74th INTERNATIONAL ASTRONAUTICAL CONGRESS

2-6 October 2023, Baku, Azerbaijan
Global Challenges & Opportunities: Give Space a Chance

Call for Papers & Registration of Interest
IAF Alliance Programme Partners 2022

Contents
1. Message from the International Astronautical Federation (IAF) 2
2. Message from the Local Organizing Committee 2
3. Message from the IPC Co-Chairs 3
4. Messages from the Partner Organizations 4
5. International Astronautical Federation (IAF) 6
6. International Academy of Astronautics (IAA) 12
7. International Institute of Space Law (IISL) 13
8. The Space Generation Advisory Council (SGAC) 14
9. Message from the IAF Vice President for Technical Activities 15
10. Technical Sessions 16
11. IAC 2023 Call for Papers Deadlines 56
12. Preliminary IAC 2023 at a Glance 57
13. Instructions for Authors 58
14. Space in Azerbaijan 59
1. Message from the International Astronautical Federation (IAF)

Dear Colleagues,

The 74th International Astronautical Congress will take place in Baku, Azerbaijan between 2nd and 6th October 2023. It is an honour for the International Astronautical Federation to invite world experts and specialists in the field of space to share their research, and to discuss and debate the issues that are of mutual interest. Space is our future and we are all part of it. The space industry is a global industry and we are all part of it. It is our responsibility to ensure that space is used for the benefit of all mankind. And the International Astronautical Congress is an excellent platform that brings us all together, united in the face of global challenges and ready to explore the untapped potential of space for the benefit of the humanity.

In 2023, the global space community will convene in Baku at the International Astronautical Congress once again, exactly 50 years after Baku hosted the 24th edition of the IAC and became the first and the only city in the region to do so. This, certainly, is a major occasion in the history of the space industry development in Azerbaijan, as it is one of the core priorities of our vision as a country aspiring to foster the formation of regional space ecosystem and strengthen its position as an emerging space nation. What’s more, the 74th edition of IAC will give you a chance to get a first-hand experience of the unmatched Azerbaijan hospitality, expose yourself to genuine cultural immersion, and enjoy the diverse charms of our beautiful country.

On behalf of the Space Agency of the Republic of Azerbaijan, it is a great pleasure and an honour to host the 74th International Astronautical Congress in Baku, Azerbaijan. We are confident that the IAC 2023 will facilitate the forging of strong partnerships that will unite us all even more closely in our joint efforts to achieve global peace and prosperity.

Once again, we would like to extend a welcoming invitation to the IAC 2023 to our friends, colleagues, partners, and, in general, the international space community, to become parts of the innovative, immersive, and fascinating space event in Baku, Azerbaijan.

Sincerely,

Pascale Ehrenfreund
Past President, International Astronautical Federation (IAF), France

2. Message from the Local Organizing Committee

The space gives us extensive opportunities to dare, to create, to innovate, and to work in synergy towards a thriving, advanced future of the mankind. And the International Astronautical Congress is an excellent platform that brings us all together, united in the face of global challenges and ready to explore the untapped potential of space for the benefit of the humanity.

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Once again, we would like to extend a welcoming invitation to the IAC 2023 to our friends, colleagues, partners, and, in general, the international space community, to become parts of the innovative, immersive, and fascinating space event in Baku, Azerbaijan.

3. Message from the International Programme Committee (IPC) Co-Chairs

It is a real privilege and a great pleasure to host the 74th International Astronautical Congress IAC 2023 in Baku, Azerbaijan. Azerbaijan will welcome the global space community to Baku and offer an exceptional congress experience uniting participants into a collective stream of the past and the future under the theme Global Challenges and Opportunities: Give Space a Chance.

On behalf of Azercosmos, Space Agency of the Republic of Azerbaijan, we invite courageous space pioneers, space contributors, scientists, researchers, space experts and practitioners and students to submit their proposals to present at IAC 2023. Through improving knowledge transfer across academic institutions, the space industry, and societal organizations, IAC 2023 is an excellent platform for showcasing your best practices, achievements, and challenges turning into viable initiatives.

Being a member since 2003, Azerbaijan has been actively involved in IAFs activities. However, our ties with the IAF and the International Astronautical Congress (IAC) date back to 1973. For 70 years, the IAC has been a global platform for promoting space for wellbeing of the whole world. And we are proud for the legacy that the 24th IAC held in Baku in 1973 has left us with. The 24th IAC was one of the most memorable congresses in the history, leaving a lasting impression on guests. We are happy to mention that, in his letter, Stark Draper, the former President of the IAF in 1973, thanked the Azerbaijani community for their warm welcome, as well as congress organizers for arranging such an outstanding event. These words have inspired us and Azercosmos, as a host organization, to put forward the candidacy of Baku city in a bid to host the 74th IAC in Baku in 2023!

Now that the IAC returns to our region after such a long time, it will bring a breath of fresh air not only to Azerbaijan, but to the neighboring countries. It will contribute to the regional space platform with many new ideas, discussions and debates, while also creating opportunities for guests to immerse in Azerbaijan’s rich culture. As the transportation, business and space hub of the region, Azerbaijan will ensure the greatest benefits to all the participants of the upcoming IACs.

In terms of the organizational standard, the IAC in Baku will be approached with special attention and dedication. Our Institutions and people have mobilized their powers in order to organize and deliver an exceptional congress experience to all participants. And we are working strenuously with our partners to make IAC 2023 Baku event that could reach everyone, everywhere!

We sincerely hope you grab the chance to demonstrate your research papers publicly by being a contributor in one or more of the 180 technical sessions, and share knowledge and experience with collaborators working inside your sphere. All abstracts will proceed to the peer review and validation. And a certain number of papers will have the privilege of moving on to the next stage as vibrant presentations or oral performances.

We would like to encourage our international partners, individuals from governmental, scientific, academic, and commercial entities; heads of space agencies and space industries; scientists, engineers, enthusiasts, young professionals, and students, in one word: the entire space community, to become parts of the innovative, immersive, and fascinating space event in Baku, Azerbaijan, in 2023.

Dunay Bedirxanov
IPC Co-Chair, Vice-chairman/CTO, Azercosmos, Azerbaijan

Giorgio Saccoccia
IPC Co-Chair, President, Italian Space Agency (ASI), Italy

Samaddin Asadov
Chair, Azercosmos, Azerbaijan
4. Messages from the Supporting Organizations

Message from the International Academy of Astronautics (IAA)

For well over the past sixty years the International Academy of Astronautics, created at the outset of a new Space Age, has provided answers and solutions to the immense challenges that have faced the world community. This has made it a foremost center of excellence in Astronautics, thanks to the concerted efforts of its dedicated members who developed its vision for the role of humankind in Space.

Aiming to mobilize the best talents from many fields of science and technology, the Academy has been most successful in developing a wide array of new activities to explore the unlimited possibilities of Space to improve the quality of life for people all over the world. Decades of continuous progress have been achieved through important international events such as the highly successful Summits in Washington DC and Mexico attended by 25 to 35 Heads of Space Agencies, as well as nearly 25 standalone IAA conferences in the world and 13 symposia each year at the International Astronautical Congress.

The International Academy of Astronautics (IAA) is pleased to invite you to attend the IAA Academy Day open meeting on Sunday and the various IAA symposia throughout the week. The Academy is organizing 13 symposia at next year’s IAC in Baku, representing about one third of the IAC technical programme, and will co-host some interesting sessions with the IAF and the IISL. On the occasion of the Academy Day, newly elected Academicians will be introduced and the major IAA Awards will be given.

Please join us in advancing humankind’s reach into the Space frontier!

John Schumacher
President, International Academy of Astronautics (IAA)

Message from the International Institute of Space Law (IISL)

On behalf of the International Institute of Space Law, I am pleased to invite you to attend our 66th Colloquium on the Law of Outer Space in Baku, Azerbaijan. This year’s Colloquium consists of seven exciting sessions and explores a range of highly relevant issues. Legal questions raised by current public and private space activities will be addressed and debated by the world’s finest space lawyers as well as students and young professionals. IISL will also co-host a session with the IAA: The 37th IAA-IISL ‘Scientific Legal Roundtable’ will provide an opportunity for lawyers, scientists and engineers to address digitalization in an interdisciplinary setting. These are all issues, to which, we believe, IISL can and should contribute to. No other Institution has this global inclusive reach and such a top-level experienced expert membership paired with bright young scholars, which guarantees relevant contributions.

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The World Finals of the 32nd Manfred Lachs Space Law Moot Court Competition will take place in Baku, welcoming university students from Africa, the Asia Pacific, Europe, Latin America, and North America, and we are proud and honoured that they will, as always, be judged by sitting members of the International Court of Justice. The IISL is proud to be an integral part of the Congress and its Technical Programme and to further the discourse between disciplines so fundamental to our shared ways forward in this new era of the use of space.

We are looking forward to welcoming you to Baku!

Kai-Uwe Schrogl
President, International Institute of Space Law (IISL)

Message from the Space Generation Advisory Council (SGAC)

On behalf of SGAC, we are pleased to invite you to the 21st Space Generation Congress (SGC) to be held in Baku, Azerbaijan on 28-30 September 2023, prior to the 74th International Astronautical Congress (IAC).

In 2023, SGC will focus on emerging space actors, with a view towards involving students and young professionals in the space sector from as many parts of the world as possible. Being the only event of its kind, SGC offers the next generation of space leaders the opportunity to network and examine critical questions that are facing the space and international community at large.

It is with great pleasure that we would like to invite our global youth community to submit an abstract for the 74th IAC that will be held in Baku. The IAC brings together scientists, practitioners, engineers, and leaders of the space industry and of agencies together at a single forum to discuss recent research breakthroughs, technical advances and existing opportunities, as well as to grow their space careers.

We are looking forward to welcoming you to Baku!

Hamza Hameed
Chair, Space Generation Advisory Council (SGAC)

Anthony Yuen
Co-Chair, Space Generation Advisory Council (SGAC)
5. International Astronautical Federation (IAF)

Founded in 1951, the International Astronautical Federation is the world’s leading space advocacy body. The IAF has 433 members from 72 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" and its motto “Connecting GH Space People” - the Federation advances knowledge about space and fosters the development and application of space assets by advancing global cooperation.

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

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IAF IAC 2023
74th International Astronautical Congress
2 – 6 October 2023, Baku, Azerbaijan

The International Academy of Astronautics is a 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 independent non-governmental organization established in 1960 and recognized by the United Nations in 1996. It is an honorary society with an action agenda. With about 1200 elected members and corresponding members from 91 nations, the International Academy of Astronautics 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 more than 70 studies to date and is engaged in the preparation of about 40 others. The Academy also publishes four book series and its journal Acta Astronautica ranked 1st in its area of astronautics and space.

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Email: sgeneral@iaasmail.org
Website: www.iaaspace.org

7. International Institute of Space Law (IISL)

Founded in 1960, the International Institute of Space Law (IISL) is an independent non-governmental organization 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. Additionally, prospective membership is open to students and young professionals with a demonstrated interest in space law.

Since 1992, the IISL has organized the annual Manfred Lachs Space Law Moot Court Competition. The competition is based on a hypothetical space law case, and is written by IISL members. Approximately sixty student teams from universities in Africa, the Asia Pacific, Europe, and North America participate. The competition is an important part of the organization’s outreach programme, and is its principal mechanism for engaging future generations of space law professionals. The regional champions compete in the World Finals, which take place at the IAC and are judged each year by judges of the International Court of Justice. This unique feature makes the Manfred Lachs Moot Court one of the most prestigious moot court competitions in the world.

