi Bussolino
Bussolino and Associates — ITALY

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

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

Co-Chairs

Oliver Kunz
National Aeronautics and Space Administration MT Aerospace AG — GERMANY

Christophe Bonnal
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Shayne Swint
National Aeronautics and Space Administration (NASA)/Marshall Space Flight Center — UNITED STATES

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.

Co-Chairs

José Gavira Izquierdo
European Space Agency (ESA) — THE NETHERLANDS

David E. Glass
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

S. Ramakrishnan
Indian Space Research Organization (ISRO) —

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 and verification before flight.

Co-Chairs

Patrick M. McKenzie
RUAG Space — UNITED STATES

Sylvain Guédron
Centre National d'Etudes Spatiales (CNES) — FRANCE

Pier Paolo de Matteis
CIRA Italian Aerospace Research Centre — ITALY

D2.6 Future Space Transportation Systems Verification and In-Flight Experimentation

Discussion of system, subsystems and technologies flight testing for future space transportation systems. Emphasis is on flight experimentation/verification including technology demonstrators and test experience.

Co-Chairs

Giorgio Tumino
European Space Agency (ESA) — FRANCE

Charles Cockell
Open University — United Kingdom

Rapporteur

Tetsuo Hiraiwa
Japan Aerospace Exploration Agency (JAXA) — JAPAN

D2.7 Small Launchers: Concepts and Operations

Discussion of existing, planned and future launchers for small payloads ranging from 1500 kg to as low as 1 kg into Low Earth Orbit. Includes innovative solutions such as airborne systems, evolutions from sub-orbital concepts and flexible, highly responsive concepts. Also includes mission operations, associated operations and specific constraints.

Co-Chairs

Emmanuelle David
German Aerospace Center (DLR) — GERMANY

Nicolas Bérend
Office National d'Etudes et de Recherches Aérospatiales (ONERA) — FRANCE

Rapporteur

Harry A. Cikanek
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES

D2.8
A5.4

Going To and Beyond the Earth-Moon System: Human Missions to Mars, Libration Points and NEO's

This joint session will explore heavy-lift launch capabilities, existing or under study, for human deep space exploration missions, new science, programme architectures, technology demonstrations as well as the issues of scientific and political motivations and international cooperation. The session will also deal with worldwide needs, requirements and potential missions enabled by heavy lift launchers.

Co-Chairs

Martin Sippel
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Kenneth Bruce Morris
Booz Allen Hamilton — UNITED STATES

Rapporteur

Steve Creech
National Aeronautics and Space Administration (NASA) — UNITED STATES

D2.9
D6.2

Commercial Point-to-Point Safety Issues

TThis special joint session will address safety matters related to commercial point-to-point space transportation. Topics include air and space traffic, airport and spaceport operations, communications, vehicle design optimization and human factors as they relate to safety.

Co-Chairs

Jens Lassmann
Astrium Space Transportation — GERMANY

Douglas O. Stanley
National Institute of Aerospace — UNITED STATES

Rapporteur

Julio Aprea
European Space Agency (ESA) — FRANCE

D3

SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT

This symposium will involve papers and discussion that traverse a wide range of highly valuable future space capabilities (FSC) – in other words "building blocks" for future space exploration, development and discovery – that could enable dramatic advances in global space goals and objectives. The symposium is organised by the International Academy of Astronautics (IAA). The international discussion of future directions for space exploration and utilisation 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 utilisation during the coming decades. The 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. The sessions that comprise this symposium are key elements of current or planned International Academy of Astronautics (IAA) studies.

Coordinators

John C. Mankins
ARTEMIS Innovation Management Solutions, LLC — UNITED STATES

Alain Pradier
European Space Agency (ESA) — THE NETHERLANDS

D3.1

Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development

Future scenarios for sustainable exploration and development in space will unfold in the context of global conditions that vary greatly from those of the 1950s-1970s (the first generation of space programmes, driven by international competition), or those of the 1980s-2000s (the second generation of space programmes, enabled by international cooperation). Looking to the future, it is likely that space-faring countries will pursue their goals and objectives in a more building-block fashion focused on developing high-value future space capabilities, rather than through massive, geo-politically driven programmes. Increasingly, these developments may also reflect future commercial space opportunities. As a result, it is important that the international community should engage in an ongoing discussion of strategies and architectures to frame a "building block" approach to our future in space. Such a discussion should involve sustainable budgets and multiple-purpose system-of-systems capabilities that lead to a diverse range of future activities of broad benefit to humanity. This session, which is related to a prospective new International Academy of Astronautics (IAA) study group, will address strategies and architectural approaches that may allow a new paradigm, a "building block" approach, to be established among the space-faring countries. Papers are solicited in these and related areas.

Co-Chairs

John C. Mankins
ARTEMIS Innovation Management Solutions, LLC — UNITED STATES

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

Rapporteurs

Horst Rauck
DLR, German Aerospace Center — GERMANY

Anouck Girard
University of Michigan — UNITED STATES

D3.2

Systems and Infrastructures to Implement Future Building Blocks in Space Exploration and Development

The emergence of novel systems and infrastructures will be needed to enable ambitious scenarios for sustainable future space exploration and utilisation. 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.

Co-Chairs

William H. Siegfried
The Boeing Company — UNITED STATES

Scott Hovland
European Space Agency (ESA) — THE NETHERLANDS

Rapporteurs

Horst Rauck
DLR, German Aerospace Center — GERMANY

Paivi Jukola
Aalto University — FINLAND

D3.3

Novel Concepts and Technologies for Enable Future Building Blocks in Space Exploration and Development

In order to realise future, sustainable programmes of space exploration, utilisation and commercial development, a focused suite of transformational new concepts and supporting technologies must be advanced during the coming years. 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 realised in the foreseeable future.
This session will address cross cutting research topics and/or technologies to enable future building blocks in Space Exploration and Development. Papers are solicited in these and related areas.

Co-Chairs

Alain Pradier
European Space Agency (ESA) — THE NETHERLANDS

Alain Dupas
— FRANCE

Rapporteurs

Christopher Moore
National Aeronautics and Space Administration (NASA) — UNITED STATES

Junjiro Onoda
Japan Society for Aeronautics and Space Sciences (JSASS) — JAPAN

D3.4

Space Technology and System Management Practices and Tools

The effective management of space technology and systems development is critical to future success in space exploration, development and discovery. This session is the next in an ongoing series at the International Astronautical Congress that provides a unique international forum to further the development of a family of 'best practices and tools' 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; and (3) Systems Analysis Methods and Tools.
The full range of R&D activities are appropriate for discussion, ranging from technology development long-term planning, through technology R&D programmes, to system development projects, with special emphasis on the transition of new technologies from one stage to the next. Particular topics could include: Technology Readiness Levels (TRLs) and Technology Readiness Assessments, Technology R&D Risk Assessments and Management, Advanced Concepts Modelling Approaches and Tools, etc. Either more theoretical discussions, or examples of applications of R&D management techniques and/or tools to specific R&D programmes and projects are of interest for the session.

Co-Chairs

John C. Mankins
ARTEMIS Innovation Management Solutions, LLC — UNITED STATES

Paivi Jukola
Aalto University — FINLAND

Rapporteurs

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

Hans E.W. Hoffmann
International Astronautical Federation (IAF) — GERMANY

D4

12TH IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE

This 12th Symposium is organised by the International Academy of Astronautics. In Space Activities the focus is usually kept on the short term developments, at the expense of future goals. The Symposium will discuss topics with at least 20 to 30 years prospective lead time and identify technologies and strategies that need to be developed. These developments will be examined with the goal to support also short/medium term projects and to identify priorities required for their development. The Sessions in the Symposium will address innovative technologies and Strategies to develop Space Elevator as well as Interstellar Precursor Missions. A session will address also how Space activities can contribute to the resolution of World Societal Changes as well as to increasing the countries engaged in space activities.

