72nd INTERNATIONAL ASTRONAUTICAL CONGRESS

25–29 October 2021 | Dubai, United Arab Emirates

Call for Papers & Registration of Interest

Inspire, Innovate & Discover for the Benefit of Humankind

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IAF Alliance Programme Partners 2020

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1. Message from the International Astronautical Federation (IAF)

It is my great honor to welcome you to the 72nd International Astronautical Congress.

For the very first time, the IAC will open its doors to the global space community in the United Arab Emirates, the first Arab country to host the IAC since its establishment in 1950. The United Arab Emirates’ interest in astronomy and space sciences dates back to the 1970s, when His Highness Sheikh Zayed bin Sultan Al Nahyan met with the NASA team responsible for the Apollo Moon landing. This encounter sparked a national focus on space that began almost three decades ago, eventually leading to the birth of a national space sector. The IAC 2021 Host Organization – the Mohammed Bin Rashid Space Centre (MBRSC) – member of the IAF since 2012, was established by the Dubai Government to serve as one of the main pillars to drive the establishment of the knowledge economy and sustainable development in the UAE.

With the theme “Inspire, Innovate & Discover for the Benefit of Mankind”, the IAC 2021 looks forward to making a contribution to science and humanity by strengthening and enhancing cooperation between all countries in the space sector.

I would like to take this opportunity to thank all of our organizing committee members for their support, help, and consistent effort to make this conference a success despite the delay due to the COVID-19 outbreak. My thanks also goes to all of the international representatives from the global space sector, including top space agency officials, policymakers, scientists, and experts in the space education sector.

I look forward to seeing you in Dubai, UAE.

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

2. Message from the Local Organizing Committee

The International Astronautical Congress (IAC) — the world’s largest space conference — is coming to Dubai for the very first time from 25 - 29 October 2021. It is with great pleasure that we invite you to be a part of it by submitting your abstracts for the 72nd edition of the IAC. After a 2020 of virtual meetings and social distancing, the IAC in 2021 is an ideal, unrivaled platform to communicate and showcase your latest research, innovations and vision to the global space community. Each year, the Congress attracts high profile representatives from the global space sector, including top space agency officials, policymakers, scientists, and experts in the space technology sector.

The IAC is the place to share information and to facilitate the exchange of insights and ideas, to foster the creation of new partnerships and collaborations and we are looking forward to welcoming you to Dubai.

The IAC 2021 comes to the UAE when the country is investing more in space than it ever has, last year the Emirates Mars Mission was launched and it arrived safely to Mars last February becoming the Arab world’s first space exploration craft to Mars. It will also mark the second anniversary of the return of the first Emirati astronaut from the International Space Station, and the third anniversary of the launch of KhalifaSat — the first Earth-observation satellite manufactured in the UAE. These achievements are symbolic of the beginning of a new era in the region; the IAC 2021 will be an opportunity to shed light on how space science and technology can contribute to a nation’s progress. We invite you to join us at the IAC 2021 and help us in making this an unparalleled experience

H.E. Yousef Hamad Al Shabani
Higher Committee Chair, IAC 2021 Local Organizing Committee, United Arab Emirates

Salem Humaid Al Marri
Chair, IAC 2021 Local Organizing Committee, United Arab Emirates

Adnan Al Rais
Co-Chair, IAC 2021 Local Organizing Committee, United Arab Emirates

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

On behalf of the International Programme Committee, it is a great pleasure to invite you to submit an abstract for the 72nd International Astronautical Congress IAC 2021 that will be held in Dubai, United Arab Emirates. The IAC is an initiative to bring scientists, practitioners, engineers and leaders of space industry and agencies together in a single platform to discuss current research breakthroughs, technical advances, existing opportunities and emerging space technologies. Such platform will provide the participants with a holistic and up-to-date view of science, engineering and space technology fields and offer an access to space knowledge for professionals and experts from around the world. IAC 2021 presents an opportunity to highlight the evolutionary role of international partnerships in exploration, research, and development. It is a time to envision the discoveries to be made and knowledge to be gained to move forward together.

Participating in the IAC 2021 will enrich the youth’s knowledge in space science and technology. It will act as an accelerator for STEM education, and will be a source of enormous pride and inspiration for the ambitious younger generations. As IAC 2021 comes to Dubai, along with more than 5,000 leading figures in the international space industry from 70 countries, a platform will be developed that further cements space as one of the seven key sectors for the UAE. The year 2021 will be a significant milestone in the UAE’s history as it will witness accommodating EXPO 2020 in Dubai, and the arrival of the Emirates Mars Mission – Hope Probe, to the red planet’s orbit, synchronized with the hosting of the International Astronautical Congress (IAC), the largest specialized gathering in the space sector worldwide.

We hope you take the opportunity to contribute in one or more of the 180 technical sessions to present your research and network with colleagues working within your domain. All abstracts will be peer reviewed, and a limited number of papers will be selected as oral or interactive presentations. We are looking forward to receiving your contribution to be presented at IAC 2021 in Dubai.

The IAC in Dubai is your gateway to be in touch with new actors, pioneers, experts and leaders of space industry and agencies. Together in a single platform, research breakthroughs, technical advances, existing opportunities and emerging space technologies will be discussed, hoping to construct perpetual relationships and again meet in Paris, the following year during IAC 2022.

Saeed Al Mansoori
IPC Co-Chair, Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates

Jean-Paul Berthias
IPC Co-Chair, Centre National d’Études Spatiales (CNES), France
4. Messages from the Partner Organizations

Message from the International Academy of Astronautics

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. In addition to organizing around 20 conferences a year, worldwide, the Academy is organizing 13 symposia at next year’s IAC in Dubai, UAE, representing about one third of the IAC technical program, 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.

Kai-Uwe Schrogl
President, International Academy of Astronautics (IAA)

Message from the International Institute of Space Law

On behalf of the International Institute of Space Law, I am pleased to invite you to attend our 64th Colloquium on the Law of Outer Space in Dubai, United Arab Emirates. 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 35th 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 membership paired with bright young scholars, which guarantees relevant contributions.

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

5. International Astronautical Federation (IAF)

Founded in 1951, the International Astronautical Federation is the world’s leading space advocacy body. The IAF has more than 407 members from 71 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 all 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.

Past President and Honorary Ambassador

Jean-Yves Le Gall
President, Centre National d’Etudes Spatiales (CNES), France

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Clayton Mowry
VP, Global Sales, Marketing & Customer Experience, Blue Origin, United States

5th IAC
International Astronautical Congress
25–29 October 2021, Dubai

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 1177 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 40 others. The Academy also publishes four book series and the journal Acta Astronautica ranked 4th in the world and containing each year about 3500 refereed papers.

The Academy organizes about 20 conferences and regional meetings per year focused on the development and promotion of all space activities and covering all continents including space developing countries. In addition, the Activity also includes, in cooperation with the International Astronautical Federation and the International Institute of Space Law, the traditional contribution to the International Astronautical Congress (IAC), where the Academy organizes 13 symposia.

The Academy also continues to enjoy its participation in the COSPAR Assemblies and the International Society for Photogrammetry and Remote Sensing (ISPRS) Congress. Although the IAA has many connections to those and other similar organizations, it is distinctive as the only International Academy of elected members in the broad area of astronautics and space.

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Website: www.iaaweb.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 experts. 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.

The IISL is an officially recognized observer at sessions of the United Nations Committee on the Peaceful Uses of Outer Space, and its Scientific & Technical and Legal Subcommittees. In cooperation with the European Centre for Space Law (ECSL), the IISL organizes an annual space law symposium for the delegates and staff attending sessions of the UNCOPUOS Legal Subcommittee. In addition the Institute organizes a variety of conferences on space law throughout the year in locations all over the world. It publishes an annual volume of IISL Proceedings with papers and reports of all these activities during the year.

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Peter Martinell (South Africa)

**LEGAL COUNSEL**
8. 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 72nd International Astronautical Congress to be held in Dubai, United Arab Emirates from 25 to 29 October 2021. The Congress is organized by the International Astronautical Federation (IAF), hosted by the Mohammed Bin Rashid Space Centre (MBRSC), 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.

Join the global space community at this exciting international gathering – and play an active role in the Technical Programme by presenting your recent abstracts. Submitted abstracts can be considered for oral presentations (as ‘Short Talks’ in the Symposia) and for interactive presentations.

The theme of the Congress – “Inspire, Innovate & Discover for the Benefit of Humankind” – has been formulated broadly to enable the programme to cover a wide variety of established fields and current trends across space. This is reflected in the abstract topics, which can be viewed in this first announcement of the Call for Abstracts.

This “Call for Abstracts” is a pre-cursor to a subsequent submission of a final paper, which may be presented at the 72nd 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: Science and Exploration; Applications and Operations; Technology; Infrastructure; 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. Submit your abstract through the online IAF portal at www.iafastro.net no later than 11:59 PM CEST on 28 February 2021.

Submitted abstracts will be evaluated by the Session Chairs on the basis of technical quality and relevance to the session topics. Selected abstracts may be chosen for oral or interactive presentation. Any such choice is not an indication of quality of the submitted abstract. Their evaluation will be submitted to the International Programme Committee, which will make the final decision during the IAC Spring Meetings to be held in March 2021 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 2021 and please check the IAF website regularly to get the latest updates on the Technical Programme!

5. Somanath
Vice President, Technical Activities
International Astronautical Federation (IAF)

9. IAC 2020 Technical Sessions

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A1.1 Behaviour, Performance and Psychosocial Issues in Space

- **Session Co-Chairs:** Oleg Drvor (IAI), Inesa Kozlovskaya (IAF)
- **Rapporteur:** Elena Fomina (Russia)

A1.2 Human Physiology in Space

- **Session Co-Chairs:** Oleg Drvor (IAI), Inesa Kozlovskaya (IAF)
- **Rapporteur:** Elena Fomina (Russia)

A1.3 Medical Care for Humans in Space

- **Session Co-Chairs:** Oleg Drvor (IAI), Inesa Kozlovskaya (IAF)
- **Rapporteur:** Elena Fomina (Russia)

A1.4 Medicine in Space and Extreme Environments

- **Session Co-Chairs:** Oleg Drvor (IAI), Inesa Kozlovskaya (IAF)
- **Rapporteur:** Elena Fomina (Russia)
A1.5 Radiation Fields, Effects and Risks in Human Space Missions

The major topics of this session are the characterization of the radiation environment by theoretical modeling and experimental data, radiation effects on physical and biological systems, countermeasures to radiation and radiobiology risk assessment.