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Jenni Tapio (Finland)
Fabiola Zaccandelli (Italy)
Guoyu Wang (China)

This unique feature makes the Manfred Lachs Moot Court one of the most prestigious moot court competitions in the world.
8. Space Generation Advisory Council (SGAC)

The Space Generation Advisory Council in Support of the United Nations Programme on Space Applications is a global non-governmental, non-profit (US 501(c)) organization and network which aims to represent university students and young space professionals aged 18-35 to the United Nations, space agencies, industry, and academia. Headquartered in Vienna, Austria, the SGAC network of members, volunteers, and alumni has grown to more than 21,000 members representing more than 165 countries. SGAC was conceived at UNISPACE III in 1999, as part of the Vienna Declaration, “To create a council to support the United Nations Committee on the Peaceful Uses of Outer Space, through raising awareness and exchange of fresh ideas by youth. The vision is to employ the creativity in advancing humanity through peaceful uses of space”. SGAC holds Permanent Observer status at the United Nations Committee on the Peaceful Uses of Outer Space, as well as its Legal and Scientific and Technical Subcommittees (UN COPUOS) and regularly takes part in the annual meeting, the United Nations Committee on the Peaceful Uses of Outer Space, through its role of Space Applications. SGAC holds consultative status at the United Nations Economic and Social Council (UN ECOSOC), contributing to discussions on the role of space in achieving the UN Sustainable Development Goals. As a volunteer-run organization, SGAC believes in empowering its members and providing them with opportunities for professional development through roles in the SGAC teams. Further information regarding SGAC can be found at: www.spacegeneration.org

9. Message from the IAF Vice President for Technical Activities

The International Programme Committee is pleased to invite you to submit an abstract for consideration for the 74th International Astronautical Congress to be held in Baku, Azerbaijan from 2 to 6 October 2023. The Congress is organized by the International Astronautical Federation (IAF), hosted by the Space Agency of the Republic of Azerbaijan (Azercosmos), and will be supported by the International Academy of Astronautics (IAA), the International Institute of Space Law (IISL) and the Space Generation Advisory Council (SGAC) who contribute to the IAC through their particular events and symposia. The Space domain is experiencing quick modifications; one could say a revolution, both for users and developers of Space solutions. Coming years will be for sure a game changer for all space actors. It is the right time to join the global space community at this exciting international gathering – and play an active role in the Technical Programme by presenting your recent work. Holding the Congress under the theme “Global Challenges and Opportunities: Give Space a Chance” in Azerbaijan’s capital will make a significant contributions to the establishment of closer ties with foreign space agencies, companies and organizations, to the development of human capital.

This “Call for Abstracts” is a precursor to a subsequent submission of a final paper, which may be presented at the 74th IAC. Authors are invited to submit an abstract regarding an original, unpublished paper that has not been submitted in any other forum. Abstracts must fit into one of the following IAC categories: A. Science and Exploration; B. Applications and Operations; C. Technology; D. Infrastructure; E. Space and Society. Abstracts must be written in English and the length shall not exceed 400 words. Tables or drawings are not allowed in the abstract. Submitted abstracts can be considered for oral presentations (as ‘Short Talks’ in the Symposia) and for interactive presentations.

Submit your abstract through the online IAF portal at https://iafastro.directory/iac/account/login/ by 28 February 2023. Submitted abstracts will be evaluated by the Session Chairs on the basis of technical quality and relevance to the session topics. Abstracts will be considered for an oral or interactive presentation. All selected papers will be treated as equally important in the presentation sessions and Congress Proceedings, differing only in the format of the presentation sessions (in other words, Oral Presentation papers will NOT be considered more important than Interactive Presentation papers).

Their evaluation will be submitted to the International Programme Committee, which will make the final decision during the IAF Spring Meetings to be held in March 2023 in Paris, France. Please note that any relevance to the Congress main theme will be considered as an advantage. Accepted abstracts will be displayed on the Congress website and published in the IAC Congress Proceedings. We look forward to receiving your abstracts for IAC 2023 and please check the IAF website regularly to get the latest updates on the Technical Programme!

Lionel SUCHET
Vice President, Technical Activities
International Astronautical Federation (IAF)
A1.6 Astrobiology and Exploration
Space exploration planning now includes ambitious goals like human missions to the Moon and Mars, and innovative robotic exploration of bodies relevant for astrobiology such as the Mars, Venus, and the polar regions on Europa, Enceladus, and Titan. Astrobiology, therefore, becomes a space flight science, ready for direct measurements of habitability and the presence of life off Earth in many places. This session covers papers relevant to astrobiology, biotechnology, life detection, and planetary protection.

Co-Chairs
- Peter Bäth
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
- Torsten Kaiser
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur
- Ralf Wachter
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

A1.7 Life Support, Habitats 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
- Ulrich Kandler
  Airbus DS Germany — GERMANY
- Norbert Klein
  Airbus DS Germany — GERMANY

A1.8 Biology in Space
This session focuses on aspects of biology and biological systems related to gravity-based and space flight experiments as well as research not covered by other sessions of this symposium.

Co-Chairs
- Didier Chaput
  Centre National d’Études Spatiales (CNES) — FRANCE
- Fengyuan Zhuang
  Beihang University — CHINA

A1.9 Microgravity Sciences and Processes Symposium
The objective of the Microgravity Sciences and Processes Symposium, organized by the International Astronautical Federation (IAF), is to highlight and discuss the role of the IAF in microgravity 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.

Co-Chairs
- Peter Breus
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
- Oleg Orlov
  Russian Academy of Sciences (RAS) — RUSSIAN FEDERATION

Rapporteur
- Premkumar Saganti
  Lomonosov Moscow State University — RUSSIAN FEDERATION

A1.1 Human Physiology in Space
This session focuses on physiological effects of short- and long-duration spaceflight, and how this affects general health. Research into integrative (countermeasures) of space effects are also included.

Co-Chairs
- Eleni Katsarou
  Dept. of Aerospace, Biomedical, and Clinical Engineering, National University of Singapore — SINGAPORE
- Ian McCloskey
  University of California, San Francisco (UCSF) — UNITED STATES

A1.2 Human Physiology in Space
This session focuses on physiological effects of short- and long-duration spaceflight, and how this affects general health. Research into integrative (countermeasures) of space effects are also included.

Co-Chairs
- Eleni Kontos
  Dept. of Aerospace, Biomedical, and Clinical Engineering, National University of Singapore — SINGAPORE
- Ion McCloskey
  University of California, San Francisco (UCSF) — UNITED STATES

A1.3 Medical Care for Humans in Space
This session focuses on medical care for astronauts including operational medical experts, countermeasure developments 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 be on medical care for passengers and operators of commercial vehicles and orbiting spaceflights.

Co-Chairs
- Satoshi Iwase
  Aichi Medical University — JAPAN
- Oleg Orlov
  Russian Academy of Sciences (RAS) — RUSSIAN FEDERATION

A1.4 Medicine in Space and Extreme Environments
Over the last decades numerous space missions and experiments have taken place. The use of microgravity as a test bed to study new fundamentals of life revealed a substantial number of new scientific insights and anomalies. Space is the least familiar extreme environment affected by strong accelerations and changes in gravity, as well as variations in light and temperature. This session will cover the latest scientific results and technological advances from medical biological and psychological research in extreme environments for the benefit of life on Earth.

Co-Chairs
- Oleg Orlov
  Russian Academy of Sciences (RAS) — RUSSIAN FEDERATION
- Torsten Kaiser
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

A1.5 Radiation Fields, Effects and Risks in Human Space Missions
The major topics of the session are the characterization of the radiation environment by theoretical modeling and experimental data, radiation effects on physical and biological systems, countermeasures to address and radiation risk assessment.

Co-Chairs
- Lawrence Proudfit
  University of Houston — UNITED STATES
- Gernot Klotz
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

A1.6 Astrobiology and Exploration
Space exploration planning now includes ambitious goals like human missions to the Moon and Mars, and innovative robotic exploration of bodies relevant for astrobiology such as the Mars, Venus, and the polar regions on Europa, Enceladus, and Titan. Astrobiology, therefore, becomes a space flight science, ready for direct measurements of habitability and the presence of life off Earth in many places. This session covers papers relevant to astrobiology, biotechnology, life detection, and planetary protection.

Co-Chairs
- Peter Bäth
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
- Torsten Kaiser
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

Rapporteur
- Ralf Wachter
  Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
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**

Nadeem Ghafoor  
Ames Research Center — UNITED STATES

Kathy Laurini  
Co-Chairs

**Rapporteurs**

Nadine Giakoumakis  
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

**Co-Chairs**

Bernard Foing  
European Space Agency (ESA) — THE NETHERLANDS

David Karnerwer  
National Aeronautics and Space Administration (NASA),  
Aeron Research Center — UNITED STATES

**Rapporteurs**

Nadine Giakoumakis  
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

**Co-Chairs**

Bernard Foing  
European Space Agency (ESA) — THE NETHERLANDS

David Karnerwer  
National Aeronautics and Space Administration (NASA),  
Aeron Research Center — UNITED STATES

**Rapporteurs**

Nadine Giakoumakis  
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY

**Interactive Presentations - IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM**

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Microgravity Sciences and Processes addressed in the classic sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the authors will be assigned a specific ten minute slot to personally present their topic and interact with the attendees present. The interactive presentation may include audio-visual elements such as PowerPoint slides, embedded links, pictures, audio and video clips, etc. Authors will also be responsible for the author of the first Interactive Presentation in the A Category at a special ceremony.

**Co-Chairs**

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

**Rapporteurs**

Peter Graef  
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
A4 52nd IAA Symposium on the Search for Extraterrestrial Intelligence (SETI) — the Next Steps

This session, organized by the International Academy of Astronautics (IAA), covers the strategic, architectural and technology development for future human exploration, and the search for Mars, Lagrange points and Moons.

Chair:
Kathryn Brown
York University
Co-Chairs:
Maria Antonietta Perico
Thales Alenia Space Italia — ITALY

A5.1 Human Exploration of the Moon and Lunar Space

This session will examine how to support human exploration of the Moon and Lunar space.

Chair:
Hans von Olheim
Avalon Space — CANADA

A6.7 Interactive Presentations — 26th IAA Symposium on Space Debris

This session, organized by the European Astronaut Association — EAA, will examine how to support human exploration of the Moon and Lunar space.

Chair:
Christian Sallaberger
German Aerospace Center (DLR) — GERMANY

A6.2 Model and Risk Analysis

This session will address the mitigation of the current and future debris problems and mechanisms for in-situ and on-ground risk assessments. This interstellar workshop will cover the mitigation of the current and future debris problems and mechanisms for in-situ and on-ground risk assessments. It will provide an overview of the state of the art in debris mitigation techniques and highlight the challenges and opportunities for future missions.

Chair:
Nadine Ghafoor
Avalon Space

A6.5 Impact-Induced Mission Effects and Risk Assessments

This session will examine the impact of mission effects on risk assessments. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Zihong Song
Avalon Space

A6.3 Mitigation, Tools, Techniques - Challenges - SEM

This session will examine the mitigation of mission effects on risk assessments. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Yelizaveta Lisenkova
Avalon Space

A6.6 Post Mission Disposal and Space Debris Removal - 2

This session will focus on the mitigation of mission effects on risk assessments. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Marko Jankovic
Canadensys Aerospace Corporation — CANADA

A5.2 Space Debris Detection, Tracking and Characterization - SST

This session, organized by the European Astronaut Association — EAA, will focus on the mitigation of mission effects on risk assessments. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Kathy Laurini
Canadensys Aerospace Corporation — CANADA

A6.8 Operations in Space Debris Environment, Situational Awareness - SSA

This session will address the operations in space debris environment. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Satomi Kawamoto
Avalon Space

A6.1 Space Debris Detection, Tracking and Characterization - SST

This session, organized by the European Astronaut Association — EAA, will focus on the mitigation of mission effects on risk assessments. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Christian Sallaberger
German Aerospace Center (DLR) — GERMANY

A5.3 Human and Robotic Partnerships in Exploration - Joint session of the IAA Human Spaceflight and IAF Exploration Symposium

This session will examine the role of robotic technology in the exploration of space, and the potential of human and robotic technologies in space exploration. It will also cover the development of robotic technologies for human spaceflight missions.

Chair:
Christian Sallaberger
German Aerospace Center (DLR) — GERMANY

A5.5 Interactive Presentations — 26th IAA Symposium on Human Exploration of the Solar System

This session, organized by the International Academy of Astronautics (IAA), will focus on the mitigation of mission effects on risk assessments. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Mark A. Synder
The Aerospace Corporation — UNITED STATES

A5.6 Deep Space Habitats and Resources

This session will address the habitats and resources required for human exploration of deep space. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Noelia Sanchez Ortiz
Barrabes.biz — SPAIN

A5.7 Operations in Space Debris Environment, Situational Awareness - SSA

This session will address the operations in space debris environment. It will cover the assessment of mission effects on mission safety, mission efficiency, and mission sustainability. It will also provide an overview of the state of the art in mission effect assessment and highlight the challenges and opportunities for future missions.