Coordinators

Giuseppe Reibaldi
International Academy of Astronautics (IAA) — THE NETHERLANDS

Hans E.W. Hoffmann
ORBComm Inc — GERMANY

D4.1

Innovative Concepts and Technologies

In order to realize future, sustainable programmes of space exploration and utilisation, a focused suite of transformational new system concept and supporting technologies must be developed during the coming decade. The technical objectives to be pursued should be drawn from a broad, forward looking view of the technologies and system needed, but must be sufficiently focused, to allow tangible progression and dramatic improvements over current capabilities. This session will address cross cutting considerations in which a number of discipline research topics and/or technologies may be successful developed to support transformational new system concept. Papers are solicited in these and related areas.

Co-Chairs

Roger X. Lenard
LPS — UNITED STATES

Giorgio Saccoccia
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Paivi Jukola
Aalto University — FINLAND

D4.2

Contribution of Space Activities to Solving Global Societal Issues

The session will discuss the contributions, in the future, of space exploration and utilisation to the solution of global challenges (e.g. energy, population, sustainable development) and how the space systems will support the understanding of the global societal issues. The session will include also the identification of the related technologies that needs to be developed. The definition of a roadmap will be encouraged. Environmental issues including global climate change will not be covered in this particular session.

Co-Chairs

John C. Mankins
ARTEMIS Innovation Management Solutions, LLC — UNITED STATES

Giuseppe Reibaldi
International Academy of Astronautics (IAA) — FRANCE

Rapporteur

Hans E.W. Hoffmann
International Astronautical Federation (IAF) — GERMANY

D4.3

Global Strategy for Space Elevators

The recently completed IAA study, "Space Elevators - Feasibility and Next Steps" looked at engineering, operational, and funding steps towards an operational capability. This session will suggest strategies to implement the space elevator infrastructure. In addition, the session can accept the strategies to leverage this remarkable transportation capability of routine, inexpensive and safe access to our solar system.

Co-Chairs

Peter Swan
SouthWest Analytic Network — UNITED STATES

Robert E Penny
Cholla Space Systems — UNITED STATES

Rapporteur

Bruce Chesley
Boeing Space and Intelligence Systems — UNITED STATES

D4.4

Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond

Knowledge about space beyond our solar system and between the stars — that is interstellar space — is lacking data. Even as IBEX, NASA's Interstellar Background Explorer, studies the edge of our solar system, it still is confined to earth orbit. Arguably, some of the most compelling data to understand the universe we live in will come from sampling the actual environment beyond our solar system as Voyager 1 and Voyager 2 spacecraft are on the threshold of doing. In the 36 years since the Voyager probes' launches, significant advances in materials science, analytical chemistry, information technologies, imaging capabilities, communications and propulsion systems have been made. The recently released IAA study: "Key Technologies to Enable Near-Term Interstellar Scientific Precursor Missions" along with significant initiatives like the DARPA seed-funded 100 Year Starship, signal the need, readiness and benefits to aggressively undertaking interstellar space missions. This session seeks to define specific strategies and key enabling steps to implement interstellar precursor missions within the next 10-15 years. Suggestions for defined projects, payloads, teams, spacecraft and mission profiles that leverage existing technological capacities, yet will yield probes that generate new information about deep space, rapidly exit the solar system and which can be launched before 2030 are sought.

Co-Chairs

Louis Friedman
The Planetary Society — UNITED STATES

Mae Jemison
100 Year Starship — UNITED STATES

Rapporteur

Stephanie Wilson
University of Boston — UNITED STATES

D5

47TH SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES

This 47th Symposium organised by the International Academy of Astronautics addresses management approaches, methods, design solutions and regulations to improve the quality, efficiency, and collaborative ability of space programs. All aspects are considered: risk management, complexity of systems and operations, knowledge management, human factors, economical contraints, international cooperation, norms, and standards.

Coordinator

Jeanne Holm
National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratory — UNITED STATES

Roberta Mugellesi-Dow
European Space Agency (ESA) — GERMANY

D5.1

Insuring Quality and Safety in a Cost Constrained Environment: Which Trade-Off?

The topics to be addressed include evaluation of analysis versus test results for deployable and 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.

Co-Chairs

Manola Romero
Office National d'Etudes et de Recherches Aérospatiales (ONERA) — FRANCE

Alexander S. Filatyev
Central Aero-HydroDynamic Institute — RUSSIA

Rapporteur

Pierre Molette
— FRANCE

D5.2

Knowledge Management and Collaboration in Space Activities

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 organisation.

- How are aerospace organisations managing the ability to share knowledge to develop new missions?
- What solutions are in place to work securely across corporate and international boundaries?
- How is knowledge captured, shared, and used to drive innovation?

This session focuses on the processes and technologies that organisations are using to sustain, energise and invigorate their ability to learn, innovate, and share knowledge within and amongst organisations for sustainable, peaceful exploration of space. Case studies and defined approaches will discuss:

- Analysis of successful projects and innovations in the application of knowledge management
- Grounded research in knowledge and risk management
- Capture of technical expertise and lessons learned from previous successful projects that are applicable to new programmes and focus on driving innovation.
- Methods that allow data, information or knowledge exchange within or amongst organisations in support of actual programmes or missions are of particular interest.

Co-Chairs

Roberta Mugellesi-Dow
European Space Agency (ESA) — GERMANY

Lionel Baize
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Jeanne Holm
University of California, Los Angeles — UNITED STATES

D5.3

Prediction and measurement of space weather conditions and impacts on space missions

Space weather and its fluctuations strongly impacts space missions. Environmental conditions yield constraints at design phase, and important risks in the course of the mission. The evaluation of the average and worst case conditions to be met, and of their impact on missions and sub-systems are thus of prime importance. This session will encompass the following topics: Space weather: -flight measurements; - physical processes; - prediction of average or worst case conditions. Environment effects on missions: -ground testing; - flight experiments and lessons learnt; -modelling and prediction.

Co-Chairs

Jean-Francois Roussel
Office National d'Etudes et de Recherches Aérospatiales (ONERA) — FRANCE

Mengu Cho
Kyushu Institute of Technology — JAPAN

D6

SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES

Topics should address commercial safety and regulatory policy issues for orbital and suborbital space transportation and spaceports. The goal is to identify issues common to commercial operators of both human and robotic space vehicles to increase international safety and interoperability.

Coordinator

John Sloan
Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST) — UNITED STATES

D6.1

Commercial Space Flight Safety and Emerging Issues

This special session is seeking papers that will address commercial and government experience regarding the actual cost of implementing safety on human-rated spacecraft. Comparisons between the recurring costs of human-rated and robotic spacecraft manufactured by the same organisation are encouraged; such comparisons might be at the spacecraft or subsystem level as appropriate. Papers examining the non-recurring cost differences are also encouraged, as well as discussions of the differences in cost of launch site infrastructure and launch vehicles launching human-rated verses robotic spacecraft. In addition, each paper should address the following:
It is commonly held that practices of commercial space (specifically the pursuit of efficiencies of process, cost, labour, etc.) and practices in space safety are in direct competition with each other, i.e., a gain in one is a loss to the other. Can a profitable space business be conducted safely?