Co-Chairs
- Gennady Belyaev
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Nicola Stigliani
  University of Rome — ITALY

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

A1.6 Astrobiology and Exploration

Space exploration using robots includes ambitious goals like Mars missions, and exploits robotic exploration of bodies relevant for astrobiology such as the Mars surface. They will be revisited and discussed in this session.

Co-Chairs
- Fabio Massari
  University of Rome — ITALY
- Paolo Schiavon
  University of Padova — ITALY

Repporteur
- Christian Sallaberger
  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 for providing human requirements during future deep space and planetary/ lunar surface exploration.

Co-Chairs
- Kan Yabuki
  University of Tokyo — JAPAN
- Hiroki Kiyama
  University of Tokyo — JAPAN

Repporteur
- Hiroshi Okazaki
  Waseda University — JAPAN

A2.1 Gravity and Fundamental Physics

This session is devoted to new fields of physics in condensed matter physics and gravitational physics including stringy fields, critical fluids, equivalence principle, atomic cold and plasma physics.

Co-Chairs
- David Korsmeyer
  NASA, Jet Propulsion Laboratory — UNITED STATES
- David Pinto
  University of São Paulo — BRAZIL

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

A2.2 Fluid and Materials Sciences

The main focus of the session is on new research directions in fluids and materials sciences, where the physical or chemical reaction rates can be controlled by the evolution of the material properties.

Co-Chairs
- Volker Wollenhaupt
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Yoshinori Saeki
  University of Tokyo — JAPAN

Repporteur
- Shinya Yabuta
  National Aerospace Laboratory Agency (JAXA) — JAPAN

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

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

Co-Chairs
- Shinya Yabuta
  National Aerospace Laboratory Agency (JAXA) — JAPAN
- Yoshinori Saeki
  University of Tokyo — JAPAN

Repporteur
- Masatoshi Nishimoto
  Microgravity Center of Science University — RUSSIA

A2.4 Science Results from Ground Based Research

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

Co-Chairs
- Valentina Shokehta
  University of Naples — ITALY
- Antonio Viviani
  University of Naples — ITALY

Repporteur
- Natasha L. Smirnova
  Microgravity Center of Science University — RUSSIA

A2.5 Facilities and Operations of Microgravity Experiments

This session is devoted to new diagnostic developments, new technologies and concepts for the future, ground and flight operation (microrockets, robotics, hardware & software).

Co-Chairs
- Rainer Willnow
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Christopher Cooper
  ESA/ESTEC, ILEWG & VU Amsterdam — NETHERLANDS

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

A2.6 Microgravity Sciences on board ISS and beyond

This session focuses in the presentation of scientific and operational results obtained from microgravity sciences research conducted on large orbital platforms, in particular the ISS. Papers on planned or newly developed research topics and experimental scenarios are also invited. The session is not limited to the usage of the ISS but comprises the preparation scenarios for further long term flight opportunities beyond the low earth orbit such as Deep Space Gateway.

Co-Chairs
- Alexander Sauter
  Universität der Bundeswehr München — GERMANY
- Didier Chaput
  Centre National d’Études Spatiales (CNES) — FRANCE

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

A2.7 Life and Physical Sciences under reduced Gravity

This session is focused on the presentation of scientific and operational results obtained from life and physical sciences research conducted on large orbital platforms, in particular the ISS. Papers on planned or newly developed research topics and experimental scenarios are also invited. The session is not limited to the usage of the ISS but comprises the preparation scenarios for further long term flight opportunities beyond the low earth orbit such as Deep Space Gateway.

Co-Chairs
- Angela Siefert
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Stijn Vermeersch
  Université Libre de Bruxelles — BELGIUM

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

A3.1 Space Exploration Overview

This session provides a overview of the current and future robotic missions and material plans for initiatives in the exploration of the lunar orbit.

Co-Chairs
- Christian Sallaberger
  Centre National d’Études Spatiales (CNES) — FRANCE
- Benoit Fouché
  Université libre de Bruxelles — BELGIUM

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

A3.2A 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 review 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 author will be assigned a specific eight 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 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 at a special ceremony at which the winner follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs
- Rainer Willnow
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Marc Allan持
  Japan Aerospace Exploration Agency (JAXA) — JAPAN

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

A3.2B Interactive Presentations - IAF MICOROGRAVITY 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 review 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 author will be assigned a specific eight 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 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 at a special ceremony at which the winner follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs
- Rainer Willnow
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Marc Allan持
  Japan Aerospace Exploration Agency (JAXA) — JAPAN

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

A4.1 Preparatory Activities

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

Co-Chairs
- Valentina Shokehta
  University of Naples — ITALY
- Antonio Viviani
  University of Naples — ITALY

Repporteur
- Natasha L. Smirnova
  Microgravity Center of Science University — RUSSIA

A4.2 Fluids and Materials Sciences

The main focus of the session is on new research directions in fluids and materials sciences, where the physical or chemical reaction rates can be controlled by the evolution of the material properties.

Co-Chairs
- Volker Wollenhaupt
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Yoshinori Saeki
  University of Tokyo — JAPAN

Repporteur
- Shinya Yabuta
  National Aerospace Laboratory Agency (JAXA) — JAPAN

A4.3 Microgravity Experiments from Sub-Orbital to Orbital Platforms

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

Co-Chairs
- Shinya Yabuta
  National Aerospace Laboratory Agency (JAXA) — JAPAN
- Yoshinori Saeki
  University of Tokyo — JAPAN

Repporteur
- Masatoshi Nishimoto
  Microgravity Center of Science University — RUSSIA

A4.4 Science Results from Ground Based Research

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

Co-Chairs
- Valentina Shokehta
  University of Naples — ITALY
- Antonio Viviani
  University of Naples — ITALY

Repporteur
- Natasha L. Smirnova
  Microgravity Center of Science University — RUSSIA

A5.1 Radiation Fields, Effects and Risks in Human Space Missions

The major topics of this session are the characterization of the radiation environment by theoretical modeling and experimental data, radiation effects on physical and biological systems, countermeasures to radiation and radiobiology risk assessment.

Co-Chairs
- Gennady Belyaev
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
- Nicola Stigliani
  University of Rome — ITALY

Repporteur
- Vladimir Poutikov
  Deutsches Zentrum für Luft- und Raumfahrt e.V (DLR) — GERMANY
A3.2C Moon Exploration – Part 3
This session will address current and future lunar missions. The sessions will address orbital missions, robotic surface missions, as well as the science aspects on the Moon, resource utilization and preparatory activities for future solar system exploration.

Co-Chairs
Bernard Fering
ESAC, ESTRACK & VIC Observatory – THE NETHERLANDS

Rapporteur
David A. Cesarini
National Aeronautics and Space Administration (NASA) – United States

A3.3A Mars Exploration – Missions Current and Future
The planeteers in Mars exploration have made giant steps with multiple robotic missions from a variety of nations. This session will cover current results from ongoing Mars missions and the designs for proposed Mars missions.

Co-Chairs
Vincenzo Grigioni
Thales Alenia Space Italia – ITALY
Pierre M. Weisbequet
Centre National d’Études Spatiales (CNES) – FRANCE

Rapporteurs
Cheryl Reed
Northrop Grumman Innovation Systems – United States
Amalia Ercoli Finzi
Politecnico di Milano – ITALY

A3.3B Mars Exploration – Science, Instruments and Technologies
The planeteers in Mars exploration have made giant steps with multiple robotic missions from a variety of nations. This session will cover science, instruments and technologies for Mars missions including expected experiments. Papers will address any aspect of the search for evidence of extinct Martian life, and how data and feedback communications are particularly welcome.

Co-Chairs
Vincenzo Grigioni
Thales Alenia Space Italia – ITALY
Pierre M. Weisbequet
Centre National d’Études Spatiales (CNES) – FRANCE

Rapporteurs
Cheryl Reed
Northrop Grumman Innovation Systems – United States
Amalia Ercoli Finzi
Politecnico di Milano – ITALY

A3.4A Small Bodies Missions and Technologies (Part 1)
This session will present missions and technologies aspects related to the exploration of small bodies including a search for pre-biotic signatures.

Co-Chairs
Susan McLennan-Leaver
Space Technology (Vanier) Ltd. – CANADA
Stephen Ustin
Institute for Environmental and Space Sciences (ISES) – Germany

Rapporteurs
Norbert Fischer
TU Graz – AUSTRIA
Marc D. Rayman
NASA Jet Propulsion Laboratory – UNITED STATES

A3.4B Small Bodies Missions and Technologies (Part 2)
This session will present the missions and technologies aspects related to the exploration of small bodies including a search for pre-biotic signatures.

Co-Chairs
Stephen Ustin
Institute for Environmental and Space Sciences (ISES) – Germany
Susan McLennan-Leaver
Space Technology (Vanier) Ltd. – CANADA

Rapporteurs
Norbert Fischer
TU Graz – AUSTRIA
Marc D. Rayman
NASA Jet Propulsion Laboratory – UNITED STATES

A3.5 Solar System Exploration including Ocean Worlds
This session will address robotic missions for Solar System exploration (inner and outer planets and their satellites, and space plasma physics) except the Earth, Moon, Mars, and small Solar System Objects (SSOs). Emphasis will be given to missions addressing missions to so-called Ocean Worlds (Enceladus, Europa, Titan) that are sought. Papers covering both new missions concepts as well as the associated specific technologies are invited.

Co-Chairs
Susan McLennan-Leaver
Space Technology (Vanier) Ltd. – CANADA

Rapporteurs
Mark D. Rayman
NASA Jet Propulsion Laboratory – UNITED STATES
Norbert Fischer
TU Graz – AUSTRIA

A4 50th IAA Symposium on the Search for Extraterrestrial Intelligence (SETI) – The Next Steps
The symposium, organized by the International Academy of Astronautics (IAA), covers the strategic plans, architectural concepts and technology development for future human exploration of the Moon, Mars, Lagrange Points and NEOs.

Co-Chairs
Michael Geistler
German Aerospace Centre – GERMANY
Penny May
University of Western Sydney – AUSTRALIA

Rapporteurs
K. Bruce Morris
Arcadis – CANADA

A5 Human Exploration of the Moon and Cislunar Space
This session will explore space transportation capabilities, existing or under study, for human deep space exploration missions, new science, programme architectures, technology demonstrations as well as the issues of scientific and political motivations and international cooperation. The session will also take a look at how transportation capacity is evolving in the coming years and the corresponding impact on complex mission design, implementation, and operations.