Chair:
Noelia Sanchez Ortiz
Barrabes.biz — SPAIN
A6.8 Political, Legal, Institutional and Economic Aspects of Space Debris Mitigation and Removal - STM Security

This session will address the non-technical aspects of debris mitigation, debris remediation and STM. Topics may include: political, legal, liability and regulation, on the role of bodies such as UN COPUOS or IADC, as well as on insurance, financial incentives and funding. In addition, security-related aspects and the role of international cooperation in order to address debris issues may also be considered.

**Co-Chairs**
- Giuseppe Culicchia, ESA — THE NETHERLANDS
- Alexander Knotts, Deimos Space UK Ltd — UNITED KINGDOM

**Reairport**
- Andrea Capecchi, Lockheed Martin Space Systems — UNITED STATES
- Ludovic Manenti, ADP DSS — FRANCE

A6.9 Orbit Determination and Propagation - SST

This session will address every aspect of orbit determination coming from the SST (Space Surveillance Tracking), related to assessment of raw and derived data accuracy, orbit measurement processing and training and risk analysis of space debris.

**Co-Chairs**
- John García, European Space Agency (ESA) — GERMANY
- Sergio Pintado, University College London (UCL) — UNITED KINGDOM

**Reairport**
- Daniele Ubertini, University of Bologna — ITALY
- Galen Young, FLIR Systems Inc. (FLIR) — UNITED STATES

A7.4 Science Goals and Drivers for Future Exoplanet, Space Astronomy and Space Physics

The session will be devoted to scientific problems and needs in the fields of space astronomy, space physics, and fundamental physics. New directions for measurements that are being opened by emergent results and newly identified phenomena will be explored. Scientific roadmaps to address these directions will be discussed.

**Co-Chairs**
- Eric Miller, Arizona State University (ASU) — UNITED STATES
- Alexandros Papadopoulos, European Southern Observatory (ESO) — GERMANY

**Reairport**
- Joseph Kallman, Goddard Space Flight Center (GSFC) — UNITED STATES
- Fawwaz Al-Abed, University of Virginia (UVA) — UNITED STATES

A7.5 Technology Needs for Future Missions, Systems, and Instruments

This session is dedicated to the development of new technology for future missions, systems, and instruments. The session will provide an overview of the technology needs of current missions and plans for future missions. It will also discuss potential technology development needs for future missions and systems.

**Co-Chairs**
- Chris Horgan, University of Leicester — UNITED KINGDOM
- Michela Chiari, University of Padova (UNIPD) — ITALY

**Reairport**
- Andrew Court, TNO — THE NETHERLANDS
- Anna Durrant, University of Oxford — UNITED KINGDOM

A6.10 TBD

This session will address a topic that has not yet been determined.

**Co-Chairs**
- Principal: TBD

**Reairport**
- Principal: TBD

A6.1 P Interactive Presentations - 21st IAF SYMPOSIUM ON SPACE DEBRIS

This session offers a unique opportunity to deliver your technical message in an interactive presentation on any of the subjects of space debris addressed in the Congress. The presentation will be displayed on a digital screen in a dedicated location and available for viewing by all Congress attendees for the entire Congress week. In addition, on-site attendees will be able to ask questions electronically for the presenter, and the author will be assigned a specific time slot to personally present, and will be able to interact with the audience present. The Interactive Presentation addresses the role of electronic display capabilities, such as PowerPoint charts, embedded hot links, pictures, audio and video clips etc. An award will also be presented to the author of the best Interactive Presentation in the A Category as a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard oral talk.

**Co-Chairs**
- Barbara Bertanza, European Space Agency (ESA) — GERMANY
- Paolo Mazzola, University of Rome “La Sapienza” — ITALY

**Reairport**
- Marco Speranza, University of Naples “Federico II” — ITALY
- Christopher Brito, Centre National d’Etudes Spatiales (CNES) — FRANCE

A7.6 APPLICATIONS AND OPERATIONS

**Category**

**B1 IAF EARTH OBSERVATION SYMPOSIUM**

**B2 IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM**

**B3 IAF HUMAN SPACEFLIGHT SYMPOSIUM**

**B4 30th IAF SYMPOSIUM ON SMALL SATELLITE MISSIONS**

**B5 IAF SYMPOSIUM ON INTEGRATED APPLICATIONS**

**B6 IAF SPACE OPERATIONS SYMPOSIUM**

Category coordinated by Igor V. Sorskin, S.P. Korolev Rocket and Space Corporation Energia, RUSSIAN FEDERATION
B1.6 Assessing and Mitigating the Global Freshwater Crisis

Rapporteur

Advances in Space-based Communication Systems and Services, Part 3

This session focuses on all aspects of new space communications, services, architecture and infrastructure; fixed, mobile and broadcast services, including the high-throughput satellite (HTS) and low earth orbit systems. It includes integration into satellite networks, for and beyond, HTS bands and higher frequencies and laser communication (including quantum communications, V-band, and radio-frequency and internet services, including video to users, near-earth and interplanetary systems. It also includes spectrum issues for new services, and systems modeling.

Co-Chairs

Mohammad Zargham
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

Robert Shumsky
Capella Communications

B2.4 Advances in Space-based Communication Systems and Services, Part 3

This session focuses on all aspects of new space communications, services, architecture and infrastructure; fixed, mobile and broadcast services, including the high-throughput satellite (HTS) and low earth orbit systems. It includes integration into satellite networks, for and beyond, HTS bands and higher frequencies and laser communication (including quantum communications, V-band, and radio-frequency and internet services, including video to users, near-earth and interplanetary systems. It also includes spectrum issues for new services, and systems modeling.

Co-Chairs

Robert Shumsky
Capella Communications

Rapporteur

Kevin D. Foley
European Space Agency (ESA) — THE NETHERLANDS

B1.8 Earth Observations to address Earth’s Environment and Climate Challenges

This session is focused on all aspects of space-based communication systems and services, fixed, mobile and broadcast services, including the high-throughput satellite (HTS) and low earth orbit systems. GTS.3

Co-Chairs

Harry Ciboroski
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES

Rapporteur

Tanya Tietmeyer
Canadian Space Agency — CANADA

B1.1P Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Earth Observation addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week.

Co-Chairs

Luc Fernerey
Airbus Defence and Space — GERMANY

Wouter de Gruij
Stem Unifying

B2 IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM

This session is focused on all aspects of space-based communication systems and services, architecture and infrastructure; fixed, mobile and broadcast services, including the high-throughput satellite (HTS) and low earth orbit systems. It includes integration into satellite networks, for and beyond, HTS bands and higher frequencies and laser communication (including quantum communications, V-band, and radio-frequency and internet services, including video to users, near-earth and interplanetary systems. It also includes spectrum issues for new services, and systems modeling.

Co-Chairs

Peter Built
European Union Agency for the Space Programme (EUSPA) — THE NETHERLANDS

Rapporteur

Stef Wijnen
The Aerospace Corporation — UNITED STATES

B2.1 Advances in Space-based Navigation Technologies

This session is focused on all aspects of space-based navigation systems, services, architecture and infrastructure; fixed, mobile and broadcast services, including the high-throughput satellite (HTS) and low earth orbit systems. It includes integration into satellite networks, for and beyond, HTS bands and higher frequencies and laser communication (including quantum communications, V-band, and radio-frequency and internet services, including video to users, near-earth and interplanetary systems. It also includes spectrum issues for new services, and systems modeling.

Co-Chairs

Robert Shumsky
Capella Communications

Rapporteur

Robert D. Brillantes
SIN University — UNITED STATES

B3 IAF HUMAN SPACEFLIGHT SYMPOSIUM

This session is focused on all aspects of human spaceflight, as well as related issues. It includes both technical and societal perspectives on human spaceflight, including presentations on human spaceflight, launch services, and cooperation with other space agencies and industries.

Co-Chairs

Kevin D. Foley
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Wie-Leuk
The Aerospace Corporation — UNITED STATES

IAF HUMAN SPACEFLIGHT SYMPOSIUM

This session is focused on all aspects of human spaceflight, as well as related issues. It includes both technical and societal perspectives on human spaceflight, including presentations on human spaceflight, launch services, and cooperation with other space agencies and industries.

Co-Chairs

Kevin D. Foley
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Igor M. Makarov
Space Corporation Design — RUSSIAN FEDERATION

Peter Loewen
Netherlands Space Society (NVR) — THE NETHERLANDS

IAF HUMAN SPACEFLIGHT SYMPOSIUM

This session is focused on all aspects of human spaceflight, as well as related issues. It includes both technical and societal perspectives on human spaceflight, including presentations on human spaceflight, launch services, and cooperation with other space agencies and industries.

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Kevin D. Foley
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Igor M. Makarov
Space Corporation Design — RUSSIAN FEDERATION

Peter Loewen
Netherlands Space Society (NVR) — THE NETHERLANDS

IAF HUMAN SPACEFLIGHT SYMPOSIUM

This session is focused on all aspects of human spaceflight, as well as related issues. It includes both technical and societal perspectives on human spaceflight, including presentations on human spaceflight, launch services, and cooperation with other space agencies and industries.

Co-Chairs

Kevin D. Foley
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Igor M. Makarov
Space Corporation Design — RUSSIAN FEDERATION

Peter Loewen
Netherlands Space Society (NVR) — THE NETHERLANDS

IAF HUMAN SPACEFLIGHT SYMPOSIUM
B3.1 Governmental Human Spaceflight Programmes (Overview)

This session provides an overview of current and planned human spaceflight programmes of governments worldwide. The presentations will include the roles of national space agencies, government programmes, and international cooperation in human spaceflight. The session will cover topics such as new programme announcements, current status, future plans, budget, and technology development. 

Co-Chairs

Co-Chairs

B3.2 Commercial Human Spaceflight Programmes

This session is designed to examine and identify the potential evolution of key elements of human spaceflight programmes, as the role of businesses and private entities in human spaceflight expands. It will also include the role of non-governmental sector companies in human spaceflight, including potential roles in future commercial human spaceflight activities. 

Co-Chairs

B3.3 Human Spaceflight Infrastructure

This session examines current and future human spaceflight infrastructure, including the roles of national space agencies, government programmes, and international cooperation in human spaceflight. The presentations will include the roles of national space agencies, government programmes, and international cooperation in human spaceflight. The session will cover topics such as new programme announcements, current status, future plans, budget, and technology development. 

Co-Chairs

B3.4 Flight & Ground Operations of Human Spaceflight - Joint Session of the IAF Human Spaceflight and IAF Space Operations

This session examines the role of human spaceflight in the overall context of space exploration and collaboration, and provides an overview of current and future human spaceflight programmes. The presentations will include the roles of national space agencies, government programmes, and international cooperation in human spaceflight. The session will cover topics such as new programme announcements, current status, future plans, budget, and technology development. 

Co-Chairs

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

This session examines the role of human spaceflight in the overall context of space exploration and collaboration, and provides an overview of current and future human spaceflight programmes. The presentations will include the roles of national space agencies, government programmes, and international cooperation in human spaceflight. The session will cover topics such as new programme announcements, current status, future plans, budget, and technology development. 

Co-Chairs

B3.6 Human and Robotic Partnerships in Exploration - Joint session of the IAF Human Spaceflight and IAF Exploration

This session examines the role of human spaceflight in the overall context of space exploration and collaboration, and provides an overview of current and future human spaceflight programmes. The presentations will include the roles of national space agencies, government programmes, and international cooperation in human spaceflight. The session will cover topics such as new programme announcements, current status, future plans, budget, and technology development. 

Co-Chairs

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

This session examines the role of human spaceflight in the overall context of space exploration and collaboration, and provides an overview of current and future human spaceflight programmes. The presentations will include the roles of national space agencies, government programmes, and international cooperation in human spaceflight. The session will cover topics such as new programme announcements, current status, future plans, budget, and technology development. 

Co-Chairs
Constellations and Distributed Systems

Small Earth Observation Missions

This session will focus on new and upcoming remote monitoring missions, satellite and technology developments, and design of both current and planned Earth and mini-Earth missions. This session addresses the technologies, applications, and missions achieved through the use of small, cost-effective satellites for the delivery of data for Earth observation. This includes remote sensing satellites in low Earth orbit and the development of new opportunities for small spacecraft technologies suited to use on small satellites including those in the range to multiple satellite constellations. Particularly encouraged are technologies or technology development efforts that model and simulate developments, such as the small satellite mission and the emerging satellite community. Significant presenters of this session include various Earth observation missions and technology providers in addition to traditional users. The session will address emerging opportunities for small satellite mission and applications for emerging missions and technologies.