Co-Chairs

John Sloan
Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST) — UNITED STATES

Christophe Chavagnac
EADS Astrium — FRANCE

Rapporteur

Gennaro Russo
CIRA Italian Aerospace Research Center, Capua — ITALY

D6.2
A1.9

Commercial Point-to-Point Safety Issues

This special joint session will address safety matters related to commercial point-to-point space transportation. Topics include air and space traffic, airport and spaceport operations, communications, vehicle design optimization and human factors as they relate to safety.

Co-Chairs

Jens Lassmann
Astrium Space Transportation — GERMANY

Douglas O. Stanley
National Institute of Aerospace — UNITED STATES

Rapporteur

Julio Aprea
European Space Agency (ESA) — France

D6.3

Insurance and Level of Safety for Commercial Viability

Space insurance is important to the success rate of space transportation missions for end users, satellite operators, e.g. According to current architecture of expendable rockets it translates mostly in reliability figures. Safety level of both the vehicle and design and mission may heavily impact space insurance fundamentals, mission success probability, liability risk, and insurance prices. The purpose of this session is to detail the relationship between safety matters and the space insurance business at large. Papers are welcome from insurers, vehicle manufacturers and operators, spaceport operators, and investors.

Co-Chairs

Christophe Chavagnac
Astrium UK — FRANCE

John Sloan
Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST) — UNITED STATES

Category E

SPACE AND SOCIETY

Interaction of space with society, including education, policy and economics, history and law

Category coordinated by Chris Welch, *International Space University (ISU) - FRANCE*

E1

SPACE EDUCATION AND OUTREACH SYMPOSIUM

This symposium deals with activities, methods and techniques for formal and informal space education at different educational levels, space outreach to the general public, space workforce development, etc. Each of the sessions in the symposium features an invited key note speaker followed by presentation of selected papers. Symposium sessions may also include panel discussions. When submitting abstracts for consideration, please note that: • Papers should have clear education or outreach content • technical details of projects, even if carried out in an educational context, will not usually qualify. • Papers reporting on programmes/activities that have already taken place will usually be received more favourably than those dealing with concepts and plans for the future. • More weight will usually be given to papers that clearly identify target groups, benefits, lessons-learned, good practive and that include measures of critical assessment.
Papers covering topics/activities which have been reported at a prior IAC must state this explicitly and detail both the additional information to be presented and the added value that will results.

Coordinators

Naomi Mathers
Advanced Instrumentation and Technology Centre (AITC) — AUSTRALIA

Chris Welch
International Space University (ISU) — FRANCE

E1.1

Ignition - Primary Space Education

This session will focus on all aspects of primary space education, i.e. up to a student age of 11.

Co-Chairs

Michael Pakakis
Victorian Space Science Education Centre — AUSTRALIA

Jeong-Won Lee
Korea Aerospace Research Institute — KOREA, REPUBLIC OF

Rapporteur

Jessica Culler
National Aeronautics and Space Administration (NASA)/Ames Research Center — UNITED STATES

E1.2

Lift Off - Secondary Space Education

This session will focus on all aspects of secondary space education, for students of age 12-18.

Co-Chairs

Dennis Stone
World Space Week Association — UNITED STATES

Kerrie Dougherty
Powerhouse Museum — AUSTRALIA

Rapporteur

Vera Mayorova
Bauman Moscow State Technical University — RUSSIA

E1.3

On Track - Undergraduate Space Education

This session will focus on all aspects of undergraduate space education.

Co-Chairs

David Cook
University of Alabama in Huntsville — UNITED STATES

Jacob Sutherlun
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES

Rapporteur

Franco Bernelli-Zazzera
Politecnico di Milano — ITALY

E1.4

In Orbit - Postgraduate Space Education

This session will focus on all aspects of (post)graduate space education.

Co-Chairs

Angela Diaz Phillips
Purdue University — UNITED STATES

David B. Spencer
The Pennsylvania State University — UNITED STATES

Rapporteur

James L. Stofan —
National Aeronautics and Space Administration (NASA) — UNITED STATES

E1.5

Enabling the Future - Developing the Space Workforce

This session will focus on the challenges, opportunities and innovative approaches to developing the current and future global space workforce.

Co-Chairs

Olga Zhdanovich
European Space Agency (ESA) — THE NETHERLANDS

Amalio Monzon
EADS — UNITED KINGDOM

Rapporteurs

Edward J. Hoffman
National Aeronautics and Space Administration (NASA) — UNITED STATES

Bettina Boehm
European Space Agency (ESA) — FRANCE

E1.6

Calling Planet Earth - Space Outreach to the General Public

This session will focus on the challenges, opportunities and innovative approaches to developing the current and future global space workforce.

Co-Chairs

Carol Christian
STScI — UNITED STATES

Lisa La Bonte
United Nations Association-UAE / AYVF — UNITED ARAB EMIRATES

Rapporteur

Kerrie Dougherty
Powerhouse Museum — Australia

E1.7 New Worlds - Innovative Space Education and Outreach

This session will focus on novel and non-standard methods of space education and outreach in non-traditional areas and to non-traditional target groups.

Co-Chairs

Jean-Daniel Dessimoz
Swiss Space Association — SWITZERLAND

Vera Mayorova
Bauman Moscow State Technical University — RUSSIA

Rapporteur

Carol Christian
STScI — UNITED STATES

E1.8 Open Space: Participatory Space Education and Outreach

This session will focus on the involvement and participation of target groups in space education and outreach-related activities which are internet - or digitally mediated or reply on an "open source" approach, e.g. hackathons, unconferences, barcamps, etc.

Co-Chairs

Chris Welch
International Space University (ISU) — FRANCE

Carolyn Knowles
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Jessica Culler
National Aeronautics and Space Administration (NASA)/Ames Research Center — UNITED STATES

E1.9 Space Culture: Innovative Approaches for Public Engagement in Space

This Session is co-sponsored by the IAF Technical Committee on the Cultural Utilization of Space (ITACCUS) and will focus the activities of institutions such as museums, space agencies and non-profit organizations involving space that engage the cultural sector.

Co-Chairs

Roger Malina
Laboratoire d'Astrophysique de Marseille — FRANCE

Franco Bernelli-Zazzera
Politecnico di Milano — ITALY

Rapporteur

Carol Christian
STScI — UNITED STATES

E1.10 / V.5 Social Media for Space Education and Outreach Young Professional Virtual Forum

This is a virtual session focusing on the use of social media to enhance education and outreach. This session is co-sponsored by the Space Education and Outreach Committee and Workforce Development-Young Professionals Programme Committee.

Co-Chairs

Jessica Culler
National Aeronautics and Space Administration (NASA)/Ames Research Center — UNITED STATES

Ruth McAvinia
ESA — Ireland

E2 44TH STUDENT CONFERENCE

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

Coordinators

Stephen Brock
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES

Marco Schmidt
University Wuerzburg — GERMANY

E2.1 Student Conference – Part 1

Undergraduate and graduate level students (no more than 28 years of age) present technical papers on any project in space sciences, industry or technology. These papers will represent the specific work of the author(s) (no more than two students). The students presenting in this session will compete in the 44th International Student Competition. This session is NOT for team projects. Team project papers should be submitted to session E2.3. French, German, US, British and Canadian students submitting abstracts for the sessions E2.1 and E2.2 should apply via the national coordinators: - for France: Benedicte Escudier at: benedicte.escudier@supaero.fr - for Germany: Marco Schmidt at: schmidt.marco@informatik.uni-wuerzburg.de - for USA: Stephen Brock at: stephenb@aiaa.org - for Great Britain: Chris Welch at: Welch@isu.isunet.edu - for Canada: Jason Clement: Jason.Clement@asc-csa.gc.ca The guidelines for the student competition will be distributed from the session chairs to the authors after abstract acceptance.