Co-Chairs
Amalia Ercoli Finzi
Politecnico di Milano – ITALY
Sara Weil
University of Arizona – UNITED STATES

Rapporteurs
Christiane Löffler
European Space Agency (ESA) – THE NETHERLANDS

A5.1 Human Exploration of the Moon and Cislunar Space
This session will explore the science and infrastructure required to support human exploration of the Moon and Cislunar space. Papers are invited to discuss technology roadmaps as well as interfaces to allow international cooperation.

Co-Chairs
K. Bruce Morris
Arcadis – CANADA

Rapporteurs
Marc Haese
Deutsche Zentrum für Luft- und Raumfahrt e.V. (DLR) – GERMANY

A5.2 Human Exploration of Mars
This session will explore the science and infrastructure required to support human exploration of Mars and the means of Mars. Papers are invited to discuss technology roadmaps as well as interfaces to allow international cooperation.

Co-Chairs
K. Bruce Morris
Arcadis – CANADA

Rapporteurs
Marc Haese
Deutsche Zentrum für Luft- und Raumfahrt e.V. (DLR) – GERMANY

A5.3 Human and Robotic Partnerships in Exploration – Joint session of the IAA Human Spaceflight and IAF Exploration Symposium
This session covers new systems and technology for human spaceflight and exploration programs, and the role of human and robotic partnerships in such systems such as orbital robotic assembly, habitat, habitat construction support, human mobility support systems for Io VLD mobility aids, safety, and robotic precursor activities to human spaceflight for test, validation, and demonstration of systems. This paper welcomes papers considering how the roles of humans, robots and intelligent systems are likely to evolve in the coming years and the corresponding impact on complex mission design, implementation, and operations.

Co-Chairs
Christian Boldt
Aalto University – FINLAND

Rapporteurs
Jeroen Schouten
Deutsche Zentrum für Luft- und Raumfahrt e.V. (DLR) – GERMANY

A5.4 Space Transportation Solutions for Deep Space Missions
This session will explore space transportation capabilities, existing or under study, for human deep space exploration missions, new science, programme architecture, technology demonstrations as well as the issues of scientific and political motivations and international cooperation.

Co-Chairs
K. Bruce Morris
Arcadis – CANADA

Rapporteurs
Gerard Schindler
European Space Agency (ESA) – THE NETHERLANDS

A5.5 Interactive Presentations - IAF IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps
This session offers a unique opportunity to deliver your latest messages in an interactive presentation on any of the subjects of the IAA Symposium on the Search for Extraterrestrial Intelligence (SETI) including a discussion of all kinds of contacts. The technical side is not limited to the microphone window, but includes audio and any kind of radiators. The interactive papers include all scientific implications, risk communication and philosophical considerations of any kind of discovery or contact.

Co-Chairs
Claudio Massironi
University of Insubria – ITALY
Michael Albert Goetz
University of Münster – UNITED STATES

Rapporteurs
Marc D. Rayman
NASA Jet Propulsion Laboratory – UNITED STATES

A5.6 Interactive Presentations - 50th IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps
This session offers a unique opportunity to deliver your latest messages in an interactive presentation on any of the subjects of the IAA Symposium on the Search for Extraterrestrial Intelligence (SETI), including a discussion of all kinds of contacts. The technical side is not limited to the microphone window, but includes audio and any kind of radiators. The interactive papers include all scientific implications, risk communication and philosophical considerations of any kind of discovery or contact.

Co-Chairs
Claudio Massironi
University of Insubria – ITALY
Michael Albert Goetz
University of Münster – UNITED STATES

Rapporteurs
Marc D. Rayman
NASA Jet Propulsion Laboratory – UNITED STATES

A6 24th IAA Symposium on Human Exploration of the Solar System
This symposium, organized by the International Academy of Astronautics (IAA), covers the strategic plans, architectural concepts and technology development for future human exploration of the Moon, Mars, Lagrange Points and NEOs.

Co-Chairs
Christian Boldt
Aalto University – FINLAND
Maria Antonietta Peroni
Trento University – ITALY

Rapporteurs
Amalia Ercoli Finzi
Politecnico di Milano – ITALY

A6.1 Human Exploration of the Moon and Cislunar Space
This session will explore the science and infrastructure required to support human exploration of the Moon and Cislunar space. Papers are invited to discuss technology roadmaps as well as interfaces to allow international cooperation.

Co-Chairs
K. Bruce Morris
Arcadis – CANADA

Rapporteurs
Marc Haese
Deutsche Zentrum für Luft- und Raumfahrt e.V. (DLR) – GERMANY

A6.2 Human Exploration of Mars
This session will explore the science and infrastructure required to support human exploration of Mars and the means of Mars. Papers are invited to discuss technology roadmaps as well as interfaces to allow international cooperation.

Co-Chairs
K. Bruce Morris
Arcadis – CANADA

Rapporteurs
Marc Haese
Deutsche Zentrum für Luft- und Raumfahrt e.V. (DLR) – GERMANY

A6.3 Human and Robotic Partnerships in Exploration – Joint session of the IAA Human Spaceflight and IAF Exploration Symposium
This session covers new systems and technology for human spaceflight and exploration programs, and the role of human and robotic partnerships in such systems such as orbital robotic assembly, habitat, habitat construction support, human mobility support systems for Io VLD mobility aids, safety, and robotic precursor activities to human spaceflight for test, validation, and demonstration of systems. This session also welcomes papers considering how the roles of humans, robots and intelligent systems are likely to evolve in the coming years and the corresponding impact on complex mission design, implementation, and operations.

Co-Chairs
Christian Boldt
Aalto University – FINLAND

Rapporteurs
Jeroen Schouten
Deutsche Zentrum für Luft- und Raumfahrt e.V. (DLR) – GERMANY

A6.4 Space Transportation Solutions for Deep Space Missions
This session will explore space transportation capabilities, existing or under study, for human deep space exploration missions, new science, programme architecture, technology demonstrations as well as the issues of scientific and political motivations and international cooperation.

Co-Chairs
K. Bruce Morris
Arcadis – CANADA

Rapporteurs
Gerard Schindler
European Space Agency (ESA) – THE NETHERLANDS

A6.5 Interactive Presentations - 24th IAA Symposium on Human Exploration of the Solar System
This session offers a unique opportunity to deliver your latest messages in an interactive presentation on any of the subjects of the IAA Symposium on the Search for Extraterrestrial Intelligence (SETI), including a discussion of all kinds of contacts. The technical side is not limited to the microphone window, but includes audio and any kind of radiators. The interactive papers include all scientific implications, risk communication and philosophical considerations of any kind of discovery or contact.
A6.1 Space Debris Detection, Tracking, and Characterization
This session will address any aspect of SST (Space Surveillance and Tracking), advanced ground- and space-based measurement techniques, relating processing methods, and results of space debris characterization.

**Co-Chairs**
- Thomas Schlichteweiß
- Vincent Virat

**Rapporteur**
- Jean-Claude Traineau

A6.2 Modelling and Risk Analysis
This session will address the characterization of the current and future debris population and methods for in-orbit and on-ground risk assessments. The in-orbit analysis will cover collision risk estimations based on statistical population models and deterministic catalogue, and active assistance.

**Co-Chairs**
- Carmen Pauzé
- Daniel Othougoz

**Rapporteur**
- John Auburn

A6.3 Impact-Induced Mission Effects and Risk Assessments
This session addresses completeness of Spacecraft safety: impact induced seriousness, impact assessment, determination of mission effects and risk assessment. In particular, the session will cover impacts to space assets, mission elements, and the overall mission's objectives.

**Co-Chairs**
- Enrico Bertolucci
- Zizheng Gong

**Rapporteur**
- Piero Orecchia

A6.4 Mitigation - Tools, Techniques and Challenges - SEM
This session will focus on the mitigation part of the SST (Space Surveillance and Tracking), implementation of debris avoidance and reduction measures, debris mitigation with experiments and results to support the development of space missions.

**Co-Chairs**
- germany
- Piero Orecchia

**Rapporteur**
- Jean-Claude Traineau

A6.5 Post Mission Disposal and Space Debris Removal - SEM
This session will focus on the mitigation part of the SST (Space Surveillance and Tracking), implementation of debris avoidance and reduction measures, debris mitigation with experiments and results to support the development of space missions.

**Co-Chairs**
- Enrico Bertolucci
- Zizheng Gong

**Rapporteur**
- Pierre Orecchia

A6.6 Post Mission Disposal and Space Debris Removal - SEM
This session will focus on the mitigation part of the SST (Space Surveillance and Tracking), implementation of debris avoidance and reduction measures, debris mitigation with experiments and results to support the development of space missions.

**Co-Chairs**
- Enrico Bertolucci
- Zizheng Gong

**Rapporteur**
- Pierre Orecchia

A6.7 Operations in Space Debris Environment, Situational Awareness - SSA
This session will address the mitigation of debris and the prevention of collisions in the operational environment. It will cover the identification, tracking, characterization, and modeling of space debris, as well as the development of strategies to mitigate the effects of debris on spacecraft.

**Co-Chairs**
- Enrico Bertolucci
- Zizheng Gong

**Rapporteur**
- Pierre Orecchia

A6.8 Political, Legal, Institutional and Economic Aspects of Space Debris Mitigation - STMI - Security
This session will address the political, legal, institutional, and economic aspects of space debris management. It will cover the legal and institutional framework, economic aspects, and the role of international cooperation in addressing these issues.

**Co-Chairs**
- Brent Piattelli
- Alexander Saurer

**Rapporteur**
- Samir H. Qureshi

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A6.9 Orbit Determination and Propagation - SST
This session will address every aspect of orbit determination coming from the SST (Space Surveillance and Tracking), relating to assessment of risk and derived data accuracy, orbit analysis, and risk analysis of space debris.

**Co-Chairs**
- Harold Viñas
- John M. Mowrer

**Rapporteur**
- Pietro Omaly

A6.10 Joint Space Operations / Space Debris Session - STM Operations
This joint session will deal with every aspect of STM (Space Surveillance and Tracking) and space debris communities for shared understanding of the challenges and opportunities in operating in a debris-rich environment. It deals with STM—operations and security, joint STM—operations and space debris, HSF and PMD are especially welcome. Looking into the future: improved STM (automated awareness) and large constellations operations are in line with the challenging for the community and require the appropriate regulatory mechanisms.

**Co-Chairs**
- Carmen Pauzé
- Daniel Othougoz

**Rapporteur**
- Jean-Claude Traineau
B1 IAF EARTH OBSERVATION SYMPOSIUM

The Earth Observation Symposium, organized by the International Astronautical Federation (IAF), covers all aspects of Earth observations from space, especially observations related to the Earth's environment and including weather, climate, and optical sensors and technologies, systems for land, oceanic, and atmospheric applications, ground data processing.