Access to Space for Small Satellite Missions

A key economic challenge facing the viability and growth of the small satellite industry is access to space. A number of emerging launch opportunities such as the developing small-launch market and commercial launch capability hold significant promise to open new launch opportunities for small satellite missions as well as commercial ventures.

Generic Technologies for Nano/Pico Platforms

This session covers emerging and promising generic technologies for small micro-platforms. For example, it is particularly encouraging to investigate emerging and promising generic technologies for small micro-platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023). This session will focus on emerging and promising generic technologies for small and micro-platforms, real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023). This session will focus on emerging and promising generic technologies for small and micro-platforms, real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023).

B4.5A GTS.5

Joint Session between IAA and IAF for Small Satellite Propulsion Systems

This joint session will focus on small satellite propulsion systems. It aims to bring together experts from various fields to discuss the latest developments, challenges, and opportunities in this area. The session will cover topics such as propulsion system design, optimization, and performance, as well as the integration of propulsion systems into small satellite missions. Participants are encouraged to share their latest research findings, innovations, and applications in the field of small satellite propulsion systems.

B4.6A C4.8

Generic Technologies for Nano/Mini Platforms

This session covers emerging and promising generic technologies for nano and mini-platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023).

B4.7

Constellations and Distributed Systems

Small satellites offer important advantages in creating new opportunities for implementing spatially-distributed space-based systems (e.g., constellations). In this session we focus on emerging, or existing technologies that can be used in or being used to develop remote sensing data collection systems on small satellites. Examples include innovative remote sensing technologies, new approaches to constellation design, and methods for quickly deploying new space systems. The session covers various topics related to small satellites, including data collection systems, mission operations, and technology development. The session will also address emerging opportunities for small spacecraft technologies in the range to multiple constellations, such as Earth observation missions, as well as emerging opportunities for small spacecraft technologies suited to use on small satellites including those in the range to multiple satellite constellations. Particularly encouraged are technologies or technology development efforts that model and simulate developments, such as the small satellite mission and the emerging satellite community. Significant presenters of this session include various Earth observation missions and technology providers in addition to traditional users. The session will address emerging opportunities for small satellite mission and applications for emerging missions and technologies.

B4.8

Small Spacecraft for Deep-Space Exploration

This session focuses on innovative new spaceflight designs, systems, missions and technologies for the exploration and utilization of space beyond Earth orbit. Target destinations for these missions include the Moon, Mars, asteroids, and comets, as well as other exoplanetary destinations that are targets for mission studies. The session will focus on innovative new spaceflight designs, systems, missions and technologies for the exploration and utilization of space beyond Earth orbit. Target destinations for these missions include the Moon, Mars, asteroids, and comets, as well as other exoplanetary destinations that are targets for mission studies.

B4.5

Access to Space for Small Satellite Missions

This session will focus on emerging and promising generic technologies for small micro-platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023). This session will focus on emerging and promising generic technologies for small micro-platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023).

B4.4

Small Earth Observation Missions

This session will focus on emerging and promising generic technologies for small micro-platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023).

B4.6

Generic Technologies for Nano/Mini Platforms

This session will cover emerging and promising generic technologies for small micro-platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (e.g. 2023).
B5.2 Integrated Applications End-to-End Solutions

The session will be a forum for end-to-end solutions, case studies, proofs of concept and applications, and current projects that can provide innovative and sustainable solutions that combine terrestrial and space-based data services with models and other technologies to address specific user requirements. These examples can cover a variety of sectors, like disaster management, environmental monitoring, economic development, food security, climate change, sustainable development, transport, health, migration, education, and tourism. The user needs, the implementation of the solutions, the service value chain, the business case, and the societal impact of the solutions are among the many aspects that can be considered. Examples of projects with established partnerships between space and non-space stakeholders are appreciated. The different ways of assessing the impact of specific integrated applications in addressing the users’ needs and requirements will also be discussed.

Co-Chairs

Boris Penner

Uni-Space Systems AG — GERMANY

Roberta Mugellesi-Dow

European Space Agency (ESA) — UNITED KINGDOM

B5.3 Satellite Commercial Applications

The emphasis of “New space” and satellite-based (re-)solutions has contributed to the rise of commercial satellite applications. There is an increasing demand for commercialization in several vertical markets such as agriculture, energy, and transport and telecommunication. Industry is a key player in this development. Moreover, the democratization of micro and small satellites, including the establishment of satellite internet services, is driving innovation and change in the traditional satellite services and telecommunication services. This thematic session will provide an overview of the latest developments in the field.

Co-Chairs

John M. Horack

The Ohio State University College of Engineering — UNITED STATES

Denizye Ye

Chinese Academy of Science and Technology Corporation (CAST) — CANADA

B6.1 Ground Operations - Systems and Solutions

This session focuses on all aspects of ground systems and solutions for all mission types, for both preparation and execution phases.

Co-Chairs

Vince Burns

EUSAIR — GERMANY

Claude Audu

Centre National d’Études Spatiales (CNES) — FRANCE

Rapporteur

Krzysztof Miszczyk

Airbus Defence and Space — GERMANY

B6.2 Innovative Space Operations Concepts and Advanced Systems

This session focuses on innovative space operations and addresses advanced concepts, systems, approaches, and tools for operating existing and new types of missions, improving mission output in quality and quantity, and reducing cost.

Co-Chairs

Marc Cardiño

Tostes Avenue Space France — ITALY

Thomas Kuch

Deutsche Forschungsgemeinschaft (DFG) — GERMANY

Rapporteur

Jean-Baptiste Molinos

ESOC Grund-B. — ITALY

Yukiko Naganuma

Japan Aerospace Exploration Agency (JAXA) — JAPAN

B6.3 Mission Operations, Validation, Simulation and Training

This session addresses the theme of space-based operations, from preparation through validation, simulation and training, including operations concepts, exercises and lessons learned.

Co-Chairs

Andreas Rebhun

European Space Agency (ESA) — GERMANY

Zein Maroun

Thales Véléa Véluca Deutschland GmbH — GERMANY

Rapporteur

Bomil Pederson

Kongsberg Satellite Services AS — NORWAY

Matthew Duggan

The Boeing Company — UNITED STATES

B6.4 Flight & Ground Operations of HSF Systems - A Joint Session of the IAF Human Spaceflight and IAF Space Operations Symposia

This session addresses advanced concepts and challenges and their potential solutions for flight and ground operations within governmental and commercial human spaceflight. Topics include among others, cutting-edge operational tools, solutions, efficient cost reduction measures, improved operational ground facilities or infrastructure, enhanced logistics concepts as well as new approaches for mission planning, ground transportation, and sustainment.

Co-Chairs

Dierk Volmer

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

Amin Parvin

University of Tehran — IRAN

Rapporteur

Thomas A.K. Anderson

Deutsche Aerospace Company AG — GERMANY

Markus Grösch

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

B6.5 Large Constellations & Fleet Operations

Access to space has been simplified, and the door is now wider than ever. The rise of commercial applications has opened the door to new players, with large constellations of units that have been deployed before. The space traffic management approaches, end-of-life management, as well as the advantages, challenges, the outflows and foreseen developments.

Co-Chairs

John Rubins

Astrostart AS — UNITED KINGDOM

Zein Maroun

Thales Véléa Véluca Deutschland GmbH — GERMANY

Rapporteur

Andreas Rebhun

European Space Agency (ESA) — GERMANY

Shawn Linam

I'mtico Inc. — UNITED STATES

Interaction Presentations - IAF SPACE OPERATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Operations addressed in the classic sessions. The presentation will be displayed on a digital screen in a dedicated location and available for use by all Congress attendees for the entire Congress week. In addition, your video, pictures, audio and slides will be streamed live to the audience attending the interactive presentation, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The interactive presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded links, pictures, audio and video clips etc. An award will be presented to the author of the best interactive Presentation in the category of a special commendation. An abstract that follows the standard format must be submitted by the deadline for classic IAC abstracts.

Co-Chairs

John Rubins

Astrostart AS — UNITED KINGDOM

Otto G. Liskov

Michelin V Formation Support Center (CASC) — CANADA

Propulsion Laboratory — UNITED STATES

Category C

TECHNOLOGY

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

C1 IAF ASTRODYNAMICS SYMPOSIUM

C2 IAF MATERIALS AND STRUCTURES SYMPOSIUM

C3 IAF SPACE POWER SYMPOSIUM

C4 IAF SPACE PROPULSION SYMPOSIUM

Category coordinated by John C. Mankins, ARTREMS Innovation Management Solutions, LLC, UNITED STATES

C1 IAF ASTRODYNAMICS SYMPOSIUM

The symposium addresses advances in celestial mechanics, attitude dynamics, guidance, navigation and control of space systems.

Chairmen

David S. Schennach

Coordinating Center for Astrodynamics Research, University of Colorado — UNITED STATES

Vianney Martinez

Thales Alenia Space France — FRANCE

C1.1 Attitude Dynamics (1)

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

Co-Chairs

Zhihong Wang

China Academy of Space Technology (CAST) — CHINA

Glenn A. F كان

University of Michigan — UNITED STATES

Rapporteur

Shanghai University of Science and Technology — CHINA

C1.2 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. The theme also covers dynamics and control of multiple interconnected rigid and flexible bodies, including spherical systems, and in orbit assembly.

Co-Chairs

Georgios Ares

— SINGAPORE, REPUBLIC OF

Wolfgang Marquardt

Max-Planck-Institut für Aerothronische Technik (MAP) — GERMANY

Rapporteur

Armin Hauck

Aeronautics Research Institute of Israel (AFRI) — ISRAEL

C1.3 Guidance, Navigation and Control (1)

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

Co-Chairs

Jing Li

Institute of Astronautical Science Engineering (China)

Academy of Space Technology (CAST) — CHINA

Krzysztof Kalarus

Aerion University — CANADA

Rapporteur

Julia Cvitkov Bureš

OSIRIS system A/S Denmark — DENMARK
measurements and in-orbit testing • Lessons learned related to space vehicle structures and components development, verification and qualification.

• Thermo-Mechanical loads and environment • New structural concepts (e.g. multi-functional structures, design concepts for reusability) • Structure design and verification

ArianeGroup
Jochen Albus

Different rapid prototyping processes are currently used for different materials in the fabrication of metal, ceramic, and plastic parts. However, as very new technique, Additive Manufacturing is strongly emerging due to the capability of optimization of structural parts for space applications as it concerns weight reduction, improvement of mechanical properties, and reliability, and advancements in space vehicle development with respect to engineering analysis, manufacturing, and test verification.

Different rapid prototyping processes are currently used for different materials in the fabrication of metal, ceramic, and plastic parts. However, as very new technique, Additive Manufacturing is strongly emerging due to the capability of optimization of structural parts for space applications as it concerns weight reduction, improvement of mechanical properties, and reliability, and advancements in space vehicle development with respect to engineering analysis, manufacturing, and test verification.
C3.8 Specialized Technologies, including Nanotechnology

Specialized materials and artificial structures are realized in a wide variety of space applications both to enable advanced exploration, and science/survey mission scenarios to perform test verifications among extreme microgravities of space and highest capabilities in structural, thermal, electrical, electromechanical, optical performances. Specific examples are the microgravity in ballistics, electrical thermal conductivities of certain nanotubes which are experimentally first applications at micro scale such as some composite structures. High efficiency energy storage wheels, MEMS and NEMS devices. Molecular nanotechnology and advanced synthesis of nanomaterials are the next generation of nano-scale devices to create unique conductive and storage functionalities for various applications and space storage technologies. The focus of the session will be on application of smart materials and microstructural systems, novel sensor and actuator concepts and new concepts for multi-functional and intelligent systems. It also includes the novel smart structures, control of structures, and design of new materials for advanced structural systems as well as the interplay between new perspectives on the design and use of new materials in nanoscale devices and technology for future spacecraft mission scenarios. The session covers fundamentals of new design concepts and advanced applications for power generation, wind generation, solar generation, water cycling techniques, and new generation of advanced propulsion systems. The session also addresses all types of propellantless propulsion including (but not limited to) solar sails, magnetic sails, laser propulsion, tethers, etc.