Co-Chairs

Rachid Amekrane
Astrium GmbH — GERMANY

Benedicte Escudier
SUPAERO- Ecole Nationale Supérieure de l'Aéronautique et de l'Espace — FRANCE

Rapporteur

Jeong-Won Lee
Korea Aerospace Research Institute — KOREA, REPUBLIC OF

E2.2 Student Conference – Part 2

Undergraduate and graduate level students (no more than 28 years of age) present technical papers on any project in space sciences, industry or technology. These papers will represent the specific work of the author(s) (no more than two students). The students presenting in this session will compete in the 44th International Student Competition. This session is NOT for team projects. Team project papers should be submitted to session E2.3.French, German, US, British and Canadian students submitting abstracts for the sessions E2.1 and E2.2 should apply via the national coordinators: - for France: Benedicte Escudier at: benedicte.escudier@supaero.fr - for Germany: Marco Schmidt at: schmidt.marco@informatik.uni-wuerzburg.de - for USA: Stephen Brock at: stephenb@aiaa.org - for Great Britain: Chris Welch at: Welch@isu.isunet.edu - for Canada: Jason Clement: Jason.Clement@asc-csa.gc.ca The guidelines for the student competition will be distributed from the session chairs to the authors after abstract acceptance.

Co-Chairs

Marco Schmidt
University Wuerzburg — GERMANY

Jeong-Won Lee
Korea Aerospace Research Institute — KOREA, REPUBLIC OF

Rapporteur

Benedicte Escudier
SUPAERO- Ecole Nationale Supérieure de l'Aéronautique et de l'Espace — FRANCE

E2.3 / V.4 Student Team Competition

Undergraduate and graduate level student teams 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.
The guidelines for the student competition will be distributed from the session chairs to the authors after abstract acceptance.

Co-Chairs

Naomi Mathers
Victorian Space Science Education Centre — AUSTRALIA

Carolyn Knowles
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Soyeon Yi
Korea Aerospace Research Institute — KOREA, REPUBLIC OF

E2.4 Educational Pico and Nano Satellites

Proposed session with SUAC.

Co-Chairs

Volker Gass
Swiss Space Center — SWITZERLAND

Muriel Richard
Swiss Space Center — SWITZERLAND

Rapporteur

Franco Bernelli-Zazzera
Politecnico di Milano — Italy

E3 27TH SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS

This symposium, organized by the International Academy of Astronautics, will provide a systematic overview of the current trends in space policy, regulation and economics, by covering national as well as multilateral space policies and plans. The symposium also integrates the 29th IAA/IISL Scientific-Legal roundtable.

Coordinators

Jacques Masson
European Space Agency (ESA) — FRANCE

Max Grimard
EADS Astrium — FRANCE

E3.1 Regional cooperation in space: policies, governance and legal tools

This session will provide a forum for the discussion of existing or emerging schemes for regional cooperation in space. Three key domains are considered: political aspects (balance between common objectives, regional integration, and sovereignty, national pride, ...) economic aspects (level of funding, contribution mechanisms, "return rules", ...) and legal regimes (e.g. ESA Convention, EU "space competence", ...). Papers are expected from Europe, North America, South America, Asia, Africa. This session will support the activities of the IAA on-going Study Group on the same topic.

Co-Chairs

Ciro Arevalo Yepes
The World Economic Forum's Global Agenda Council on Space Security — COLOMBIA

Elisabeth Back Impallomeni
University of Padova — ITALY

E3.2 International Space Exploration Policies and Programmes

Space Exploration is an important space policy domain and international cooperation plans and partnerships have been gaining momentum in recent years, as reflected by the International Space Exploration Forum and the IAA Heads of Space Agencies Summit on Exploration planned on January 2014. This session will provide a forum to reflect on the trends in space exploration and present the latest developments in the field, including the results from these events. This session is supporting the activities of an IAA Study Group on "Dynamics of Space Exploration Strategies and Future Outlook".

Co-Chairs

Nicolas Peter
European Space Agency (ESA) — FRANCE

Pascale Ehrenfreund
Space Policy Institute, George Washington University — UNITED STATES

E3.3 The space economy: what are the socio-economic impacts?

The 'space economy' covers the value-chain of the space sector (from launchers to satellites and space services) and its various downstream applications. This session will focus on actual illustrations (with figures), where the returns of investing in space systems and/or its downstream uses are discussed, either at country, regional or even corporate levels (e.g. job creation due to a space activity, direct and indirect value-added derived from applications, cost-savings, productivity gains). Papers should also present the underlying methodologies used to get to the results.

Co-Chairs

Claire Jolly
Organisation for Economic Co-operation and Development (OECD) — FRANCE

Joan Harvey
Canadian Space Agency — CANADA

E3.4 Assuring a Safe, Secure and Sustainable Space Environment for Space Activities

Space activities provide a wealth of increasing benefits for people on Earth. However space actors have come to realise that in order to continue the many benefits the world community has come to depend on, the international community will have to develop the technical, legal, policy and political means to keep a safe, secure and sustainable space environment. This session will explore the progress being made within multilateral fora, the private sector and individual countries in reaching a safe, secure and sustainable space environment. It will especially examine activities within the UN Committee for the Peaceful Uses of Outer Space; the European Union proposed Code of Conduct for Space Activities, and other efforts to create the conditions for this desired end.

Chairman

Ray Williamson
Secure World Foundation — UNITED STATES

E3.5 / E7.6 29th IAA/IISL Scientific-Legal Roundtable: Controlling the Eyes in the Sky: Preventing Abuse of Space Data

With the increasingly high resolution of space EO data, combined moreover with increasing location and navigation information provided by satellites, new questions arise regarding the risks and threats of abuse of such data, for example in areas of privacy, human rights and public order (terrorism).
This concerns in particular the governments regulating, controlling and often even themselves undertaking such space activities but also, increasingly, private operators who undertake them, either for the governments or for their own private gain. Clearly, regulations, mechanisms and concepts to counteract such risks, both legally and technically/operationally, exist, but their usage is not necessarily beyond discussion. Which technical measures and which legal instruments would be suitable to realistically safeguard future use of space EO data? What would be the possibilities as well as the effects of introducing, for example, 'firewalls', 'informed consent', or the 'criminalization' of leaking data in a comprehensive manner into these space sectors?
The 2014 IAA/IISL Scientific-Legal Roundtable is to address this issue from an interdisciplinary perspective.

Co-Chairs

Frans von der Dunk
University of Nebraska-Lincoln — THE NETHERLANDS

Rainer Sandau
Deutsches Zentrum fьr Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur

Marc Haese
DLR, German Aerospace Center — GERMANY

E4 48TH IAA HISTORY OF ASTRONAUTICS SYMPOSIUM

History of space sciences, technology and development, rocketry, personal memoirs. The entire spectrum of space history, at least 25 years old, is covered as well as history of rocketry and astronautics in China.

Coordinators

Christophe Rothmund
Snecma — FRANCE

Philippe Jung
Association Aéronautique & Astronautique de France (AAAF) — FRANCE

Ake Ingemar Skoog
– GERMANY

Marsha Freeman
21st Century Science & Technology — UNITED STATES

E4.1 Memoirs and Organisational Histories

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

Co-Chairs

Marsha Freeman
21st Century Science & Technology — UNITED STATES

Susan McKenna-Lawlor
Space Technology (Ireland) Ltd. — IRELAND

Rapporteurs

Theo Pirard
Space Information Center — Belgium

Niklas Reinke
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — Germany

E4.2 Scientific and Technical Histories

Historical summaries of rocket and space programmes, and the corresponding technical and scientific achievements.