Co-Chairs
Andrije Court
THU — THE NETHERLANDS
Andrew Court
National Aeronautics and Space Administration (NASA) — UNITED STATES

B1.1 International Cooperation in Earth Observation Missions

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

Co-Chairs
Mehdad Rafidinia Reza
National Institute of Teheran Branch (NITB) — IRAN
Josep Lluís Arranz
University of Barcelona — SPAIN
James Graft
Air & Space Policy Laboratory — UNITED STATES

B1.2 Future Earth Observation Systems

This session is focused on the development of next-generation Earth observation systems. Descriptions of new concepts and innovative earth observation sensors and systems are encouraged.

Co-Chairs
Tim Stagg
UK Space Agency — United Kingdom
Alain Ghysels
Centre National d’Etudes Spatiales (CNES) — FRANCE
Jonne Scholten
Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY

B1.3 Earth Observation Sensors and Technology

This focus is on instruments and future concepts being proposed, developed, tested, or calibrated for all aspects of Earth observation. Particular emphasis is on systems and technology that can improve measurements and delivery performance for science, commercial or operational earth observation. Descriptions of new concepts and innovative earth observation sensors and systems are encouraged.

Co-Chairs
Andrew Court
THU — THE NETHERLANDS
Naak Le Goff
CSL — FRANCE

B1.4 Earth Observation Data Management Systems

This focus is on Earth Observation-related data processing and systems. Emphasis is on the challenge of new information and technology opportunities and the role of data management systems. The session also covers innovative methods and technologies for ensuring the high availability, data delivery, and for merging the multi-odata available to decision makers. Presentation of International coordination and programmes — on Earth Observation data-related systems — is also encouraged.

Co-Chairs
Gerard Schoeller
Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY
Jin-Ho Yoon
Agency for Science, Technology and the Environment (A*STAR) — SINGAPORE

B1.5 Earth Observation Applications, Societal Challenges and Economic Benefits

This focus is on issues and trends in Earth Observation data to generate value-added products and services for meeting societal challenges or addressing new commercial approaches. Presentation of algorithms, processing chains and services including consideration of cost investments and economic and societal benefits, especially leveraging innovative approaches such as web-based tools, are encouraged. In addition to those that have already been undertaken, optimal satellite systems and operational services integration are encouraged.

Co-Chairs
Mitsuhiro Honda
Japan Aerospace Exploration Agency (JAXA) — JAPAN
Ko Yoo
GIST University Laboratory of Space Technology, Chonnam National University (CHONAM) — SOUTH KOREA

B1.6 21st Anniversary of the Disaster Charter: History, Status and Future of this Powerful and Productive International Cooperation

The Disaster Charter, through its 21st Charter, has been offering outstanding success. Session focus is on Charter history, current status and the future. Presentations are encouraged which involve case studies, lessons, history of the formation and early years, current status of operations, analysis of what has worked and why, challenges, and recommendations for the future.

Co-Chairs
Harry J. A. Giesken
National Research and Atmospheric Administration (NOAA) — UNITED STATES
Arthur Rahn
Airbus Defence and Space GmbH — UNITED KINGDOM

B1.1P Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM

This session offers an unique opportunity to observe key messages presented on any of the subjects of Earth Observation addressed in the classic Sessions. The presentations will be displayed on a Digital screen in a dedicated location and available for view by all IAF and Congress attendees for the entire Congress week. In addition, one afternoon dedicated to studio presentations for the attendees to enjoy live presentations. The author will be assigned for specific time slots to participate in the final and interact with the interlocutors present. The interactive Presentations may take advantage of all electronic display capabilities, such as Powerpoint slides, embedded links, pictures, audio and video. An award will also be presented to the author of the best Interactive Presentation in the B Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard papers.}

B2 IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM

The Symposium is intended to cover all aspects of new space communications, services, architectures and infrastructure; fixed, mobile and broadcast services, including the high-throughput services (HTS); new and Earth observation systems/services; and constellations. The session also covers innovative methods for communication and navigation; secured communication; enhanced navigation and communication services, including video to users; next-generation and multibeam systems. It also includes spectrum issues for new systems/services, and space systems engineering.

Co-Chairs
Robert B. Mickelson
Raytheon — UNITED STATES
Kate Becker
European Space Agency (ESA) — ITALY

B2.1 Advances in Space-based Communication Systems and Services, Part 1

This session is focused on all aspects of new space communications, services, architectures and infrastructure; fixed, mobile and broadcast services, including the high-throughput services (HTS) and Earth observation systems/services; and constellations. The session also covers innovative methods for communication and navigation; secured communication; enhanced navigation and communication services, including video to users; next-generation and multibeam systems. It also includes spectrum issues for new systems/services, and space systems engineering.

Co-Chairs
Nicola Benedetti
National Institute of Informatique and Communications Technology (NICT) — JAPAN
Otto Koudelka
Canadian Aeronautics and Space Institute — CANADA

B2.2 Advances in Space-based Communication Systems and Services, Part 2

This session is focused on all aspects of new space communications, services, architectures and infrastructure; fixed, mobile and broadcast services, including the high-throughput services (HTS) and Earth observation systems/services; and constellations. The session also covers innovative methods for communication and navigation; secured communication; enhanced navigation and communication services, including video to users; next-generation and multibeam systems. It also includes spectrum issues for new systems/services, and space systems engineering.

Co-Chairs
Hiroshi Kishimoto
The Activo Polytechnic University Applied Physics Laboratory — UNITED STATES
Manfred Wittig
Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY

B2.3 Advances in Space-based Communication Technologies, Part 1

This session is focused on all aspects of new space communications, services, architectures and infrastructure; fixed, mobile and broadcast services, including the high-throughput services (HTS) and Earth observation systems/services; and constellations. The session also covers innovative methods for communication and navigation; secured communication; enhanced navigation and communication services, including video to users; next-generation and multibeam systems. It also includes spectrum issues for new systems/services, and space systems engineering.

Co-Chairs
Carson Miller
National Aeronautics and Space Administration (NASA) — UNITED STATES
Nada Al-Agha
Incomspace — UNITED ARAB EMIRATES

B2.4 Advances in Space-based Communication Technologies, Part 2

This session is focused on all aspects of new space communications, services, architectures and infrastructure; fixed, mobile and broadcast services, including the high-throughput services (HTS) and Earth observation systems/services; and constellations. The session also covers innovative methods for communication and navigation; secured communication; enhanced navigation and communication services, including video to users; next-generation and multibeam systems. It also includes spectrum issues for new systems/services, and space systems engineering.

Co-Chairs
R.K. Villschulte
NASA — UNITED STATES
Elnaert Bernery
Canadian Aeronautics and Space Institute — CANADA
Enrique Pacheco Cabello
Instituto de Telematica y Energias Renovables (ITEA) — SPAIN

B2.5 Advances in Space-based Navigation Systems, Services, and Applications

This session is focused on all aspects of new space communications, services, architectures and infrastructure; fixed, mobile and broadcast services, including the high-throughput services (HTS) and Earth observation systems/services; and constellations. The session also covers innovative methods for communication and navigation; secured communication; enhanced navigation and communication services, including video to users; next-generation and multibeam systems. It also includes spectrum issues for new systems/services, and space systems engineering.

Co-Chairs
Erik D. Paulus
University of Applied Sciences — GERMANY
Giovanni B. Palmerini
Telecommunications Research Institute (TIR) — ITALY

B2.6 Advances in Space-based Navigation Systems, Services, and Applications

This session is focused on all aspects of new space communications, services, architectures and infrastructure; fixed, mobile and broadcast services, including the high-throughput services (HTS) and Earth observation systems/services; and constellations. The session also covers innovative methods for communication and navigation; secured communication; enhanced navigation and communication services, including video to users; next-generation and multibeam systems. It also includes spectrum issues for new systems/services, and space systems engineering.
B3  IAF HUMAN SPACEFLIGHT SYMPOSIUM

The symposium, organized by the International Astronautical Federation (IAF), invites papers on all aspects of ongoing and planned human spaceflight including the design, development, operations, utilization and future plans of space missions involving humans. The human spaceflight symposium will also feature discussions on presentations for the launch of new human spaceflight capabilities and collaborative efforts of human and robotic systems and technologies.

Co-Chairs
- Kevin De Reus
- Sergey K. Shaevich

B3.1 Governmental Human Spaceflight Programmes (Overview)

This session provides the framework for the yearly and annual “Overview” presentations on present and upcoming governmental human spaceflight programmes. Each year, the session will focus on specific themes derived from the received abstracts. The session will encompass examples from the space agencies of the governmental human spaceflight programmes, especially from the national space agencies or space agencies of the governmental organizations.

Rapporteur
- Igor S. Kuznetsov
- Victor L. Ponomarev

B3.2 Commercial Human Spaceflight Programmes

The session provides the framework for yearly and annual “Overview” presentations on present and upcoming commercial human orbital and suborbital spaceflights and space stations in development or in launch operations. Topics include the status of development, testing, and operations; and the architecture and performance of various systems; launch infrastructure and launch vehicles; and other considerations.

Rapporteur
- Jürgen Schütz

B3.3 Utilization & Exploitation of Human Spaceflight Systems

This session provides the framework for yearly and annual “Overview” presentations on present and upcoming commercial human orbital and suborbital spaceflights and space stations in development, as well as human-rated launch vehicles and human-rated vehicles and spacestations. Topics include the status of development, testing, and operations; and the architecture and performance of various systems; launch infrastructure and launch vehicles; and other considerations.

Rapporteur
- Michael D. Howes

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

This session addresses advanced concepts, key challenges and their solutions related to 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.

Rapporteur
- Christian Streich
B4.6B  Generic Technologies for Nano/Pico Platforms
The session offers an overview and progress reports on generic technologies for nano and pico platforms. Real-life examples are particularly encouraged, both recently launched and shortly to be launched (last 3 years).

Chairman
Co-Chair

Repporteur

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 energy, or enabling technologies that can be used or being used to create networked data systems on small satellites. More specifically, Session B4.7 focuses on Constellations (e.g. Constellations missions for earth observation, IoT and IoT communications), distributed architectures (e.g. Distributed IoT systems) and sensor networks. 

Repporteur

B4.8  Joint Session between IAA and IAF for Small Satellite Propulsion Systems
This session will bring together propulsion system developers from small satellite companies and institutions from around the world to discuss the latest developments and challenges in small satellite propulsion systems.