Evolution is the session's unique opportunity to deliver live presentations in an interactive format on any of the subjects of Material and Structures presented in the classic session format. Each presentation is followed by a discussion moderated by the attendees of the session. This allows for real-time feedback and learning opportunities. The session also covers all aspects of the design, testing, and applications of smart materials, including new technologies and their potential applications in various fields such as aerospace and automotive industries. The session aims to present recent advances in the field of smart materials and their applications in different industries. It is expected to provide valuable insights into the most cutting-edge technologies and their potential for future applications.

C3 Space Power Systems Symposium

Reliable energy systems continue to be key for all space missions. The future exploration and development of space depend on new, more affordable and reliable energy sources. Nano-satellites and small CubeSats, which are small and cheap, are key to the future of space exploration. However, these systems are increasingly being integrated 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 platform for the development of new innovative power systems. These activities are now put into a much larger space and energy program that range from point power systems development to energy systems concepts such as solar power plants. The Space Power Symposium, organized by the international aerospace community (IGS), addresses all aspects of the development of new space power systems, including their design, testing, analysis, and applications. It also provides a platform for discussions on the latest advances in this field and the future directions of space power systems development.

C3.3 Advanced Space Power Technologies

This paper presents an overview of the development of advanced space power technologies and concepts for the satellites, mission/missionary/planetary exploration and examined space stations. These include technologies and concepts related to power generation (solar, nuclear, etc.) and harvesting, power conditioning, management and distribution, power transmission and energy storage.

Co-Chairs

Matthew Parsons
Australian National University (ANU) — AUSTRALIA

Rapporteur

Gary Balkovec
European Space Agency (ESA) — UNITED KINGDOM
**C4.2 Liquid Propulsion (2)*** 

The session Liquid Propulsion (2) is dedicated to liquid rocket engines, with particular emphasis on sub-systems and specific components (including propellants). The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modeling, applications, science and fundamentals.

**Co-Chairs**
- Angelo Carbone (University of Technology (TU Delft) — THE NETHERLANDS)
- Fabien Delahaye (CIRA — ITALY)

**Rapporteurs**
- Christian Bach (Dresden University of Technology (DUT) / Technische Universität Dresden — GERMANY)
- Taisuke Shimojima (Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA) — JAPAN)

**C4.3 Solid and Hybrid Propulsion (1)**

The session Solid and Hybrid Propulsion (1) is dedicated to solid and hybrid rocket motors, with particular emphasis on sub-systems and specific components (including propellants). The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modeling, applications, science and fundamentals.

**Co-Chairs**
- Stefano Merck (ArianeGroup SAS — FRANCE)
- Toru Shimada (Office National d’Etudes et de Recherches Aérospatiales (ONERA) — FRANCE)

**Rapporteurs**
- Sergio Sangiorgi (CIRA — ITALY)
- Jean-Claude Trinque (Centre National d’Études Spatiales (CNES) — FRANCE)

**C4.4 Solid and Hybrid Propulsion (2)**

The session Solid and Hybrid Propulsion (2) is dedicated to solid and hybrid rocket motors, with particular emphasis on sub-systems and specific components (including propellants). The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modeling, applications, science and fundamentals.

**Co-Chairs**
- Dieter Hahn (Aston University — UNITED KINGDOM)
- Michele Andreussi (Independent Consultant — ITALY)

**Rapporteurs**
- Christoph Bartholome (Centro Nacional de Estudos Espaciais — PORTUGAL)
- Alf Gudmunds (Austria University — UNITED KINGDOM)

**C4.5 Electric Propulsion (1)**

The session Electric Propulsion (1) is dedicated to all aspects of Electric Propulsion, including full systems, sub-systems and specific components. The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modeling, applications, science and fundamentals.

**Co-Chairs**
- Grant A. Roper (University of Southampton — UNITED KINGDOM)
- Mariana Andreussi (Independent Consultant — ITALY)

**Rapporteurs**
- Vitali Solovey (CIRA — ITALY)
- Vladimir Kuznetsov (GKN Aerospace Engine Systems — SWEDEN)

**C4.6 Electric Propulsion (2)**

The session Electric Propulsion (2) is dedicated to all aspects of Electric Propulsion, including full systems, sub-systems and specific components. The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modeling, applications, science and fundamentals.

**Co-Chairs**
- Alexander Lovtsov (British Interplanetary Society — UNITED KINGDOM)
- Simon Feist (BRITISH INTERPLANETARY SOCIETY — UNITED KINGDOM)

**Rapporteurs**
- Anna Federica Urbano (Koc University — TURKEY)
- Elena Toscani (Centre National d’Études Spatiales (CNES) — FRANCE)

**C4.7 Hyperionic Air-breathing and Combined Cycle Propulsion, and Hyperionic Vehicle**

The session Hyperionic Air-breathing and Combined Cycle Propulsion, and Hyperionic Vehicle is dedicated to all aspects of air-breathing and combined cycle propulsion systems with space applications. The types of engines considered in this session include turbojet, rocket, scramjet, ramjet, afterburner, fans, turboprop, free-piston, and other forms of hyperionic combined cycle propulsion, together with the associated vehicle.

**Co-Chairs**
- Taisuke Shimojima (Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA) — JAPAN)
- Martin Van Leeuwen (GMV Aerospace Engine Systems — SWEDEN)

**Rapporteurs**
- Taisuke Shimojima (Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA) — JAPAN)
- Jean-Claude Trinque (Centre National d’Études Spatiales (CNES) — FRANCE)

**C4.8 Joint Session between IAA and IAF for Small Satellite Propulsion Systems**

This session will explore advanced and disruptive propulsion technologies, systems, and ideas (including integration of different propulsion concepts), showcasing potential to enable new architectures and solutions, and exploring the capabilities of current and future propulsion concepts.

**Co-Chairs**
- Anne-Mari Lorentz (Swedish Generation Advisory Council (SGAC) — SWEDEN)
- Jef Broeck (The Aerospace Corporation — UNITED STATES)

**Rapporteurs**
- Elena Tosca (Joint Propulsion Laboratory — California Institute of Technology — UNITED STATES)
- Toru Shimada (Office National d’Etudes et de Recherches Aérospatiales (ONERA) — FRANCE)

**C4.10 Joint Session on Nuclear Power and Propulsion Systems, and Propellantless Propulsion**

This session is dedicated to nuclear power and propulsion systems, and propellantless propulsion systems for space applications. This session also addresses all types of propulsion systems including (but not limited to) solar sails, magnetic sail, laser propulsion, tethers, etc.

**Co-Chairs**
- John B. Blake (European Space Agency (ESA) — UNITED KINGDOM)
- Leonardo Balduzzi (IAF – European Space Agency — THE NETHERLANDS)
- Christian Bach (Technical University Dresden — GERMANY)

**Rapporteurs**
- Simon Feist (BRITISH INTERPLANETARY SOCIETY — UNITED KINGDOM)
- Alexander Lovtsov (British Interplanetary Society — UNITED KINGDOM)

**C4.11 Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM**

Authors with an abstract accepted for an interactive presentation will be asked to prepare slides and display them for the duration of the congress on plasma screens. Authors will be assigned speaking times in which they must be near the plasma screens to engage in interactive discussions with other congress attendees.

**Co-Chairs**
- Elizabeth Jens (Joint Propulsion Laboratory — California Institute of Technology — UNITED STATES)
- Dag Riih (Space Generation Advisory Council (SGAC) — SWEDEN)
- Mario Kobald (German Aerospace Center (DLR) — GERMANY)

**INFRASTRUCTURE**

**D1 IAF SPACE SYSTEMS SYMPOSIUM**

This Space Systems Symposium, organized by the International Astronautical Federation (IAF), addresses the present and future development of space systems, architectures, and technologies, with sessions on System Engineering Methods, Processes, and Tools, Enabling Technologies for Space Systems, Significant Achievements in space systems with technologies, refer to other C4 sessions.

**Co-Chairs**
- Michael Bernard (European Space Agency (ESA) — GERMANY)
- Börje Hultman (National Aeronautics and Space Administration (NASA) — UNITED STATES)
- Titus R. Adde (IAF Propulsion Laboratory — UNITED STATES)

**D1.1 Innovative and Visionary Space Systems**

This session will explore innovative concepts and scenic for space applications in future scenarios. The session objectives to broaden the opportunities for innovation in order to foster the development of new space missions and support new or existing initiatives to other approaches strengthened in leading and advancing the future of novel and transformational space systems and relevant applications. In this perspective, the emphasis of viability is the hope of future and the reality of technology. By proposing novel concepts of space systems and applications, we can also broadsight future technologically preferable outcomes beyond current administration.

**Co-Chairs**
- Titus R. Add (IAF Propulsion Laboratory — UNITED STATES)
- Peter Stiehlmann (Joint Propulsion Laboratory (JPL) — THE NETHERLANDS)
D1.2 Space Systems Architectures

This session addresses current and future space systems architectures designed to realize mission concepts for Earth orbiting or exploration missions, both robotic and crewed. These architectures and their elements and linking blocks should aim at an increase in functionality, performance, efficiency, reliability and operations of mission systems, while addressing the need for an innovative or more disruptive technologies. The scope of the session includes solar power satellites or multiple satellite systems, such as constellations, formations, networks, distributed systems, and system-of-systems (including hybridization with terrestrial systems). Anomalous space allocation of functionality and agents of tasking, both on-board and ground-based, may be addressed.

Chair
Klaus Schilling
Johannes Gutenberg University of Mainz — GERMANY

Co-Chairs
Klaus Schilling
Johannes Gutenberg University of Mainz — GERMANY

D1.3 Technologies to Enable Space Systems

This session will focus on innovative, novel, technological developments that are usually high risk, but which have the potential to significantly enhance the performance and extending the scope of new space systems. Existing innovative technologies for space applications often result from spin-offs and these will be discussed during the session, together with potential spin-offs, examples include instrumentation, biotechnology, components, micro- and space technology, AI, advanced new space applications.

Chair
Stefan Arnold
The Åbo Akademi University Applied Physics Laboratory — FINLAND

Co-Chairs
Benedikt Battel
Univ. Göttingen (GFZ)


This session will focus on state-of-the-art systems engineering methodologies that introduce the time and cost, and improve the quality of space system design. Of special interest are multi-disciplinary methods, procedures, and tools used for system design, Product Realization, Technical Management, Operations, and achievement of space systems to improve risk management, safety, reliability, testability, and quality of life-cycle cost estimates. Specifically, presenters may include new organizational structures, methodology, procedures, tools, leadership that benefit space systems design, development and operations; state of the art systems engineering methodologies for space systems, including space systems of systems (SoS); engineering design methods or modeling and simulation tools applied to space system design and operation; methodologies and processes for technical planning, control, assessment and decision analysis of space system design; achievement in space system development environments, such as constrained engineering design; mechanisms to improve risk management, earned value management, configuration management, data management, availability, safety, reliability, testability and quality of life-cycle cost estimates.

Chair
Yingying Wang
Qingdao University — CHINA

Co-Chairs
Yingying Wang
Qingdao University — CHINA


This session will focus on state-of-the-art systems engineering methodologies that introduce the time cost, and improve the quality of space system design. Of special interest are multi-disciplinary methods, procedures, and tools used for system design, Product Realization, Technical Management, Operations, and achievement of space systems to improve risk management, safety, reliability, testability, and quality of life-cycle cost estimates. Specifically, presenters may include new organizational structures, methodology, procedures, tools, leadership that benefit space systems design, development and operations; state of the art systems engineering methodologies for space systems, including space systems of systems (SoS); engineering design methods or modeling and simulation tools applied to space system design and operation; methodologies and processes for technical planning, control, assessment and decision analysis of space system design; achievement in space system development environments, such as constrained engineering design; mechanisms to improve risk management, earned value management, configuration management, data management, availability, safety, reliability, testability and quality of life-cycle cost estimates.

Chair
Guolun Liao
Institute of Space Science and Application — CHINA

Co-Chairs
Guolun Liao
Institute of Space Science and Application — CHINA

D1.5 Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards

This session will focus on lessons learned in space system experience the necessary way to ensure mission success of future missions. The prospective workshop will include the advancement of mission accomplishments, the challenges and the best practices that the mission success, incorporating documentation of lessons learned. The scope of the session also includes the standardization in development and operations, lessons learned in design, development, and operations; achievement from project management; achievement from mission success and overall operation; best practices of project management; experiences and challenges in project or project management; lessons learned in risk management, earned value management, configuration management, development and operations, discussion to standards of the mission, the documentation of the earned lessons to ensure and make available to future missions.