Co-Chairs

Kerrie Dougherty
Powerhouse Museum — AUSTRALIA

Hervé Moulin
Institut Français d'Histoire de l'Espace — FRANCE

Rapporteurs

Christophe Rothmund
Snecma — FRANCE

William Jones
— UNITED STATES

E4.3 History of Canadian contribution to astronautics

Special session with invited & proposed speakers. Origin (technical & political aspects) of the space activities & programs of Canada.

Chair

Otfrid Liepack
National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratory — UNITED STATES

Geoffrey Languedoc
Canadian Aeronautics & Space Institute (CASI) — CANADA

Rapporteur

Philippe Cosyn
— BELGIUM

E5 25TH SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY

This 25th symposium organised by the International Academy of Astronautics (IAA) will review the impact and benefits of space activities on the quality of life on Earth, including arts and culture, society's expectations from space, life in space, as well as technology and knowledge transfer.

Coordinators

Geoffrey Languedoc
Canadian Aeronautics & Space Institute (CASI) — CANADA

Olga Bannova
University of Houston — UNITED STATES

E5.1 Space Architecture: technical aspects, design, engineering, concepts and mission planning

The session welcomes papers on all aspects of the challenges of emplacing, sustaining, and growing accommodations for space habitation throughout the inner solar system: Earth orbits, Lagrange points, the Moon's surface, interplanetary space, Near Earth Objects, the moons of Mars, Mars' surface, and the asteroid Main Belt. These places share a need for basic protection against space radiation, vacuum, and thermal extremes, but vary widely in remoteness, proximity to gravity wells and resources, and socio-psychological impact. Architectural solutions, including pressurized volume, shielding, life support, food production, transportation access, and social accommodation will stretch concepts and technologies for space architecture. The session seeks papers on topics including, but not limited to: integration of architecture, structures, space systems, life-support systems, man-machine interfaces, and new technologies.

Co-Chairs

Olga Bannova
University of Houston — UNITED STATES

Brent Sherwood
Caltech/JPL — UNITED STATES

Rapporteur

Anna Barbara Imhof
Liquifer Systems Group (LSG) — AUSTRIA

E5.2 Models for Successfully Applying Space Technology Beyond Its Original Intent

Many R&D organizations look for ways to demonstrate the value of their technology portfolio to educate as well as accommodate a broad community of onlookers and users. Academia- and government-sponsored space programs need to depict how their science and technology activities are relevant to technology transfer, knowledge sharing, and technology commercialization. Papers will explore a variety of approaches that organizations can adopt for the successful transfer of technologies that impact new products and services for space and non-space applications. Relevant legislation, business structures, models, metrics, and alternative technology transfer models will be discussed. Papers will provide examples of successful models with descriptions of the approach and tools used, results to date, issues addressed, and ongoing changes made.

Co-Chairs

Olga Bannova
University of Houston — UNITED STATES

Nona Minnifield Cheeks
National Aeronautics and Space Administration (NASA)/Goddard Space Flight Center — UNITED STATES

Rapporteur

Anna Barbara Imhof
Liquifer Systems Group (LSG) — AUSTRIA

E5.3 Space Architecture: Designing Human Systems Interaction

In response to the diversifying needs of users in space exploration and commercial spaceflight, interest in a more detailed analysis of human-machine interfaces has been growing in space agencies, industry, and academia. At the same time, the wider individual and societal implications of the human- technology relationship have evolved into a key theme of interdisciplinary engagement with space. This session explores conceptual and applied issues related to the design of human interaction with space systems. In the context of habitats and infrastructure in the space and ground segment, these include interfaces of work stations, consoles, and devices; tools and payload hardware used in EVA and IVA; remote interaction; human-robotic partnerships; ambient intelligence, ubiquitous computing, and beyond. The application of these concepts to designs must providehumans with the necessary tools for work and off-duty settings while addressing their psychological and physiological needs, in full recognition of the technical challenges presented by the space environment. Focusing on the discussion of solutions developed in collaboration with architects and designers, we invite submissions from practitioners and theorists working on human-rated systems within, or collaborating across, the humanities, life sciences, human factors engineering, systems engineering, and planning in space and analogous environments.

Co-Chairs

Jackelynne Silva
Georgia Institute of Technology — UNITED STATES

Anna Barbara Imhof
Liquifer Systems Group (LSG) — AUSTRIA

Rapporteur

Regina Peldszus
European Space Agency (ESA) — GERMANY

E5.4 Contemporary Arts Practice and Outer Space: A Multi-Disciplinary Approach

Since the late 1970s, a number of artists have been negotiating access to space facilities and organisations, critiquing or making experiential the exploration and utilisation of space, or re-purposing space technology, materials or data independently or in direct exchange with the space sector. Today, this practice is branching into a several directions, ranging from performance, installation, video, or conceptual work situated in the space or space analogous environments themselves, to commercial gallery contexts, and the realm of participation and public engagement with science. This session addresses the practice of contemporary artists who have developed new ways to appropriate space for their work, the conceptual and practical foundations of their engagement, and the implications of this emerging aesthetic paradigm for both the fields of space and art. Submissions are welcome from artists and art historians; representatives from space industry, space agencies and the cultural sector facilitating or programming related projects crossing over the increasingly blurred boundaries of creative practice.

Co-Chairs

Richard Clar
Art Technologies — FRANCE

Regina Peldszus
European Space Agency (ESA) — GERMANY

Rapporteur

Carrie Paterson
California State University — UNITED STATES

E5.5 Space Assets and Disaster Management

This session will explore the role that art can play on extended space missions and culture can enrich space programmes.

Co-Chairs

Peter Swan
SouthWest Analytic Network — UNITED STATES

Geoffrey Languedoc
Canadian Aeronautics & Space Institute (CASI) — CANADA

Rapporteur

Natasha Jackson
Faculty of Engineering, Carleton University — CANADA

E5.6 Space Societies and Museums

Space Societies form a special and important group of IAF members, in size the second Largest after space industries. They include professional societies, non-profit organisations and other organisations interested in space activities. Some have a large membership of 10.000 or more, others can be small to very small. There are some which are already a century old, others are just being created. They exist in traditional and emerging space nations. Together, they constitute an impressive number of individuals who all are connected to space. If things move according to plan, as of 2013 Space Museums are also entitled to become members of the IAF, providing their own interaction possibilities to space enthusiasts. This symposium, organised by the IAF Space Societies Committee, is the first of its nature. It is intended to offer a podium for ideas and proposals to enhance the interaction between the societies, their members and the Federation. Papers could for example address proposals to exchange experiences and good practices, sharing articles, exhibition or educational material, novel ideas to help outreach to the general public, etc. In particular also papers are invited on ways to integrate young societies, representatives of emerging space nations and museums in the IAF family and to develop mutual benefits.

Chairman

Scott Hatton
The British Interplanetary Society — UNITED KINGDOM

E6 BUSINESS INNOVATION SYMPOSIUM

The symposium will address creative business approaches to serving government and private sector customers, as well as government options for encouraging this activity. The symposium will address the general role of government in encouraging space industry applications, new business models in traditional space industry applications (e.g. satellite-based services involving Earth observation, navigation and communications), and new space industry applications (e.g., space tourism, space-industrialisation, space resource utilisation).