Chairman
Co-Chair

Repporteur

B4.9  Small Satellite Missions Global Technical Session
The Small Satellites Missions Global Technical Session (GTS) is a collaboration between the International Academy of Astronautics (IAA) Small Satellite Missions Symposium and the International Astronautical Federation (IAF) Small Satellite Missions Panel. The session provides a forum for sharing technical insights, discussing new trends and developments, and identifying future challenges and opportunities in the field of small satellite missions.

Chairman
Co-Chair

Repporteur

B4.10  Interactive Presentations: 28th IAA SYMPOSIUM ON SMALL SATELLITE MISIONS
This session offers a unique opportunity to deliver short key messages in an interactive presentation on any of the subjects on small satellite missions addressed in the classic sessions. The presentations will be displayed on a digital screen in a dedicated location and available for viewing by all Congress attendees for the entire Congress. In addition, one additional video link from another presentation will be provided for attendees interested in the topic.
B6.3 Mission Operations, Validation, Simulation and Training
The session addresses the broad topic of operations, from preparation through validation, simulation and training, including operations concepts, execution and lessons learned. This includes both flight and surface operations.

Co-Chairs
Anna Maria Rubichi — European Space Agency (ESA) — GERMANY
Jörg Meier — Airbus Defence & Space — GERMANY
Repporteur
Bence Predko — Kongsberg Satellite Services AS — NORWAY
B6.4 Flight and Ground Operations of HSF Systems - A Joint Session of the IAF Human Spaceflight and IAF Space Operations Symposia
This session addresses systems, advanced concepts, key challenges and their solutions related to flight and ground operations within governmental and commercial human spaceflight programs. 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
Dmitriy Valiakhov — Arianespace FLys — France
Ralf Stettenfels — Thales Alenia Space Italia — ITALY
Repporteur
Thomas R. Anderson — Danish Aerospace Company A/S — DENMARK
B6.5 Joint Space Operations / Space Debris Session — STM Operations
This joint session will deal with every aspect of STM Operations and Security. It facilitates discussions between Space Operations and Space Debris communities for shared understanding of the challenges, issues and solutions in a dovetail-rich environment. It deals with STM—Operations and Security; lessons learned from STM operations; IAP and STM are especially welcome. Citing works into the future: improved STM, automated STM, and large constellation operations are an AIP key challenges for the community and require the appropriate regulatory environment.

Co-Chairs
John Auburn — Astrotech INT — UNITED KINGDOM
Darren McIntyre — Integrity Applications Incorporated (IAI) — UNITED STATES
Helen Tang — NewSpace2060 — AUSTRALIA
Repporteur
A. Akdarium — United Space Research Organization (SPR) — UNITED STATES
Norman Filet — University of Toronto — CANADA
Andreas Orbado — German Laboratory for Earth and Raumfahrt e.V. (DLR) — GERMANY
B6.6 Interactive Presentations - IAF SPACE OPERATIONS SYMPOSIUM
This session offers a unique opportunity to either give live presentations or to video presentations on any of the subjects of Space Operations addressed in the actual 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 author will be assigned a specific time slot to personally present the topic and interact with the attendees present. The interactive presentation may take advantage of audio-video capabilities, such as PowerPoint charts, embedded live tests, phone and radio interfaces. An废水 well-discipline will present the author of the best live Interactive Presentation in the Category C as a special award. An abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs
John Auburn — Astrotech INT — UNITED KINGDOM
OSIL Impact — Norwich Academy and Space Advocacy (NASA), Art Propulsion Laboratory — UNITED STATES

C1 IAF ASTRODYNAMICS SYMPOSIUM
This symposium addresses advances in celestial mechanics, attitude dynamics, guidance, navigation and control of space systems. 

Co-Chairs
Anna Gorman — Center for Aeronautics and Space Science and Technology (CASSST) — PENSACOLA
Repporteur
Ariel Russo — University of Florida — UNITED STATES
C1.1 Guidance, Navigation and Control (1)
The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth orbiting and interplanetary spacecraft, including formulation, execution, rendezvous and docking.

Co-Chairs
Jian Chen — The University of Texas at Austin — UNITED STATES
Aurélie Battistelli — ONERA-Space All-Boutron — GERMANY
Repporteur
Polish Academy of Sciences — Institute of Automatic Control (Poland) — POLAND
C1.2 Guidance, Navigation and Control (2)
The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth orbiting and interplanetary spacecraft, including formulation, execution, rendezvous and docking.

Co-Chairs
Ning Guo — National Aeronautics and Space Administration, Air Force Research Laboratory (NASA) — UNITED STATES
Repporteur
Naval Research Laboratory
C1.3 Guidance, Navigation & Control (3)
The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth orbiting and interplanetary spacecraft, including formulation, execution, rendezvous and docking.

Co-Chairs
Miguel Rivero Méndez — Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY
Jean de Lahoratte — ONERA-Space All-Boutron — GERMANY

B5 IAF SYMPOSIUM ON INTEGRATED APPLICATIONS
Space systems are more and more needed to operate in the presence of volatile, uncertain service providers. The concept of Integrated Applications encompass the simultaneous use of various space missions and technologies. The symposium will address various aspects of integrated applications. Integrated applications combine different space systems (communication, navigation, remote sensing, research missions, etc.) with additional ground-based systems (in addition to other technologies as IGPS, AI, IoT, etc.) and offers solutions to deliver services according to user needs. The applications exploit the synergy between different data sources to provide the right information at the right time in the right user or a cost-effective solution to deliver the data to users in a readily usable form. The goal of the symposium is to enable the development of end-to-end solutions by connecting the user communities that are doing toward wired/to solutions with those that are developing existing technologies for integrated applications.

Co-Chairs
Lorin Parker — University of Colorado’s Applied Physics Laboratory — UNITED STATES
Roberta Mugellesi-Dow — European Space Agency (ESA) — UNITED KINGDOM
Repporteur
Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY
B5.1 Tools and Technology in Support of Integrated Applications
"New" is the scope of work that has been published for 2022 and partially treated in the paper. As the only edition of the IAC, this symposium will provide an opportunity for individual presentations, the topic is not restricted but please feel free to propose papers with open discussion. The session will focus on specific systems, tools and technology in support of integrated applications by addressing the various issues associated with applications development, the lack of data to be collected, resource competition and how the data are used in the overall context of the study. These challenges are multitude and complex, and the data used may be from various sources, including from various organizations and countries. The data, however, need to be standardized and the data sharing policies are not uniform. Therefore, this session will address the tools, the lack of cooperation and the data sharing policies and provide solutions to the problems. Possible topics include: ground-truthing of data collected from space platforms; innovative, low-cost tools for data distribution and access that focus on the space segment; new ways of distributing integrated data products; data fusion and visualization tools; managing integrated applications programs and public outreach efforts to connect the public to these applications.

Co-Chairs
Lorin Parker — University of Colorado’s Applied Physics Laboratory — UNITED STATES
Robert Mugellesi-Dow — European Space Agency (ESA) — UNITED KINGDOM
Boris Prseč — OHB Systems AG — GERMANY
Repporteur
Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY
B5.2 Integrated Applications End-to-End Solutions
"New" is the scope of work that has been published for 2022 and partially treated in the paper. As the only edition of the IAC, this symposium will provide an opportunity for individual presentations, the topic is not restricted but please feel free to propose papers with open discussion. The session will focus on specific systems, tools and technology in support of integrated applications by addressing the various issues associated with applications development, the lack of data to be collected, resource competition and how the data are used in the overall context of the study. These challenges are multitude and complex, and the data used may be from various sources, including from various organizations and countries. The data, however, need to be standardized and the data sharing policies are not uniform. Therefore, this session will address the tools, the lack of cooperation and the data sharing policies and provide solutions to the problems. Possible topics include: ground-truthing of data collected from space platforms; innovative, low-cost tools for data distribution and access that focus on the space segment; new ways of distributing integrated data products; data fusion and visualization tools; managing integrated applications programs and public outreach efforts to connect the public to these applications.

Co-Chairs
Lorin Parker — University of Colorado’s Applied Physics Laboratory — UNITED STATES
Robert Mugellesi-Dow — European Space Agency (ESA) — UNITED KINGDOM
Boris Prseč — OHB Systems AG — GERMANY
Repporteur
Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY
B5.3 Satellite Commercial Applications
"New" is the scope of work that has been published for 2022 and partially treated in the paper. As the only edition of the IAC, this symposium will provide an opportunity for individual presentations, the topic is not restricted but please feel free to propose papers with open discussion. The session will focus on specific systems, tools and technology in support of integrated applications by addressing the various issues associated with applications development, the lack of data to be collected, resource competition and how the data are used in the overall context of the study. These challenges are multitude and complex, and the data used may be from various sources, including from various organizations and countries. The data, however, need to be standardized and the data sharing policies are not uniform. Therefore, this session will address the tools, the lack of cooperation and the data sharing policies and provide solutions to the problems. Possible topics include: ground-truthing of data collected from space platforms; innovative, low-cost tools for data distribution and access that focus on the space segment; new ways of distributing integrated data products; data fusion and visualization tools; managing integrated applications programs and public outreach efforts to connect the public to these applications.

Co-Chairs
Lorin Parker — University of Colorado’s Applied Physics Laboratory — UNITED STATES
Robert Mugellesi-Dow — European Space Agency (ESA) — UNITED KINGDOM
Boris Prseč — OHB Systems AG — GERMANY
Repporteur
Deutsches Zentrum für Luft- und Raumfahrt (DLR) — GERMANY
B6.3 Space Operations SYMPOSIUM
The Space Operations Symposium, organized by the International Astronautical Federation (IAF), addresses all aspects of space operations and mission-related advanced concepts and innovations. The symposium covers both flight and ground operations. Relevant topics include advanced operations, training, planning, and real-time operations. Multiple tracks is provided for commercial space operations, advanced systems, new operations concepts, and small satellite operations.

Co-Chairs
Li Ming — China Academy of Space Technology (CAST), China
John M. Horack — The Ohio State University — UNITED STATES
Repporteur
Robert Jasper — Deimos Space SLU — SPAIN
B6.1 Ground Operations - Systems and Solutions
This session discusses all aspects of ground systems and solutions for mission types, for both preparation and execution phases.

Co-Chairs
Sara Burns — Geosynchronous — GERMANY
Thierry Leav — CNES — FRANCE
Repporteur
Ahmed Hany — Atkins, Tesla Space & Power — GERMANY
B6.2 New Space Operations Concepts and Advanced Systems
This session addresses advanced concepts and innovations, systems and tools for operating new types of missions, improving mission output in quality and efficiency, reducing cost.