Chair
Noriaki Inoue
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Co-Chairs
Noriaki Inoue
Japan Aerospace Exploration Agency (JAXA) — JAPAN

D1.6 Cooperative and Robotic Space Systems

This session will focus on cooperative and robotic systems as they apply to the space domain. This emerging topic includes concepts such as constellations, multi-satellite architecture, and orbit servicing of space systems and technologies. Hosted payloads, where their objectives may be unrelated to the principal mission, are also addressed. The session will discuss the design, development and operation of cooperative and robotic systems, including multi-satellite architectures, and on-orbit servicing of space systems and technologies. Hosted payloads, where their objectives may be unrelated to the principal mission, are also addressed.

Chair
Klaus Schilling
Johannes Gutenberg University of Mainz — GERMANY

Co-Chairs
Klaus Schilling
Johannes Gutenberg University of Mainz — GERMANY

D1.7 Interactive Presentations - IAF SPACE SYSTEMS SYMPOSIUM

The session will focus on interactive presentations in an interactive presentation on any of the subjects of space systems addressed in the classic sessions. The presentation will be displayed on a digital screen in a dedicated location and available for viewing by all Congress attendees. The session will also include a discussion period after each presentation. The interactive presentation may be presented by the authors of the presentation, or by invited experts in the field. Comments and questions will be welcomed from the audience and will be moderated to ensure a productive and informative discussion. The interactive presentation will be a unique opportunity for attendees to engage directly with the presenters and ask questions about the technical content of the presentation. The interactive presentation will be accessible via the IAF website and mobile app, allowing attendees to participate remotely and engage with the presenters and other participants.

Chair
Klaus Schilling
Johannes Gutenberg University of Mainz — GERMANY

Co-Chairs
Klaus Schilling
Johannes Gutenberg University of Mainz — GERMANY

D2 IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

Topics of this symposium, might be possible space media articulated characterized by the international Astronautical Federation (IAF), address worldwide space transportation solutions and innovations as an overall relevant technological needs and ground support infrastructure. The symposium addresses existing vehicles, vehicles in development and future space transportation solutions.

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE

D2.1 Launch Vehicles in Service or in Development

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

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE

D2.2 Launch Services, Missions, Operations and Facilities

Review of the current and planned launch services and support, including economies of space transportation systems, financing, cost, insurance, licensing. Advancements in ground infrastructure, ground operations, production methods, mission planning and mission control for both expendable and reusable launch services.

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE

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

Discussion of staging, staging or new advanced concepts for cargo and human orbital transfer. Includes current and new transfer technologies, entry and landing systems, sub-systems and systems for accommodating crew and cargo stage transfer.

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE

D2.4 Future Space Transportation Systems

Discussion of future space transportation systems design and conceptualizations for both expendable and reusable systems for both low earth orbit and exploration missions.

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE

D2.5 Technologies for Future Space Transportation Systems

Emerging technologies enabling new reusable or expendable launch vehicles and in-space transportation systems. Emphasis on early TRL developmental and verification in-flight, including ground testing and/or innovative technology prototype demonstrations not involving actual flight.

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE

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

Discussion of emerging, planned and/or ongoing experiments for future space technology and space transportation systems. Emphasis on current or future TRL technologies for future launch vehicles and in-space transportation systems.

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE

D2.7 Small Launchers: Concepts and Operations

Discussion of emerging, planned and/or ongoing experiments for small-scale injectors ranging from 500 kg to 2 kg into Earth Orbit. Includes innovative concepts such as alternative launchers, evolutions from sub-orbital concepts, combinations of existing launching elements and new elements, reusable, partially reusable and expendable concepts, and flexible, low-cost, small rocket concepts. Includes mission operations, design, development, and specific concepts.

Chair
Yugong Qian
China Aerospace Science & Industry Corporation — CHINA

Co-Chairs
David Sokol
National University of Singapore — SINGAPORE
D3.1 Strategic 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-Chair
John C. Miltinis
IAF Innovation Management Solutions, LLC — THE NETHERLANDS

Repeater
Alain Probst
European Space Agency (ESA) — THE NETHERLANDS

D3.2A Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems 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 step in the development of an International Aeronautics Congress (IAC) and the next conference in the “Jerome Pearson Memorial Lecture.”

Co-Chair
Peter Jukola
—the Netherlands

Repeater
Gary Brantford
AIAA — THE UNITED STATES

D3.2B Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Technologies

Co-Chair
Christopher Moore
Honeywell Aerospace and Space Management (HAMS) — THE NETHERLANDS

Repeater
André Rols
AIAA — THE UNITED STATES

D3.3 Space System Technology and System Management Practices and Tools

Co-Chair
Alain Probst
European Space Agency (ESA) — THE NETHERLANDS

Repeater
Gary Brantford
AIAA — THE UNITED STATES

D3.4 Innovative Concepts and Technologies

Co-Chair
Pawel Mróz
European Space Agency (ESA) — THE NETHERLANDS

Repeater
TMD European Space Technology (Estonia) — THE NETHERLANDS

D3.5 Modern Day Space Elevators Customer Design Drivers

Co-Chair
Pawel Mróz
European Space Agency (ESA) — THE NETHERLANDS

Repeater
André Rols
AIAA — THE UNITED STATES

D2.1P Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES

D2.2 Modern Day Space Elevators

Co-Chair
Kweku Bruce Morris
Innovative Rocket Spacecraft (IRS) — GERMANY

Repeater
Josef Wiedemann
MT Aerospace AG — GERMANY

D2.3 Space Technology and System Management Practices and Tools

Co-Chair
John C. Miltinis
IAF Innovation Management Solutions, LLC — THE NETHERLANDS

Repeater
Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

D2.4 New Space Ventures, including Space Logistics and Space Safety for Sustainability

Co-Chair
Ayman Ahmed
Arab Academy for Aerospace Technology and Civil Aviation — EGYPT

Repeater
Giuseppe Reibaldi
University of Michigan — UNITED STATES

D2.5 Emerging Space Ventures, including Space Logistics and Space Safety for Sustainability

Co-Chair
Junjiro Onoda
ISAS/JAXA — JAPAN

Repeater
Josef Wiedemann
MT Aerospace AG — GERMANY

D2.6 Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES

D2.7 Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES

D2.8 Space Transportation Solutions for Deep Space Missions

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Arnaud Merot
European Space Agency (ESA) — THE NETHERLANDS

D2.9 Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES

D2.10 Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES

D2.11 Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES

D2.12 Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES

D2.1 Interative Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations. Addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, any attendee is eligible for selection to deliver the interactive presentation, and this author will be assigned a specific date and time for delivery of the presentation. This session will be listed in the Congress program as “Presentation” and in the Congress program as “Interactive Presentation”. In this category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Ranganath Kommineni
University of Michigan — UNITED STATES

Repeater
Christophe Bonnal
AIAA — THE UNITED STATES
Enabling Safe Commercial Spaceflight: Vehicles and Spaceports

Rapporteur
IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES
Rapporteur
International Astronautical Congress
2 - 6 October 2023, Baku, Azerbaijan
D4.IP
Interactive Presentations - 57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES
This session offers a unique opportunity to deliver your live presentations in an interactive setting on any of the subjects of Safety, Quality and Knowledge Management in Space Activities, organized by the International Astronautical Federation (IAF). In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as embedded hot links, pictures, audio and video clips etc. An award will also be presented to the author of the best Interactive Presentation in the D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

D5.3 Predicting, Testing, and Measuring the Effects of the Space Environment on Space Missions
The space environment can impact the performance and reliability of space missions. It has several natural and induced components, including high energy radiation, plasmas, atomic oxygen, planetary dust, extreme temperatures, sunspots, microgravity, environmental and debris, and molecular and particulate contamination. Environmental conditions present are not only in the design phase, and the operational aspect of the mission. The evaluation of the nominal and worst-case conditions can be met, mitigated, and protected, and their impact on missions and flight systems are thus of prime importance. This session will encompass the following topics: space weather, plasma charging, radiation effects, atomic oxygen, planetary dust, molecular and particulate contamination, plasma induced charging effects, and interactions, and combined environment effects. The session is an opportunity to share experiences, prediction of nominal or worst case condition, ground testing, flight experiments and mission review, modeling and prediction, and thermosolar degradation effects.

Co-Chairs
Harun de Mejia
Togu Ogbaher
Space Exploration Agency (JAXA) — JAPAN

D5.4 Cybersecurity in Space Systems, Risks and Countermeasures
With the rising of New Space and the emergence of commercial space industry increasingly digital and data-dependent, the management of supply-related risks and protection aspects is becoming a key concern, with the identification and development of innovative cybersecurity measures and management solutions. This session is an opportunity to share experiences, the implementation of best practices, the countermeasures and engineering approach to design and protect space systems, data and space-related assets; dedicated training, information sharing and analyses; and cybersecurity standards to ensure mission success, cyber resilience, and protection against cyberattacks. It will also be presented to the author of the best Interactive Presentation in the D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs
Cezar Ungur
European Space Agency (ESA) — UNITED KINGDOM
D5.5 Space Resources, the Enabler of the Earth-Moon Ecosystem
In 2019, with the launch of the Artemis program, NASA is increasing the number of companies investing in commercial resource utilization facilities. This session is dedicated to technology advancements and legal aspects related with space resources. It is important to ensure that the private sector is able to develop and exploit space resources for the benefit of humankind. This session will focus on the development of space resources for the benefit of humankind.

Co-Chairs
Roberta Mugellesi-Dow
Stefan Zeid
European Space Agency (ESA) — UNITED KINGDOM
D5.6 IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES
Topics of this symposium, organized by the International Astronautical Federation (IAF), address commercial safety and regulatory policy issues for orbital and suborbital space transportation and services. The goal is to identify common issues to commercial operations of both human and robotic space vehicles in order to increase international safety and interoperability.

Co-Chairs
Jean-Bruno Marciacq
European Space Agency (ESA) — UNITED KINGDOM
D5.1 For a Successful Space Program : Quality and Safety
Space is a difficult and complex program and safety is a key factor for the success of any space project. The context is marked by the large number of interactions in the space environment and the potential for failure at any level. The session offers an opportunity to discuss the key aspects of quality and safety in the context of space missions, space systems, and space transportation. It is an opportunity to discuss how the design and operation of space systems can be optimized to ensure the safety and reliability of space missions.

Co-Chairs
Alexander St. John
Deimos Energy
University of Pennsylvania — UNITED STATES
D5.2 Emerging Trends of Knowledge Management in Organizations
Digital transformations and intelligent organizations, machine learning, cloud computing, new collaboration tools, and intelligent search technologies are changing how space-related organizations do their work. Knowledge management’s evolution and technological advancement is changing how space-related organizations do their work. Change management strategies that include digitalization and AI technologies are being increasingly adopted to address the challenges faced by organizations and to improve the efficiency of the knowledge sharing and collaboration for mission success.

Co-Chairs
Morgan Law
European Space Agency (ESA) — UNITED KINGDOM
42
43
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 science, industry or technology. These papers will represent the work of the author(s) (no more than two students). The student presenting in this session will be the student author(s). The symposium is not appropriate for the presentation of new or unpublished results. This is an opportunity to discuss the changing space exploration context and current opportunities, and challenges and future space activities in the domain of space activities. The Symposium includes topics such as: space exploration, space economy, space law, space policy, regulation and economics, space technology, and space education. The symposium is intended for undergraduate and graduate students.

Co-Chairs

- Jessica Culler
  - MCA Arms Research Center — UNITED STATES

- Giovanni De Carolis
  - Politecnico di Milano — ITALY

Student Team Competition

Undergraduate and graduate level student teams (students no more than 28 years of age per team present papers or a single presentation to space sciences, industry or technology. These papers will represent the work of the student (three or more students). The student presenting in this session will be the team student(s). The symposium is not appropriate for the presentation of new or unpublished results. This is an opportunity to discuss the changing space exploration context and current opportunities, and challenges and future space activities in the domain of space activities. The Symposium includes topics such as: space exploration, space economy, space law, space policy, regulation and economics, space technology, and space education. The symposium is intended for undergraduate and graduate students.