Coordinator

Ken Davidian
Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST) — UNITED STATES

E6.1 Case Studies and Prizes in Commercial Space

The entrepreneurial space movement can benefit from the experience of other programs, companies and individuals and new ideas that are built on these histories can be better positioned in a competitive market. This session is intended to collect and tell the histories of past and new space business attempts and successes as well provide insights into the use of incentive prizes to spur the emergence of a New Space movement.

Chairman

Aude de Clercq
European Space Agency (ESA) — THE NETHERLANDS

E6.2. Public/Private Human Access to Space - Supporting Studies

The International Academy of Astronautics (IAA) Commission 3 "Space Technology & System Development" has initiated a study group (#3.14) entitled "Public/Private Human Access to Space". The papers presented in this session either support this activity directly or indirectly through the use of management theory models as applied to select commercial space industry segments.

Chairman

Ken Davidian
Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST) — UNITED STATES

E6.3 New Space and New Science

The space industry has been predominated by government programs with a major focus on scientific exploration (both robotic or human). More recently, the world has seen the emergence of private organizations embarking on ambitious scientific space programs of their own. This session is designed to compile a sampling of these programs, providing a description and update of their activities in the non-profit world of science.

Chairman

Ken Davidian
Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST) — UNITED STATES

E7 57TH IISL COLLOQUIUM ON THE LAW OF OUTER SPACE

This symposium, organised by the International Institute of Space Law (IISL), addresses various aspects of the law of outer space and is structured in five sessions.

Coordinators

Lesley Jane Smith
Leuphana University of Lьneburg/Weber-Steinhaus & Smith — GERMANY

Mahulena Hofmann
University of Luxembourg — LUXEMBURG

E7.1 6th Nandasiri Jasentuliyana Keynote Lecture on Space Law and Young Scholars Session

In the first part of this session, the IISL will invite a prominent speaker to address the members of the Institute and other congress attendants on a highly topical issue of broad interest. The second part of this session will be especially dedicated to the space lawyers of the future, in that young scholars (under 35 years old) are invited to present a paper on "Space Law - Future Challenges and Potential Solutions" but the IISL is also open to other topics.

Co-Chairs

Tanja Masson-Zwaan
International Institute of Air and Space Law, Leiden University – THE NETHERLANDS

Milton Smith
Sherman & Howard, LLC — UNITED STATES

E7.2 Up, up and away: Future legal regimes for long-term presence in space

Current space law may be inadequate to meet the challenges of human presence and long-term activities in space. Authors are invited to review and evaluate current law, both public and private, in that regard. Others may consider how future activities could or should be regulated, or the problems inherent in space colonisation and governance. Science fiction has already opened such matters, and some may wish to reflect in the contribution that has there been made.

Co-Chairs

Jean-François Mayence
Belgian Federal Office for Science Policy (BELSPO) — BELGIUM

Francis Lyall
University of Aberdeen, Scotland, U.K. — UNITED KINGDOM

E7.3 The ISS IGA: Lessons learned and looking to the future

The International Space Station (ISS) has been governed by the International Space Station Intergovernmental Agreement (IGA). The IGA first entered into force in 1988, the second iteration in 1998. Since its inception it has included four major bodies of law: jurisdiction, tort, intellectual property and criminal law. It has governed the actions of approximately 16 Nations-States; facilitated the addition of a major partner; and incorporated a number of innovations. Currently, ISS operations have been extended to 2020. This panel will address the legal future of the ISS beyond 2020. What worked? What needs to be changed? What is the IGA's value as precedent for continuation of the ISS and other missions.

Co-Chairs

Joanne Gabrynowicz
University of Mississippi — UNITED STATES

Motoko Uchitomi
Japan Aerospace Exploration Agency (JAXA) — JAPAN

E7.4 Legal issues associated with private human flight, including space and ground facilities, traffic management and spaceports

With the ever-increasing likehood that a commercial industry for private human flight will ultimately develop, careful consideration must be given to the multitude of legal issues that are relevant for the 'launch' and return phases to and from earth. Various private entities have developed, or are in the process of developing, unique technologies to facilitate the space 'tourism' experience, and appropriate legal rules, at both a national and international level, will be required to cover issues such as safety, licensing, infrastructure, jurisdiction and control, traffic management (both in air and in space), and dedicated flight 'corridors', amongst others.
This session seeks to encourage an exchange of views as to whether there are common legal principles that might apply to all aspects of both the space and ground facilities that may be necessary, and also to discuss how the differences in technology may require variations at a national level to accommodate the sui generis questions that will arise for the various services that may be offered.

Co-Chairs

Steven Freeland
University of Western Sydney — AUSTRALIA

Niklas Hedman
United Nations Office at Vienna — AUSTRIA

Rapporteur

Diane Howard
McGill University — UNITED STATES

E7.5 Recent Developments in Space Law

In this session, papers are invited to address legal aspects of the most recent developments in space activities that have taken place since March 2013.

Co-Chairs

Philippe Clerc
Centre National d'Etudes Spatiales (CNES) — FRANCE

Lesley Jane Smith
Leuphana University of Lüneburg/Weber-Steinhaus & Smith — GERMANY

E7.6 E3.5 29th IAA/IISL Scientific-Legal Round Table

With the increasingly high resolution of space EO data, combined moreover with increasing location and navigation information provided by satellites, new questions arise regarding the risks and threats of abuse of such data, for example in areas of privacy, human rights and public order (terrorism).
This concerns in particular the governments regulating, controlling and often even themselves undertaking such space activities but also, increasingly, private operators who undertake them, either for the governments or for their own private gain. Clearly, regulations, mechanisms and concepts to counteract such risks, both legally and technically/operationally, exist, but their usage is not necessarily beyond discussion. Which technical measures and which legal instruments would be suitable to realistically safeguard future use of space EO data? What would be the possibilities as well as the effects of introducing, for example, 'firewalls', 'informed consent', or the 'criminalization' of leaking data in a comprehensive manner into these space sectors?
The 2014 IAA/IISL Scientific-Legal Roundtable is to address this issue from an interdisciplinary perspective.

Co-Chairs

Frans von der Dunk
University of Nebraska-Lincoln — THE NETHERLANDS

Rainer Sandau
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur

Marc Haese
DLR, German Aerospace Center — GERMANY

E7.7 B3.8 Joint IAF/IISL Session on Legal Framework for Cooperative Space

This session hosts papers on topics related to the legal framework governing collaborative space programmes, in particular governmental LEO and Exploration programmes. For the IAC 2014, the session will put special emphasis on highlighting the impact of ITAR and similar export control regimes on the development and operation phases of collaborative international space programmes, including lessons learned.

Co-Chairs

Cristian Bank
EADS Astrium Space Transportation GmbH — GERMANY

Bernhard Schmidt-Tedd
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur

Luise Weber-Steinhaus
WIA-Europe — GERMANY

E8 MULTILINGUAL ASTRONAUTICAL TERMINOLOGY SYMPOSIUM

This symposium, organised by the International Academy of Astronautics (IAA), will review the progress made in multilingual space terminology and its impact on international cooperation in space. Terminology is a key issue for a better understanding among people using various languages and dialects. Consecutive or simultaneous translation does not remove the risk of ambiguity during technical meetings and accuracy in terminology is essential during all phases of cooperation. The session will address issues such as standardisation of definitions in space science and technology. The specific character of emerging space countries will also be discussed.