Co-Chairs
Mario Carbone — Thales Alenia Space France — ITALY
Thomas Kuch — Deutsche Aerospace für Luft- und Raumfahrt e.V (DLR) — GERMANY
Repporteur
Bobby Watkins — NASA MSFC — UNITED STATES

C1.4 Mission Design, Operations & Optimization (1)

The theme covers design, operations and optimization of flight and interplanetary missions, with emphasis on studies and experiences related to current and future missions.

Co-Chairs
- Minoo Moezzibehzadi
  University of Stirling — UNITED KINGDOM
- Yury Ravsky
  Peoples’ Friendship University of Russia — RUSSIA

C1.5 Mission Design, Operations & Optimisation (2)

The theme covers design, operations and optimization of flight and interplanetary missions, with emphasis on studies and experiences related to current and future missions.

Co-Chairs
- K. Y. Gao
  Chinese Academy of Sciences — CHINA
- Michael Langlois
  Politecnico di Milano — ITALY

C1.6 Orbital Dynamics (1)

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

Co-Chairs
- Jiuhong Chen
  National Aeronautics and Space Administration (NASA) — UNITED STATES
- Hsiao-Tsu Huang
  National Space Organization — TAIWAN

C1.7 Orbital Dynamics (2)

This theme focuses on the development and verification of algorithms for the prediction of orbital dynamics of spacecraft in the solar system. It also covers advances in orbit determination.

Co-Chairs
- Katie Bouman
  National Aeronautics and Space Administration (NASA) — UNITED STATES
- Robert S. Thirring
  United States Naval Academy — UNITED STATES

C1.8 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 non-stationary flexible bodies, including systems with pulsed loads, and in situ assembly.

Co-Chairs
- Veysel Isik
  ICONA Institute of Space Science and Technology — ITALY
- Giorgio Dalloro
  University of Bologna — ITALY

C1.9 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 non-stationary flexible bodies, including systems with pulsed loads, and in situ assembly.

Co-Chairs
- Ryszard Kolodziej
  National Aeronautics and Space Administration (NASA) — UNITED STATES
- Tomohiro Inagaki
  University of Tsukuba — JAPAN

C1.1P International Presentations - IAF ASTRODYNAMICS SYMPOSIUM

This theme focuses on presentations by international scientists on advances in astrodynamic sciences and their applications. The theme aims to provide a platform for the exchange of ideas and experiences related to various aspects of astrodynamic sciences, such as theoretical developments, numerical methods, and applications in space mission design.

Co-Chairs
- Michael Kowal
  University of Strathclyde — UNITED KINGDOM
- Arturo de Roiter
  University of Western Ontario — CANADA

C2 IAF MATERIALS AND STRUCTURES SYMPOSIUM

This symposium, organized by the International Astronautical Federation (IAF), provides an international forum for recent advancements in research and development of materials and structures that are essential for space exploration and utilization.

Rapporteur
- Paolo Sartorio
  University of Rome Tor Vergata — ITALY

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

This theme covers the development and verification of space structures and components for a variety of space mission applications. The theme will include advancements in the design, analysis, and test verification of structural components for space vehicles, satellites, and launch vehicles.

Co-Chairs
- Adrian Brucker
  ZUR (German Aerospace Center) — GERMANY
- Marie Ackermann
  European Space Agency (ESA) — GERMANY

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

This theme covers the development and verification of deployable and dimensionally stable structures for space missions. It will focus on advancements in the design, analysis, and test verification of deployable structures for space exploration and utilization.

Co-Chairs
- Pierre Charbonnier
  University of Toulouse — FRANCE
- Thomas von Tiedemann
  Deutsche Zentrale für Luft- und Raumfahrt (DLR) — GERMANY

C2.3 Space Structures - Dynamics and Microdynamics

This theme covers the development and verification of space structures for high-temperature applications. It will focus on advancements in the design, analysis, and test verification of space structures for high-temperature applications, including advances in thermal management, structural integrity, and performance.

Co-Chairs
- Oaii Toda
  JAXA — JAPAN
- Stéphanie Lizy-Destrez
  CNRS — FRANCE

C2.4 Advanced Materials and Structures for High Temperature Applications

This theme covers the development and verification of advanced materials and structures for high-temperature applications. It will focus on advancements in the design, analysis, and test verification of advanced materials and structures for high-temperature applications, including advances in thermal management, structural integrity, and performance.

Co-Chairs
- Massimiliano Vasile
  University of Rome Tor Vergata — ITALY
- Paolo Gasbarri
  NEC Corporation — JAPAN

C2.5 Space Environments Effects and Spacecraft Protection

This theme covers the effects of space environments on spacecraft and spacecraft protection. It will focus on advancements in the design, analysis, and test verification of spacecraft protection systems for various space environments, including space weather, solar flares, and particle radiation.

Co-Chairs
- Antonio Del Vecchio
  CNR — ITALY
- Antonelli Lehanyakia
  National Space Organization — TAIWAN

C2.6 Space Vehicles - Mechanical/Thermal/Hydrodynamics

This theme covers the development and verification of advanced space vehicles with mechanical, thermal, and hydrodynamics properties. It will focus on advancements in the design, analysis, and test verification of advanced space vehicles for various space mission applications.

Co-Chairs
- Oleg K. Alifanov
  Moscow Institute of Physics and Technology — RUSSIA
- Brij Agrawal
  National Aeronautics and Space Administration (NASA) — UNITED STATES

C2.7 Advanced Materials and Structures: Technology and Applications

This theme covers the development and verification of advanced materials and structures for high-temperature applications. It will focus on advancements in the design, analysis, and test verification of advanced materials and structures for high-temperature applications, including advances in thermal management, structural integrity, and performance.

Co-Chairs
- Marc Lammert
  Université de Toulouse — FRANCE
- David E. Glass
  University of California, Berkeley — UNITED STATES

C2.8 Smart Materials and Adaptive Structures

This theme covers the development and verification of smart materials and adaptive structures for various space mission applications. It will focus on advancements in the design, analysis, and test verification of smart materials and adaptive structures for various space mission applications.

Co-Chairs
- Gianmarco Radice
  Kyushu University — JAPAN
- Paolo Prandi
  Politecnico di Milano — ITALY

C2.9 Specialised Technologies, Including Nanotechnology

This theme covers the development and verification of specialized technologies for various space mission applications. It will focus on advancements in the design, analysis, and test verification of specialized technologies for various space mission applications.

Co-Chairs
- Mario Marchetti
  Italian Space Agency — ITALY
- Pierre Rochus
  Centre Spatial de Liège — BELGIUM

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C4.10 Joint Session on Advanced and Nuclear Power and Propulsion Systems

This session is associated only with the IAF Space Power Symposium, and the IAF Space Power Symposium organizers, includes papers addressing all aspects related to Nuclear Power and Propulsion for space applications.

C3.1 Solar Power Satellite

This session deals with all aspects of concepts and architectures for space-based solar power plants and concepts integrating space-based solar power plants with terrestrial energy economies, with the underlying assumption that solar power is the dominant energy source for space missions of the future. This session covers all aspects of space-based solar power plants and concepts integrating space-based solar power plants with terrestrial energy economies, with the underlying assumption that solar power is the dominant energy source for space missions of the future.

C3.2 Wireless Power Transmission Technologies and Applications

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

C3.3 Advanced Space Power Technologies

This session covers all aspects of advanced space power technologies and concepts for satellites, interstellar/binary exploration and mining space activities. These include concepts and methods related to power generation (solar, nuclear, etc.), and harvesting, power conditioning, management and distribution, power transmission and energy storage.

C3.4 Space Power System for Ambitious Missions

This session is dedicated to emerging concepts ranging from very small power (micro and milli-watt power) to very large power systems toward future ambitious space missions and planetary exploration missions. This includes concepts and technologies of space power systems for the access to space and beyond as well as advanced space missions with the attend power needs. This session is associated only with the IAF Space Power Symposium, and the IAF Space Power Symposium organizers, includes papers addressing all aspects related to Nuclear Power and Propulsion for space applications.
C4.6 Electric Propulsion (2)

This session is dedicated to all aspects of electric propulsion dedicated to science (fundamentals, physics, modeling, diagnostic and measurements).

Co-Chairs
Alexander Lavrentiev
IAE/avio Research Centre — RUSSIAN FEDERATION
Angelo Carrasc
University of Technology (T.U. Graz) — The NETHERLANDS

Rapporteurs
Nicolets Mogran
European Space Agency (ESA) — FRANCE

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

This session covers hypersonic air-breathing and combined cycle propulsion with space applications. The typical types of engine considered in this session include turbojet, turbofan, supersonic, scramjet, aerospike, engine, scramjet-based combined cycle (SBC), rocket-based combined cycle (RBCC), hypersonic pre-accelerated propulsion, Air Turfan Rocket (ATR) and other types of hypersonic combined cycle propulsion, together with the associated vehicle.

Co-Chairs
Hong Zhang
China Aerospace Science & Industry Corporation (CASC) — CHINA
Yen-Sen Chen
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES

Rapporteurs
Jean-Clude Traineau
Centre National d’Etudes et de Recherches Aérospatiales (CNES) — FRANCE

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

This session will pay particular attention to propulsion systems and associated technologies as an enabler to efficient small satellite access to space and orbit change. Papers are invited discussing the particular challenges of design, manufacture, testing, operation and technological developments of small satellite propulsion systems, and the challenges of obtaining high performance within a small volume and mass. The scope includes chemical and electrical propulsion systems for small orbit change, free orbit control and maneuver, and small rocket engines for small satellites and/or microsatellites, as well as papers with an emphasis on the small satellite and its system design. Contributions to other IAF sessions for a focus on other propulsion systems and engines, refer to below C4 sessions.

Co-Chairs
Anna Parisi Lattore
Italian Space Agency (ASI) — ITALY
Jeffrey Leide
The Aerospace Corporation — UNITED STATES

Rapporteurs
Elisa Zocchi
université Paris-Saclay — FRANCE

C4.9 New Missions Enabled by New Propulsion Technology and Systems

This session will explore concepts for new missions that can be enabled by specific advancements in propulsion and/or the integration of unique propulsion technologies and systems.