Co-Chairs

- Marko Stobiecki
  - Institute of Aerospace and Space Sciences — UNITED STATES

- Peter Stubbe
  - German Aerospace Center (DLR) — GERMANY

Student Conference Part 2 — Undergraduate and graduate students (no more than 28 years of age) present technical papers on any project in space science, industry or technology. These papers will represent the work of the author(s) (no more than two students). The student presenting in this session will be the student author(s). The symposium is not appropriate for the presentation of new or unpublished results. This is an opportunity to discuss the changing space exploration context and current opportunities, and challenges and future space activities in the domain of space activities. The Symposium includes topics such as: space exploration, space economy, space law, space policy, regulation and economics, space technology, and space education. The symposium is intended for undergraduate and graduate students. The symposium is not appropriate for the presentation of new or unpublished results. This is an opportunity to discuss the changing space exploration context and current opportunities, and challenges and future space activities in the domain of space activities. The Symposium includes topics such as: space exploration, space economy, space law, space policy, regulation and economics, space technology, and space education. The symposium is intended for undergraduate and graduate students.

Co-Chairs

- Marko Stobiecki
  - Institute of Aerospace and Space Sciences — UNITED STATES

- Peter Stubbe
  - German Aerospace Center (DLR) — GERMANY

Interactive Presentations - IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM

This session offers a unique opportunity to share your education and outreach activities through an interactive presentation as one of the highlights of the conference. The presentation will be displayed on a digital screen in a dedicated location and available for viewing by all Congress attendees for the entire Congress week. If your paper is selected, you will be provided with clear instructions on how to set up your presentation. This session is NOT for team projects. Team project papers should be submitted to session E2.3.

Co-Chairs

- Marko Stobiecki
  - Institute of Aerospace and Space Sciences — UNITED STATES

- Peter Stubbe
  - German Aerospace Center (DLR) — GERMANY
E3.5 Interactive Presentations - 37th IAA HISTORY OF ASTRONAUTICS SYMPOSIUM

This symposium covers the entire span of space history, at least 20 years older, the history of space science, technology, development, robots, human spaceflight and personal experiences are included. This year a special focus is laid on the origin, technical, political, and social aspects of these technological space age programs.

E3.7 Interactive Presentations - 35th IAA HISTORY OF ASTRONAUTICS SYMPOSIUM

The symposium covers the entire span of space history, at least 20 years older, the history of space science, technology, development, robots, human spaceflight and personal experiences are included. This year a special focus is laid on the origin, technical, political, and social aspects of these technological space age programs.

E3.3 Space Architecture - Habitats, Habitability, and Basses

Space architecture integrates all topics related to designing human environments for use in space. The session welcomes papers in three areas: 1) research, design, prototyping, testing, manufacture, and operation of habitats for space and analog terrestrial environments; 2) case studies of habitat design; and 3) legal, ethical, and policy implications for the human factor. Sessions will explore the development and implementation of space habitats and their role in space exploration and human spaceflight.

E3.2 Space Assets and Disaster Management

The symposium will explore the risks space assets can pose to situations requiring disaster management and emergency responses. Participants will discuss how space assets and applications can be brought to bear to aid with situational monitoring and assessment, crisis response and mitigation, and decision-making in the context of disaster management and emergency response.

E4.1 Memorials & Organisational Histories

Archaeological and biographical histories of individuals who made original contributions to the development, advancement, and perpetuation of our space age. These milestones will include the entire spectrum of space history, at least 20 years old.

E4.2 Scientific and Technical Histories

The symposium will cover the history of science, exploration, innovation, and technology. Furthermore reflection on the cultural and socio-political impact are part of this. It will include the entire spectrum of space history, at least 20 years old.

E4.5 Sharing Space Achievements and Heritage: Space Museums And Societies

Space Museums and Societies are a central element in publicising space exploration and helping to educate the public. These organizations need to be developed, managed and supported, if we want to continue to generate interest in space exploration and encourage participation in the field. Space museums and societies need to be a mix of educational institutions and cultural organizations. The symposium will discuss the role of space museums and societies in promoting space exploration and education, and the challenges and opportunities they face in fulfilling their mission.
E.5 Simulating Space Habitation: Habitats, Design and Simulation Missions

This session covers all topics relating to preparing for and simulating future space habitats and its associated facilities. This includes lessons learned as well as design proposals for future habitats, either orbit or surface structures. The session especially welcomes papers with an interdisciplinary approach and providing inputs from all fields relevant for future mission-related activities, including innovative technologies, interior design and design aesthetics, as well as studies related to human factors and social dynamics of space missions.

Co-Chairs

- David T. Kerans, Space Systems Group (SSG) – AUSTRAlia
- Julie Patrus, Acadia University of Sciences – FRAncE

Repporter

- Kitty Hendriksen, INOGIC – NEDerlands

E.5.1P Interactive Presentations - 4th IAA SYMPOSIUM ON SPACE AND SOCIETY

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space and Society addressed in the classic sessions. The presentation will be displayed on a digital screen in a dedicated location available for all IAC Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentations must take advantage of digital display capabilities, such as PowerPoint charts, embedded full size pictures, audio and video clips etc. An abstract will also be presented by the author of the best Interactive Presentation in the Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

- Geoffrey Langton, Environment & Space Institute (ESI) – CANADA
- Olga Bannova, University of Houston – UNITED STATES

E.6 IAF BUSINESS INNOVATION SYMPOSIUM

The business innovation symposium, organized by the International Astronautical Federation (IAF), is designed to offer papers that deal with research, study, analysis, description, and/or propose any topic related to space activities that bore commercial objectives, whether from an academic and/or professional perspective.

Co-Chairs

- Nancy McInerney, American Institute of Aeronautics and Astronautics (AIAA) – UNITEd STATES

E.6.1 Space Entrepreneurship and Investment: The Practitioners’ Perspectives

The session examines key aspects of entrepreneurship, innovation, financial and investment presentations from the practitioners’ perspective. Suggested topics suitable for this session can be at any level of analysis, including (from micro to macro) the space sector, industries (e.g., propulsion), industry segments (e.g., chemical propulsion), individual firms, a comparison between human-based and robotic-based entities within or as an individual example-exchange entrepreneurship and investment topics suitable for this session include descriptions related to entrepreneurship and innovation such as new market sectors, new businesses, new business plans, new projects, recent experiences of start-up companies, suitable finance or investment topics apply to large programmes, new firms, the analysis methodologies of markets, or new developments in the space and finance sectors.

Co-Chairs

- Gary Martin, Airways Canada – UNITED STATES
- Aslan Shaghpash, Space Tourism Society Canada – CANADA

Repporter

- John Dodwell, Space Industries Association – UNITED STATES

E.6.2 Public-Private Partnerships: Traditional and New Space Applications

The session brings experts from various space industry segments together to discuss new developments fostering the commercialization of space from the public and private perspectives. This innovative session brings together leaders from the private sector and government agencies to address the general role and new positions to encourage public and private partnerships (PPP). The session also seeks papers on new creative PPP business models in traditional space industry applications (such as satellite-based services meeting both demands), commercializing space (e.g., new remote sensing applications), improving efficiency in partnerships, integrating international and national space capabilities, PPP as a tool for collaboration and a means of economic development, and the role of PPPs in developing countries and emerging markets.

Co-Chairs

- Nancy McInerney, American Institute of Aeronautics and Astronautics (AIAA) – UNITEd STATES
- Kevin Stuckey, The Optinga Society – AUSTRALIA

Repporter

- Colleen McInerney, University of Houston – UNITED STATES

E.6.3 Innovation: The Academics’ Perspectives

The session welcomes academic presentations, on any level of analysis, and on any aspect of entrepreneurship, innovation, finance, or investment, organization theory, management, etc. Variance and phenomenological studies are encouraged. Qualitative, quantitative, or mixed methods approaches are all accepted. Academic domains of interest include business, economics, technology, innovation management, and all perspectives of organizational theory including organizational culture, economics and social sciences. The session is open for papers that present new results, new methods, new strategies, and new directions in any aspect of entrepreneurship, innovation, finance, or investment, and related research.

Co-Chairs

- David T. Kerans, Space Systems Group (SSG) – AUSTRAlia
- George A. Evans, Centre for Space Exploration Organisations (CSEO) – CYPRUS

Repporter

- Dafis Lambrinou, Centre for Space Exploration Organisations (CSEO) – CYPRUS

E.6.4 Strategic Risk Management for Successful Space & Defence Programmes

The space economy is a vital, holistically complex and dynamic field that drives the development of state-of-the-are capabilities, creating vast market opportunities, accommodating global warning situations, protecting the capacity for scientific excellence, and contributing to our societal quality and life. By 2050, the space economy is projected to reach $1 trillion.

Nowadays, the current fraught geopolitical and economic context, it appears that no organization is fully prepared to capitalize on this space expansion growth and avoid the “space hype bubble.” The presentation will attract multiple industry stakeholders, scientific advancements, and human benefits if we can mitigate risks and realize opportunities.

- Are we prepared to face the “space hype bubble” and grasp opportunities to bend the changing world?
- Do we have the right capacity to face such changes in terms of human resources and other capabilities?

Co-Chairs

- Maria Gabriela Seraf, European Space Agency (ESA) – FRANCE
- Helen Yang, Nanosatellite Australia – AUSTRALIA

Repporter

- Andrew Smith, European Space Agency (ESA) – FRANCE

E.6.5 Entrepreneurs Around the World

Entrepreneurship has different characteristics that differ from one country to another. The challenges that entrepreneurs face transnational and cultural barriers, but some others do not. This session welcomes websites and presentations that describe the barriers experienced by one entrepreneur in their home country and those experienced by another entrepreneur in their host country.

Presentations (about nine authors whose abstracts have been selected)

The session brings experts from various space industry segments together to discuss new developments fostering the commercialization of space from the public and private perspectives. The presentation(s) will be displayed on a digital screen in a dedicated location available for all IAC Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Innovative Presentations may take advantage of digital display capabilities, such as PowerPoint charts, embedded full size pictures, audio and video clips etc. An abstract will also be presented by the author of the best Interactive Presentation in the Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

- Nancy McInerney, American Institute of Aeronautics and Astronautics (AIAA) – UNITEd STATES

E.7 ISL COLLOQUIUM ON THE LAW OF OUTER SPACE

The ISL Colloquium on the Law of Outer Space is an annual conference that brings together leading experts and professionals from the space community about satellite networks and systems. It serves as a forum to discuss developments of national and international law in the context of a country’s orbital mission and the principles and interpretations of the Outer Space Treaty. The Colloquium looks at current questions about topics related to the ethics and understanding of what is meant by treaty law terms freedom of exploration and use. It examines how space situational awareness (SSA), space surveillance and tracking (SST) can be integrated as elements within a greater framework for effective space traffic management. It serves as a focus to discuss developments of national space law in the context of a country’s orbital mission and the principles and interpretations of the Outer Space Treaty. The Colloquium looks at current questions about topics related to the ethics and understanding of what is meant by treaty law terms freedom of exploration and use.

Co-Chairs

- General Dorothea Robitaille, Space Generation Advisory Council (SGAC) – AUSTRIA
- Valerio Reale, Leiden University – NEDerlands

E.7.1 Young Scholars Session with Keynote Lecture

The session will feature a keynote lecture followed by presentations from young space lawyers under 35 years old.

The session is open for abstracts and papers from space lawyers under 35 years old. It welcomes contributions on any topics related to space law. It also features a regular, annual keynote presentation by a leading space law expert. Keynote by Prof. Steven Freiman.

Co-Chairs

- Oliver Bakir, Space Agency of Republic of Azerbaijan (Kasan) – AZERBAIJAN
- Tarek Brisibe, ONAir – SWITZERLAND

E.7.2 UN COPUOS and ITRI Registration of Large Constellations

UN COPUOS is the committee that sets different standards with respect to space activities. They have a containing history, material scope, and membership. Their leading working methods flawed themselves in their approach to obtaining information about space objects. Whereas the method of adding publication, coordination and notification of image processing and analysis of international techniques required an important safeguard on objects already entering into our space. These differences became obvious in recent cases of registration of large constellations. The session will discuss the mechanisms which observe the registration of large constellations, describe the relation of UN COPUOS and ITRI, and analyze the possibility of their future synergies leading to the enhanced awareness of the space objects availability for satellite networks and systems.