Coordinators

Susan McKenna-Lawlor
Space Technology (Ireland) Ltd. — IRELAND

Tetsuo Yoshimitsu
ISAS/JAXA — JAPAN

E8.1 Multilingual Astronautical Terminology

This symposium, organised by the International Academy of Astronautics (IAA), will review the progress made in multilingual space terminology and its impact on international cooperation in space. Terminology is a key issue for a better understanding among people using various languages and dialects. Consecutive or simultaneous translation does not remove the risk of ambiguity during technical meetings and accuracy in terminology is essential during all phases of cooperation. The session will address issues such as standardisation of definitions in space science and technology. The specific character of emerging space countries will also be discussed.

Co-Chairs

Susan McKenna-Lawlor
Space Technology (Ireland) Ltd. — IRELAND

Tetsuo Yoshimitsu
ISAS/JAXA — JAPAN

Rapporteur

Fabrice Dennemont
International Academy of Astronautics (IAA) — FRANCE

Category V

YOUNG PROFESSIONALS VIRTUAL FORUM

The Young Professional Virtual Forum is a technical session oriented towards young space professionals allowing for sharing of information on a global scale with presenters and audience both at the IAC venue and online at their home/work/university locations. There are two types of VFs: 1- Separate or supplemental IAC session with abstract selection. 2- Broadcast of existing IAC session at the venue.

- **V1 FLIGHT CONTROL OPERATIONS YOUNG PROFESSIONALS VIRTUAL FORUM - JOINT SESSION OF THE SPACE OPERATIONS AND YOUNG PROFESSIONALS VIRTUAL FORUM SYMPOSIA**
- **V2 HUMAN SPACE ENDEAVOURS YOUNG PROFESSIONALS VIRTUAL FORUM**
- **V3 SPACE COMMUNICATIONS AND NAVIGATION YOUNG PROFESSIONALS VIRTUAL FORUM**
- **V4 STUDENT TEAM COMPETITION**
- **V5 SOCIAL MEDIA FOR SPACE EDUCATION AND OUTREACH YOUNG PROFESSIONAL VIRTUAL FORUM**

Coordinated by Kathleen Coderre, *Lockheed Martin Corporation — UNITED STATES* and Guillaume Girard, *INSYEN AG — GERMANY*

V.1 B6.4 Flight Control Operations Young Professionals Virtual Forum - Joint Session of the Space Operations and Young Professionals Virtual Forum Symposia

This session is a virtual forum co-sponsored by the Space Operations Committee and the Workforce Development/Young Professionals Programme Committee. The forum targets hands-on flight control/operations personnel from multiple international organisations with objectives of sharing best practices, lessons learned and issues. This is a joint session with session B6.4.

Co-Chairs

Katja Leuoth
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Philip Harris
National Aeronautics and Space Administration (NASA)/Johnson Space Center — UNITED STATES

Rapporteur

V.2 B3.9 Human Space Endeavours Young Professionals Virtual Forum

The Human Space Endeavours Young Professionals Virtual Forum is targeting individuals and organisations with the objective of sharing best practices, future projects, research and issues for the future of Human Space Endeavours. The is a virtual session co-sponsored by the Human Space Endeavours Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Cristian Bank
EADS Astrium Space Transportation GmbH — GERMANY

Guillaume Girard
INSYEN AG — GERMANY

Rapporteur

Alexandra Kindrat
International Space University (ISU) — CANADA

V.3 B2.8 Space Communications and Navigation Young Professionals Virtual Forum

A virtual session to present and discuss developments in a wide range of satellite communication topics, including fixed, mobile, broadcasting, and data relay technologies and services, as well as those for satellite based position determination, navigation, and timing. Both Earth orbital and interplanetary space communications topics can be addressed.
This session is co-sponsored by the Space Communications and Navigation Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Edward W. Ashford
Delft University of Technology — THE NETHERLANDS

Kevin Shortt
Canadian Space Society — CANADA

Rapporteur

V.4 E2.3 Student Team Competition

Undergraduate and graduate level students teams 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. The guidelines for the student competition will be distributed from the session chairs to the authors after abstract acceptance.

Co-Chairs

Naomi Mathers
Victorian Space Science Education Centre — AUSTRALIA

Carolyn Knowles
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Soyeon Yi
Korea Aerospace Research Institute — KOREA, REPUBLIC OF

V.5 E1.10 Social Media for Space Education and Outreach Young Professional Virtual Forum

This is a virtual session focusing on the use of social media to enhance education and outreach. This session is co-sponsored by the Space Education and Outreach Committee and Workforce Development-Young Professionals Programme Committee.

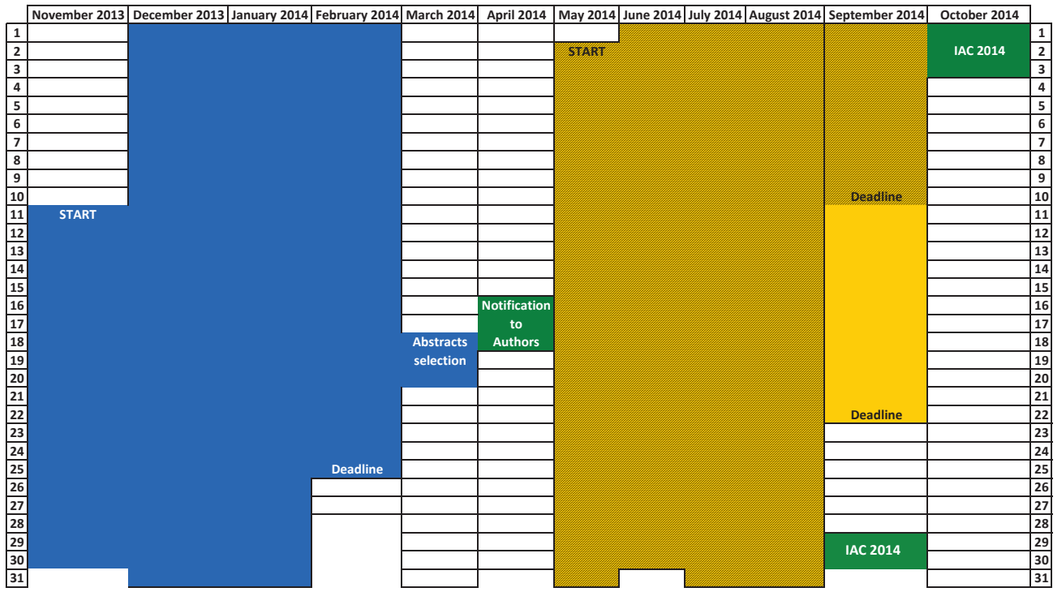
Co-Chairs

Jessica Culler
National Aeronautics and Space Administration (NASA)/Ames Research Center — UNITED STATES

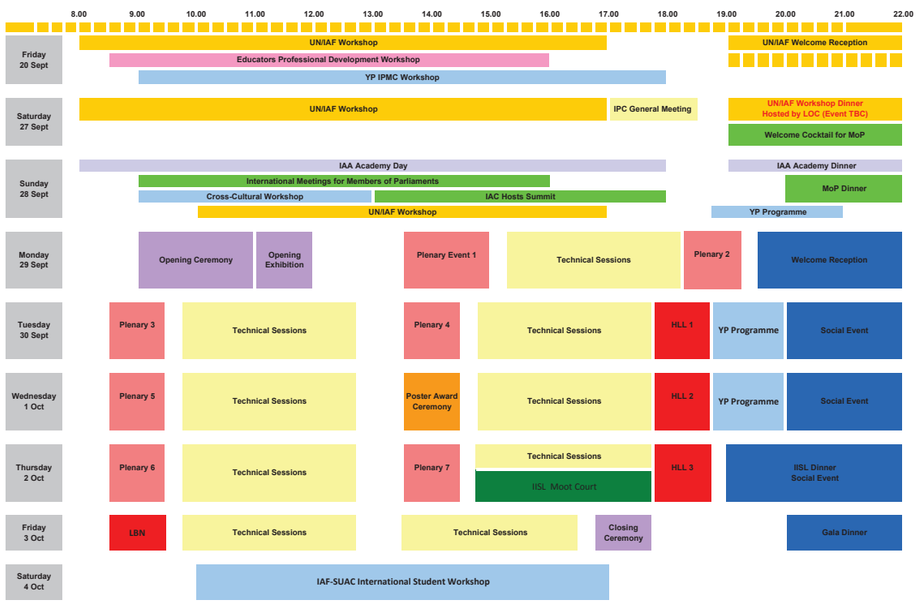
Ruth McAvinia
ESA — Ireland

Rapporteur

Calendar of Main IAC 2014 Deadlines



Preliminary Congress at a Glance Chart



Instructions to Authors

Abstract Preparation

Format

- Abstracts must be written in English.
- Abstract length should not exceed 400 words.