Co-Chairs
Giangiacomo Sessa
Italian Space Agency (ASI) — ITALY
Sébastien Gervas
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES

Rapporteurs
Elisa Zocchi
université Paris-Saclay — FRANCE

C4.10 Joint Session on Advanced and Nuclear Power and Propulsion Systems

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

Co-Chairs
Yen-Sen Chen
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES
Leopold Summerer
European Space Agency (ESA) — THE NETHERLANDS

Rapporteurs
Chongli Cui
Beihang University — CHINA
Jill Prince
British Nuclear Fuel Limited — UNITED KINGDOM

C4.11 Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM

Authors with an abstract accepted for a interactive presentation are invited to arrive early and display them for the duration of the congress on plasma screens. Authors will be assigned the integrating session(s) in which they will show the plasma screens to engage in interactive discussions with other congress attendees.

Co-Chairs
Yen-Sen Chen
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES
Nicoletta Mogran
European Space Agency (ESA) — FRANCE

C4.12 Infrastructure: Systems sustaining space missions, including space technology, space transportation, launch and systems safety

D1.1 Innovative and Visionary Space Systems

This session will address innovative concepts and concepts and services for space applications in future missions. The session objective is to broaden the scenarios for innovation in order to foster the involvement of people from non-science and subject matter experts to other appropriate stakeholders, and building and advancing the future vision of novel and transformational space systems and relevant applications. In this perspective, the dreams of yesterday on the hope of today and the reality of tomorrow by proposing novel concepts of space systems, and applications; we can broaden today’s paradigms toward favorable outcomes beyond incremental advancements.

Co-Chairs
Tobias Beitle
Air Force College — UNITED STATES
Peter Diekmann
CIRA Italian Aerospace Research Centre — ITALY

C1.3 Technologies to Enable Space Systems

This session will review innovative, technological developments that are currently high-lighted, but which have the potential to significantly enhance the performance of existing, and new space systems, enabling innovative technology for space applications often result from such innovations and are being discussed during the sessions, together with top potential space-applications. Examples include instrumentations, biotechnology, components, micro- and nanotechnology, HMRe, advanced new materials and software techniques.

Co-Chairs
Shane Arnold
The Johns Hopkins University Applied Physics Laboratory — UNITED STATES
Xavier Roess
Thales Alenia Space France — FRANCE

C1.4A Space Systems Engineering - Methods, Processes and Tools (1)

This session will focus on state-of-the-art systems engineering methodologies that reduce the time and cost, and improve the quality of space system design. Of special interest are multi-disciplinary methods, processes, and tools used for systems design, Process Resilience, Technical Management, Operations, and Retirement of space systems to improve risk management, reliability, maintainability, and quality of life cycle cost estimations. Specifically, papers may include: state-of-the-art system integration, multi-disciplinary methods, processes, tools, tools that benefit space system design, development and operation; state-of-the-art engineering methodologies for space systems, including space systems of systems; tools that involve engineering design methods or modeling and simulation tools that improve space system engineering and optimisation; methodologies and processes for space systems engineering; space system design optimisation and analysis of space system design, assessment in space system development environments, such as Cost Engineering and design efficiency, and novel methods to improve risk management, cost management, configuration management, data management, availability, safety, reliability, maintainability and quality of life cycle cost estimations.

Co-Chairs
Jon Holladay
Air Force Institute of Technology — UNITED STATES
Peter Diekmann
CIRA Italian Aerospace Research Centre — ITALY

C1.4B Space Systems Engineering - Methods, Processes and Tools (2)

This session will focus on state-of-the-art systems engineering methodologies that reduce the time and cost, and improve the quality of space system design. Of special interest are multi-disciplinary methods, processes, and tools used for systems design, Process Resilience, Technical Management, Operations, and Retirement of space systems to improve risk management, reliability, maintainability, and quality of life cycle cost estimations. Specifically, papers may include: state-of-the-art system integration, multi-disciplinary methods, processes, tools, tools that benefit space system design, development and operation; state-of-the-art engineering methodologies for space systems, including space systems of systems; tools that involve engineering design methods or modeling and simulation tools that improve space system engineering and optimisation; methodologies and processes for space systems engineering; space system design optimisation and analysis of space system design, assessment in space system development environments, such as Cost Engineering and design efficiency, and novel methods to improve risk management, cost management, configuration management, data management, availability, safety, reliability, maintainability and quality of life cycle cost estimations.
D1.5 Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.5.1 ArianeGroup SAS — FRANCE

Discussion of future overall transportation system designs and operational concepts for both expendable and reusable systems for Earth-to-space transportation and exploration.

D1.5.2 RUAG Space — SWITZERLAND

Oliver Kunz

Co-Chairs

Altec S.p.A. — ITALY

Francesco Santoro

Co-Chairs

Mitsubishi Heavy Industries Ltd. — JAPAN

Rapporteur

Yuguang Yang

understanding and cooperation amongst the world’s space-faring organisations.

This session offers an opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Systems addressed in the classic Sessions. The format is 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, animations, 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.

D1.6 Cooperative and Robust Space Systems

This session will focus on cooperative and robust systems as they apply to the space domain. The emerging topic includes concepts such as constellations, multi-spacecraft architectures, and the development of space systems and technologies. Hosted panels, where these objectives may be unraveled in the principal mission, are also addressed.

D1.6.1 Interactive Presentations - IAF SPACE SYSTEMS SYMPOSIUM

The session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.6.2 European Space Agency (ESA) — GERMANY

Jill Prince

Rapporteur

Additional areas of interest include collaborative robotic systems, such as space robotic systems and manipulators, robotic/human interactions and distributed multi-agent systems. This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Systems addressed in the classic Sessions. The format is 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, animations, 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.

D1.7 Space Transportation Solutions for Deep Space Missions

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.8 Emerging Global Space Ventures, including Reusability and other Innovations

The lessons are dedicated to discussions of innovation or initiatives that enable new or evolving space transportation systems, missions, or mission concepts. Of particular interest are innovations and associated maintenance, repair and operation (MRO) solutions as well as open innovation needs for recovery (MRO) solutions, including MRO capabilities and funding.

D1.9 IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

The session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.10 Launch Vehicles in Service or in Development

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.11 Launch Vehicles in Service or in Development

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.12 Launch Vehicles in Service or in Development

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.13 Launch Vehicles in Service or in Development

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.14 Launch Vehicles in Service or in Development

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.15 Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.16 Cooperative and Robust Space Systems

This session will focus on cooperative and robust systems as they apply to the space domain. The emerging topic includes concepts such as constellations, multi-spacecraft architectures, and the development of space systems and technologies. Hosted panels, where these objectives may be unraveled in the principal mission, are also addressed.

D1.17 Space Transportation Solutions for Deep Space Missions

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.18 Emerging Global Space Ventures, including Reusability and other Innovations

The lessons are dedicated to discussions of innovation or initiatives that enable new or evolving space transportation systems, missions, or mission concepts. Of particular interest are innovations and associated maintenance, repair and operation (MRO) solutions as well as open innovation needs for recovery (MRO) solutions, including MRO capabilities and funding.

D1.19 IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

The session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.20 Launch Vehicles in Service or in Development

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.21 Launch Vehicles in Service or in Development

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.22 Launch Services, Missions, Operations and Facilities

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.23 Upper Stages, Space Transfering, Entry, Landing and Descent Systems

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.24 Future Space Transportation Systems

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

D1.25 Technologies for Future Space Transportation Systems

This session will focus on the lessons learned in space systems. It will cover achievements, challenges, best practices, and standards. Lessons learned will be shared from past space missions and projects.

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

Discussions are encouraged on the verification of new and evolving space transportation systems and technologies. Topics include: verification and experimentation of new space transportation systems and technologies, including in-flight testing methods, verification techniques, and the use of experimental data to improve system design and operation.
D3.2B Systems and Interfaces to Implement Sustainable Space Development and Settlement - Technologies

The session will be focused on the themes and systems required to enable the sustainable development of space, with an emphasis on strategies and systems required to enable the development of Space Elevator. The session aims to identify new solutions and technologies that will enable the sustainable development of space, including strategies for the development of Space Elevator and other infrastructure. The session will also discuss the challenges and opportunities associated with the development of Space Elevator and other infrastructure, and will highlight the importance of collaboration and innovation in achieving sustainable space development.

D3.3 Space Technology and System Management Practices and Tools

The effective management of space technology and systems development is critical to future success in space exploration, development, and discovery. This session will address the key challenges and opportunities associated with space technology and systems development, and will focus on the role of management practices and tools in ensuring the success of space projects.

D3.4 Strategies for Rapid Implementation of Interstellar Missions: Progress and Beyond

Knowledge about space beyond our solar system and between the stars—a transdisciplinary—will bring benefits to society on a global scale. This session will address the methods, tools, and strategies needed to implement interstellar space missions, and will discuss the progress and challenges associated with these efforts.

D4.1 IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE

This Symposium is organized by the International Academy of Astronautics (IAA). Space activities in the basic thesis is usually kept out of the development process, as the employees in the space sector must be sufficiently flexible to change their vision and goals throughout their career. The session aims to discuss the role of management practices and tools in ensuring the success of space projects.
On Track - Undergraduate Space Education

This session will feature innovative space education and outreach programmes directed to undergraduate students. This can include the development and delivery of innovative courses, project-based work, and exhibitions. The sessions will also feature the best practices from the International Undergraduate Space Education Conference (IUEC), a recent event that brought together a range of innovative space education programmes from around the world. The sessions will be moderated by Global Co-Chairs and will include presentations from programme leaders and educators, highlighting their approaches, strategies, and initiatives. Attendees will be able to engage with presenters and other participants in discussions and networking activities.

Co-Chairs

- Rahul Sinha (University of Adelaide, Australia)
- Carlos Alegre (University of La Laguna, Spain)
- Michael Kane (BRM College, United States)

Rapporteur

- Rahul Sinha

E1.3

In Orbit - Postgraduate Space Education

This session will explain innovative space education and outreach programmes for graduate students. This can include the development and delivery of innovative courses, project-based work, and exhibitions. The sessions will be moderated by Global Co-Chairs and will include presentations from programme leaders and educators, highlighting their approaches, strategies, and initiatives. Attendees will be able to engage with presenters and other participants in discussions and networking activities.

Co-Chairs

- David R. Sprague (The Pennsylvania State University, United States)
- Carol Carrott (Delft University of Technology, Netherlands)

Rapporteur

- Carol Carrott

E1.4

Enabling the Future - Developing the Space Workforce

This session will focus on the challenges, opportunities, and innovative approaches to the development of the current and future workforce. The sessions will be moderated by Global Co-Chairs and will include presentations from programme leaders and educators, highlighting their approaches, strategies, and initiatives. Attendees will be able to engage with presenters and other participants in discussions and networking activities.