Co-Chairs

- Dimitri Stefoudi, International Foundation for Air and Space Law, Leiden University – THE NETHERLANDS

Repporter

- Setsuko Aoki, Keio University – JAPAN

E.7.3 Legal Issues Relating to Emerging Space Activities on Celestial Bodies

Panes to engage in activities on the Moon and other celestial bodies are rapidly developing. These range from possible resource exploration activities of the way to permanent human presence. Whilst the Bolton declaration (W. S. Rice) and the creation of a lunar economy are inspiring many, they also require careful consideration. In regard to legal aspects and will necessitate the development of a closer legal framework to guide the way human activities in such activities. Among other issues, this session aims to explore how legal systems can play an important role in the framework inhibiting the risks that will regulate the relationship between governments and non-governmental organizations, public and private entities, and interplanetary activities. This will involve an assessment of the existing legal framework for space as well as a gap analysis as to what measures are required further consideration.

Co-Chairs

- Setsuko Aoki, Keio University – JAPAN
- Nancy C. Wolfson, University of Houston – UNITED STATES

Repporter

- Nancy C. Wolfson, University of Houston – UNITED STATES
Co-Chairs
Astrid Heidinger
Australian Space Forum — AUSTRALIA
Reporters
Judy Houghton
University of Canterbury — NEW ZEALAND
E7.4

Key Governance Issues in the New Space Age
The rapid expansion and evolution of the global space arena is characterized by an increasing number and diversity of space actors and the emergence of new kinds of space technologies.

The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one separate session: i) policy, legal, institutional and economic aspects of space debris detection, mitigation and removal, jointly with the IAA Symposium on Space Debris, and, if possible, ii) the presentation of the proceedings of the new IAA Space Debris Conference.

The session will address the role of the Space Law Committee of the Global Partnership for UoS, as well as the role of international organizations and governmental and non-governmental entities involved in the field of space law and related activities.

The symposium, organized by the International Astronautical Federation (IAF), will address: impact mitigation and risk assessment, late-stage trajectory design, launch monitoring and radar operations, and any other relevant aspects of the organization of international space missions in the scope of the Symposium.

The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one separate session: i) policy, legal, institutional and economic aspects of space debris detection, mitigation and removal, jointly with the IAA Symposium on Space Debris, and, if possible, ii) the presentation of the proceedings of the new IAA Space Debris Conference.

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The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one separate session: i) policy, legal, institutional and economic aspects of space debris detection, mitigation and removal, jointly with the IAA Symposium on Space Debris, and, if possible, ii) the presentation of the proceedings of the new IAA Space Debris Conference.

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The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one separate session: i) policy, legal, institutional and economic aspects of space debris detection, mitigation and removal, jointly with the IAA Symposium on Space Debris, and, if possible, ii) the presentation of the proceedings of the new IAA Space Debris Conference.
E10.2 Informing Planetary Defense

This session will address aspects that contribute towards informing future planetary defense, such as:

- Understanding the risk of an asteroid impact with small Wt, e.g., results, situational awareness from ground-based observations regarding the orbital period change, physical characteristics of asteroids and comets, as well as predictions of the impact site, revised numerical modeling of impact risk, as well as Doomsday's Dynamic based on IAU impact risk.
- Results from sample return missions and NEO tracking as well as results from other NEO missions.
- Legal considerations that would contribute towards the decision to act.

Any other translational research that enhances our understanding of making better decisions and ensuring successful mitigations of a threat posed by an asteroid or comet impact.

Co-Chair
Dorottya Mocsary
ISRO — UNITED STATES

Representative
Alex Liu
Space Applications Services — ISU

GTS.4 £2.3

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 (either or more students). Students presenting in this session will compete for the Hans von Muldau Team Award. The selection of the oral presentations is solely based upon the quality of the papers and the reaction to the oral presentations by the audience as well as the novelty of the work. Furthermore, a short description how your team worked together to achieve the project goal should be included. The guidelines for the student competition will be distributed from the session chairs to the authors after abstract acceptance.

Co-Chair
Stephanie Male
Space Generation Advisory Council (SGAC) — UNITED STATES

Representative
Eric Wille
EIA THE NETHERLANDS

GTS.5 £4.9

Small Satellite Missions Global Technical Session

The Small Satellite Missions Global Technical Session (GTS) is a collaboration between the International Academy of Astronautics (IAA) Small Satellite Missions Symposium and the International Academy of Astronautics (IAA) Space Missions Global Technical Session. The session is a unique offer for sharing modern and creative approaches to address mission needs with the support of small satellite missions. The Global Technical Symposium (GTS) is designed to offer a modern and eclectic platform at the IAC for sharing technical content and to an open minded audience on-site but also online! Jointly organized by associated technical committees and the Workforce Development-Young Professional Programme Committee, these sessions are similar to the conventional technical sessions in terms of abstract submission and paper submissions. However, in addition to the on-site presentation of the technical papers, these sessions are also broadcast online. Authors are allowed to present remotely or on-site, and participants are also allowed to listen to the session from the comfort of their homes or at their workplaces in addition to the IAC venue. The IAF hopes that this approach will enable more students and young professionals without the ability to join IAC on-site to contribute to the discussion at the IAC.

Co-Chair
Matthias Huthwaite
IAC Generation Young Professionals — GERMANY

Representative
Narine M. Lezlo
One Space AU — Bongi Space Hub — GERMANY

GTS.1 £6.5

Entrepreneurship Around the World

Entrepreneurship has different causes and nature, that differ across country to country around the world. Some of the challenges that entrepreneurs face transcend cultural and cultural barriers, but others do not. This session welcomes papers and presentations that describe the barriers experienced by entrepreneurs in different countries and regions around the world. A summary discussion will identify the similarities and unique characteristics of matter-specific entrepreneurial barriers as identified by the presenters. This technical session is sponsored by the IAI Entrepreneurship and Investment Committee (JAC) and the IAF Workforce Development/Young Professionals Programme Committee, as part of the Global Technical Sessions — presentations can present in person at the IAC or from their home/university location.

Co-Chair
Jonas Dünnes
One Space AU — Bongi Space Hub — GERMANY

Representative
Ben Chadwick
ben.chadwick@iau.org — UNITED STATES

E10.IP Interactive Presentations - IAF SYMPOSIUM ON PLANETARY DEFENSE AND NEAR-EARTH OBJECTS

Interactive Presentations are a new feature for the IAC and will be broadcast online as a live session during the Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as PowerPoint files, weblinks, pictures, audio, and video clips etc. An award will also be presented to the author of the best Interactive Presentation at the Category Awards Ceremony. Announcements that follow the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair
Alex Kari
Space Applications Services — ISU

Representative
Alissa J. Haddaji
Harvard University — UNITED STATES

GTS.2 £3.9

Human Spaceflight Global Technical Session

The Human Space Endeavours Global Technical Session is targeting individuals and organisations with the objective of sharing best practices, future projects, research and issues for the future of human space endeavours. This is a Global technical session co-sponsored by the Human Space Endeavours Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chair
Guillaume Proust
Arbois Jahan
Jong-Jin Kwon
Soyoung Lee — KOREA

GTS.3 £2.8

Space Communications and Navigation Global Technical Session

A Global 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 positioning, navigation, and timing. This session is co-sponsored by the Space Communications and Navigation Committee and the Workforce Development/Young Professionals Programme Committee.
11. IAC 2023 Call for Papers Deadlines

Abstract Submission Period: 28 February 2023
Abstract Submission Deadline: 28 February 2023
Abstract Selection: 28-30 March 2023
Papers Submission Period: 15 September 2023
Papers Submission Deadline: 15 September 2023
Presentation Submission Period: 22 September 2023
Presentation Submission Deadline: 22 September 2023

12. Preliminary IAC 2023 at a Glance
13. Instructions for 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 LaTeX box provided on the abstract submission website.
- Abstracts should specify: purpose, methodology, results and conclusions.
- Abstracts should indicate that substantive technical and/or programmatic content is included.

Co-authors
- All 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 restricted area: [https://iafastro.directory/iaf/account/login](https://iafastro.directory/iaf/account/login).
- If you are submitting an abstract on our website for the first time, you will need to register.
- If 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 your presentation preference: oral presentation only, interactive presentation only, oral or interactive.
- 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 2023 to deliver and present the paper is assured.

Note: An abstract can be submitted to only one Technical Session and duplicates will be discarded.

Abstract Selection

Submitted abstracts will be evaluated by the Session Chairs on the basis of technical quality and relevance to the session topics. Prospective authors should certify that the paper was not presented at a previous meeting. Selected abstracts may be chosen for eventual oral or interactive 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](https://www.iafastro.org) by mid-April.
- Authors with an abstract accepted for oral presentation will be offered a presentation slot of 10 to 20 minutes.
- Authors with an abstract accepted for interactive presentation will be offered a presentation slot of 10 minutes.
- Authors with an abstract accepted for an interactive presentation will be asked to prepare slides and display them for the duration of the congress on screens. Authors will be assigned a specific screen number and will have a dedicated slot during which they will have the opportunity to engage in interactive discussion with other Congress attendees.

Additional Information

Preliminary versions of the IAC proceedings will be available to participants at the Congress electronically. More information about the IAF Digital Library is available on the IAF website: [https://dl.iafastro.directory/](https://dl.iafastro.directory/).

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.

Authors should follow the above instructions for the submission of their abstracts. In addition to the IAC Proceedings, 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. Dieckers-Verschoor Award for Best Paper. Please contact the IISL secretary for the regulations at secret@iislweb.org.

DEADLINES

- Abstract Submission: 28 February 2023
- Interactive Presentation Submission: 11 September 2023
- Paper Submission: 15 September 2023
- Oral Presentation Submission: 22 September 2023

Please make sure to check the IAF website ([www.iafastro.org](https://www.iafastro.org)) and the IAF App regularly to get the latest updates on the Technical Programme!

QUESTIONS

Abstract submission and/or oral presentations: [support@iafastro.org](mailto:support@iafastro.org)

Interactive presentations: [ipsupport@iafastro.org](mailto:ipsupport@iafastro.org)

14. Space in Azerbaijan: Upholding the Legacy, Shaping the Future

Innovation and aspiration to explore and harness the power of knowledge for the benefit of the world have always been a cross-cutting theme throughout Azerbaijan’s space history spanning centuries. The foundation of space exploration in Azerbaijan was laid centuries ago, with people looking up into the sky in pursuit of discovering what the universe has stored away. Let us take a journey down the memory lane and reflect on the main milestones of the emergence and establishment of space industry in Azerbaijan.

By a Presidential decree, Azercosmos was transformed into the Space Agency of Azerbaijan; the Azersky Earth observation satellite was successfully launched into the orbit. In 1990, he participated in his second space mission on Soyuz TM-11. Named after Tusi, the Shamakhi Astrophysical Observatory, established in 1959, follows through on the significant work in space research and helps to investigate the solar system bodies, study the stellar and solar physics, and solar-terrestrial relations.

Aerospace-1 telecommunication satellite – the first-ever satellite of Azerbaijan was successfully launched into the orbit.

The Maraga Observatory, a widely recognized regional scientific hub of the time, was established by Nasraddin Tusi, a prominent Azerbaijani astronomer, scientist, and thinker. He was at the origins of space activities in Azerbaijan by making an immense contribution to the scientific exploration of space through his prolific research in the fields of astronomy and physics.

The global space community will get together in Baku for the IAC once again half a century later, showcasing the world the latest developments and insights within the space sector.

Azerbaijan is taking gradual steps towards becoming one of the leading players on the global space arena, expressing its commitment to creating a better connected, developed, and secure world for future generations. The IAC 2023 is a perfect example of demonstrated allegiance and dedication of Azerbaijan to the common cause of exploring the space together and tackling the global challenges with the help of the space and the boundless knowledge it equips us with.
Join the IAF, the world leading space advocacy body!

Become an IAF Member

- Download the Application Form on www.iafastro.org
- Participate in the IAF Committees in charge of defining the Technical Programme
- Propose to host a Plenary Event during the IAC
- Propose a Global Networking Forum (GNF) Event to showcase your organization’s latest achievements or to discuss the most interesting topics about Space
- Participate and vote in the General Assembly and nominate IAF Officers
- Host one of our events!

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1. Download the Application Form on our website (www.iafastro.org) or request it to the Secretariat.
2. Complete the Application Form and attach the requested documents.
3. Send everything to our Secretariat. (info@iafastro.org)
4. We will review your application and ask in case of missing information.
5. Once reviewed, your application will be recommended by the IAF General Counsel.
6. Final approval by the General Assembly during the IAC.

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