Content

- Tables or drawings are not allowed in the abstract.
- Formulas can be included using the toolbox provided on the abstract submission web page.
- Abstracts should specify: purpose, methodology, results and conclusions.
- Abstracts should indicate that substantive technical and/or programmatic content is included.

Co-authors

All your co-authors should be added at the time you submit your abstract using the tool provided online. You should register all of them online indicating their name, affiliation, full postal address, phone and email address.

Abstract Submission

Signing in

- The submission of abstracts must be done exclusively on the IAF website at www.iafastro.org.
- If you are submitting an abstract on our website for the first time, you will need to register.
- In case you have forgotten your password, please use the password recovery utility.

Submission

- Go to the new abstract submission page.
- Browse the technical programme and choose the symposium and technical session for which you want to submit your abstract.
- Type the title and content of your abstract into the related fields.
- Choose you presentation preference: oral presentation only, poster presentation only, oral or poster.
- Confirm that the material is new and original and that it has not been presented at a previous meeting.
- Confirm that your attendance at IAC 2014 to deliver and present the paper is assured.

Note: An abstract can be submitted to only one Technical Session

Abstract Selection

Submitted abstracts will be evaluated by the Session Chairs on the basis of technical quality and relevance to the session topics. Selected abstracts may be chosen for eventual oral or poster presentation – any such choice is not an indication of quality of the submitted abstract. Their evaluation will be submitted to the Symposium Coordinators, who will make acceptance recommendations to the International Programme Committee which will make the final decision. Please note that any relevance to the Congress' main theme will be considered as an advantage.

Paper and Presentation Submission

- Details on how to prepare and submit your final paper as well as your presentation material will be available on www.iafastro.org by mid-April.
- Authors with a paper accepted for an oral presentation will be offered a presentation slot of 10 to 20 minutes.
- Authors with a paper accepted for a poster presentation will be asked to prepare and bring an A0-sized poster to the Congress (portrait format.

International Astronautical Federation (IAF)

The IAC proceedings will be distributed as a DVD to all regular Congress participants. More information about the IAC paper archive is available on www.iafastro.org.

International Academy of Astronautics (IAA)

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

International Institute of Space Law (IISL)

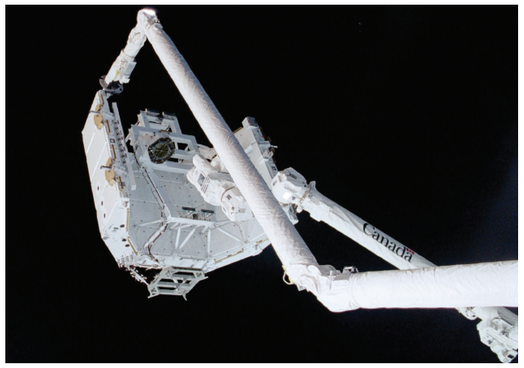
Authors should follow the above instructions for the submission of their abstracts. In addition to the IAC Proceedings DVD, the papers of the Colloquium, along with other materials, will be published in the Proceedings of IISL. Authors who qualify may ask to be considered for the Dr I.H. Ph. Diederiks-Verschoor Award for Best Paper. Please contact the IISL secretary for the regulations at secretary@iislweb.org.

DEADLINES

Abstract Submission	25 February 2014 (14:00 CET)
Paper Submission	10 September 2014 (14:00 CET)
Presentation Submission	22 September 2014 (14:00 CET)

Please make sure to check the IAF website regularly to get the latest updates on the Technical Programme!

Space in Canada



The Canadian space sector generates over $3 billion in revenues per year with about half of this total derived from exports, and provides knowledge-based, well-paying jobs for over 7,500 Canadians. While small compared with other industrial sectors the space industry owes its success to developing world-leading expertise in niche areas such as communications and Earth observation satellites, space robotics, and space hardware including satellite components and advanced composite materials.

Canada has developed an enviable reputation for its resourcefulness and reliability as a partner in global space missions. Major Canadian space programmes include:

The RADARSAT Constellation (RCM) is the evolution of the RADARSAT Program with the objective of ensuring data continuity, improved operational use of Synthetic Aperture Radar (SAR) and improved system reliability. The three-satellite RCM configuration will provide complete coverage of Canada's land and oceans and is designed to meet three principal objectives:

- Maritime surveillance - ice, wind, oil pollution and ship monitoring
- Disaster management - mitigation, warning, response and recovery
- Ecosystem monitoring - forestry, agriculture, wetlands and coastal change

The system offers up to four passes per day in Canada's far north and several passes per day over the Northwest Passage. The revisit frequency affords a range of applications that are based on regular collection of data and creation of composite images that highlight changes over time such as those induced by climate change, land use evolution, coastal modifications, urban subsidence and even human impacts on local environments.

The Near Earth Object Surveillance Satellite (NEOSSat) will systematically discover, track and determine orbits of near-Earth asteroids and comets, focusing on those in near-Sun orbits. Compared to ground-based telescopes NEOSSat will offer marked advantages in searching for near-Earth asteroids and comets. The ability to search the ecliptic plane at closer elongations to the Sun, to use parallax to discriminate NEAs from those of the Main Belt through distance determinations, and being able to observe continuously are the most significant advantages of a space platform.

The Next-Generation Canadarm (NGC) is the futuristic centrepiece of Canada's next step in advanced space robotics. The NGC will simplify repairs and perform other anticipated tasks for a variety of future missions that range from even deeper explorations of space by humans to galactic probes by robotically autonomous astronomy satellites. The NGC prototypes of robot arms, a ground control station, end-effectors and other next-generation tools will showcase unique Canadian hardware and software technology designed to extend the life of existing satellites such as the Hubble telescope by enabling the robotic servicing of sensitive equipment such as thermal blankets, cables and connectors.

The Controlled Environment Systems (CES) Research Facility and its Space and Advanced Life Support Agriculture program at the University of Guelph are an essential part of Canada's contributions to plant research and development for space activities. The CES Facility provides a complete research venue for measurement of plant growth, gas exchange, volatile organic compound evolution, and nutrient remediation in a precisely-controlled environment. The Facility is comprised of 24 sealed environment chambers including 9 variable pressure plant growth hypobaric chambers capable of sustaining a vacuum. CES personnel have extensive experience in the fields of plant physiology, environment analysis and sensor technology.

These are just a few of the many programs now being pursued by Canadian organizations. IAC 2014 will provide delegates from around the world the opportunity to meet with representatives of these and many other Canadian space organizations, to explore how the incorporation of Canadian space expertise can enhance the performance, reliability and value of international missions.

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