Co-Chairs

- Kathleen Doyle (Lockheed Martin Corporation, United States)
- Oleksii Koval

Rapporteur

- Kathleen Doyle

E1.5

Calling Planet Earth - Space Outreach to the General Public

This session will feature activities, programmes, and strategies for engaging the general public in space activities, outside the formal education system. The sessions will be moderated by Global Co-Chairs and will include presentations from programme leaders and educators, highlighting their approaches, strategies, and initiatives. Attendees will be able to engage with presenters and other participants in discussions and networking activities.

Co-Chairs

- Jessica Collett
- Medea Korzeneva

Rapporteur

- Jessica Collett

E1.6

New Worlds - Non-Traditional Space Education and Outreach

This session will feature new and innovative methods and outreach to non-traditional areas, and to non-traditional target groups. When submitting abstracts for this symposium, please clearly identify the work presented as non-traditional. The sessions will be moderated by Global Co-Chairs and will include presentations from programme leaders and educators, highlighting their approaches, strategies, and initiatives. Attendees will be able to engage with presenters and other participants in discussions and networking activities.

Co-Chairs

- New Worlds Non-Traditional Space Education Conference (NWNSEC)
- Medea Korzeneva

Rapporteur

- Medea Korzeneva

E1.7

Hands-on Space Education and Outreach

Hands-on space education and outreach can be a powerful way to introduce and teach science, technology, engineering, and arts (STEAM) concepts, especially with younger audiences. The sessions will feature outreach and demonstration projects for all levels of audience. The sessions will be moderated by Global Co-Chairs and will include presentations from programme leaders and educators, highlighting their approaches, strategies, and initiatives. Attendees will be able to engage with presenters and other participants in discussions and networking activities.

Co-Chairs

- Hands-on Space Education and Outreach Conference (HSEN)
- Medea Korzeneva

Rapporteur

- Medea Korzeneva

E1.8

10th Student Conference - Part 1

Student Conference - Part 1

Undergraduate and graduate student level works (no more than 18 years of age) present technical papers as any project in space sciences, industry or technology. These papers will represent the work of the authors, done more than two authors, under the guidance of an individual acting as a mentor. The selection of the oral presentations is based on the submitted abstracts. The guidelines for the student competition will be distributed on the student session chairs to the authors after the abstract acceptance.

Co-Chairs

- Franco Bernelli-Zazzera
- Nahum Romero

Rapporteurs

- Franco Bernelli-Zazzera
- Nahum Romero

E2.1

10th Student Conference - Part 2

Student Conference - Part 2

Undergraduate and graduate student level works (no more than 18 years of age) present technical papers as any project in space sciences, industry or technology. These papers will represent the work of the authors, done more than two authors, under the guidance of an individual acting as a mentor. The selection of the oral presentations is based on the submitted abstracts. The guidelines for the student competition will be distributed on the student session chairs to the authors after the abstract acceptance.

Co-Chairs

- Andrea Pirola
- Matthew Salih

Rapporteurs

- Andrea Pirola
- Matthew Salih

E2.2

Student Space Competition

Student Space Competition

Undergraduate and graduate student team projects present papers on any subject related to space sciences, industry or technology. These papers will represent the work of the authors, done more than two authors, under the guidance of an individual acting as a mentor. The selection of the oral presentations is based on the submitted abstracts. The guidelines for the student competition will be distributed on the student session chairs to the authors after the abstract acceptance.

Co-Chairs

- Andrea Pirola
- Matthew Salih

Rapporteurs

- Andrea Pirola
- Matthew Salih
The Future of Space Exploration and Innovation

Technological innovation, new problem and solutions have been both private and public sectors and again focus their energy on space exploration ventures. This session provides an opportunity to discuss the changing space exploration context and carry challenges and opportunities for future space activities in this domain.

Co-Chairs
Isabelle Doumbia-Henry
European Space Agency (ESA) — FRANCE

Rapporteur
Nicolas Peter
European Space Agency (ESA) — GERMANY

E3.3
Economics of Procurement in Space Contracting

The session will focus on the financial and regulatory instruments from governments and from market mechanisms facilitating and promoting the development of new space activities. It will examine how the technical developments, including systems for data sharing and space traffic management, may shape and transform the existing concepts behind the regulation of space activities. The specific attributes of autonomous space systems may also require further consideration when licensing space missions. The technologies on earth are relevant and applicable to these activities in outer space. The growing reliance on autonomous technologies may require a fresh look at the traditional implications.

Co-Chairs
Henry Hertzfeld
Space Policy Institute, George Washington University — UNITED STATES

Jean-Jacques Tortora
European Space Agency (ESA) — ITALY

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

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

Space Activities provide a wide variety of opportunities for peace on Earth. However, space activity has become increasingly important for security and national interests. The session intends to address overviews of new and existing trends in space security development, comparing different elements necessary for success from the wide variety of national, international, and transnational space policies and laws.

Co-Chairs
Marc Haene
European Space Agency (ESA) — GERMANY

Rapporteur
Deborah Santella
International Institute of Space Law (IISL) — INDIA

E4.1
Historical and Societal Contexts of Space Law

The development of artificial intelligence-based autonomous systems for space operations isopening up a whole new set of questions about their legal concepts and technical standards. Intelligent satellites that enable overall avoidance will soon become standard practice. Human intervention will be required only in the programming stage. One of the first questions to be addressed is the legal concept of space missions as it applies to artificial intelligence. The following discussion will focus on the current trends in the development of legal concepts and relevant technical standards in space law.

Co-Chairs
Jean-Karl Tréguer
European Space Agency (ESA) — FRANCE

E4.2
Scientific and Technical Histories

The symposium will cover the history of space science, exploration, innovation & technology. Furthermore, the sessions will cover the cultural, socio-political impact of the space activities. This will include the entire spectrum of space history, at least 25 years old.

Co-Chairs
Vera Peters-Oliver
European Commission — BELGIUM

Rapporteur
Brian Leach
Beresford, Shakespeare & Darby — UNITED STATES

E4.3
History of Middle Eastern Contribution to Astronautics and Astronomy

Astronomical and ground-based observations have been made for centuries in the Middle East. This session will cover historical developments in astronomy and ground-based observations, at least 25 years old.

Co-Chairs
Brian M. Urban
University of Houston — UNITED STATES

Rapporteur
Nadeem Jaffer
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST) — UNITED ARAB EMIRATES

72nd IAC
International Astronautical Congress
25–29 October 2021, Dubai
Is Space R&D Truly Fostering A Better World For Our Future?
This session will examine the linkage between space-related R&D and societal outcomes. It will feature case studies that demonstrate how space R&D has contributed to advancements in areas such as healthcare, agriculture, disaster response, and environmental protection. The session will also include discussions on the challenges and opportunities associated with ensuring that space R&D has a positive impact on societal well-being. Each contribution will be accompanied by a poster display, providing opportunities for in-depth interactions and discussions.

Moderator:
Ken Davidian
Co-Chairs:
Nikolay Konstantinov
Maria-Gabriella Sarah

Contemporary Arts Practice and Outer Space: A Multi-Disciplinary Approach
This session will explore the evolving relationship between contemporary art and space, with a focus on the role of space in shaping new artistic forms and practices. It will include case studies and presentations on topics such as art and architecture, film and video, music, and performance art. The session will also examine the impact of new technologies and communication platforms on the way art is created, consumed, and distributed.

Moderator:
Ines Prieto
Co-Chairs:
Junpei Takada
Takashi Torii

Space Assets and Disaster Management
This session will review the role of space assets in situations requiring disaster management and emergency response. It will discuss how space-based observations, communications, and navigation systems can be used to support disaster management and emergency response efforts. The session will also explore the challenges and opportunities associated with using space assets in disaster management and emergency response.

Moderator:
Dimitri Antoniadis
Co-Chairs:
Gergely Szigeti
Dominique Fourrier

Sharing Space Achievements and Heritage: Space Museums And Societies
Space societies, professional associations and museums form a special and important group of IAF members - nearly one quarter of the membership and, as a sector, second in size after space industries. They include professional societies, space museums, space associations, nonprofit organizations and other organizations interested in space activities. The submission of abstracts is open to all space museums and centers, both in the member countries of the IAF and other space agencies.

Moderator:
INna M. (IEVA) Kukalin
Co-Chairs:
Maria-Gabriella Sarah
Hal Appleby

Co-Chairs:
INna M. (IEVA) Kukalin
Maria-Gabriella Sarah
Hal Appleby

E6.IP Interactive Presentations - 32nd IAA SYMPOSIUM ON SPACE AND SOCIETY
The interactive presentation offers an opportunity to interactively present or to challenge the audience about a topic of interest to them. The session will be held in a room where the audience can ask questions and engage in discussions. The interactive presentation should be prepared in advance, and the presenter should be prepared to answer questions from the audience. The interactive presentation should be focused on a specific topic and should be presented in a clear and concise manner.

Moderator:
INna M. (IEVA) Kukalin
Co-Chairs:
Maria-Gabriella Sarah
Hal Appleby

E6.IP Interactive Presentations - IAF BUSINESS INNOVATION SYMPOSIUM
The interactive presentation offers an opportunity to interactively present or to challenge the audience about a topic of interest to them. The session will be held in a room where the audience can ask questions and engage in discussions. The interactive presentation should be prepared in advance, and the presenter should be prepared to answer questions from the audience. The interactive presentation should be focused on a specific topic and should be presented in a clear and concise manner.

Moderator:
INna M. (IEVA) Kukalin
Co-Chairs:
Maria-Gabriella Sarah
Hal Appleby

E7 ISL COLLOQUIUM ON THE LAW OF OUTER SPACE
The ISL Colloquium is a forum for the exchange of ideas and information on space law. It brings together experts from various fields to discuss current issues and developments in space law. The colloquium provides a platform for networking and collaboration, allowing participants to share their knowledge and experiences. The colloquium is open to all interested individuals, regardless of their background or affiliation.
E7.4 The Relations between Trade Law, Finance, and Space Law

The theme of this session is to explore the relations between trade law, finance, and space law. Attendees will discuss how these fields interact, with a particular focus on the impact of international trade agreements on space activities. The session aims to provide insights into how space law and finance can be combined to facilitate commercial space ventures.

E7.5 NewSpace and Space Law

NewSpace companies are disrupting the approach to carrying out space activities by traditional space actors, particularly states and traditional OldSpace actors. The “NewSpace” sector covers areas that include approaches to production, marketing strategies, delivery of goods and services, and financing of operational activities that often drastically differ from those traditionally adopted and followed by the sector. This session will explore how NewSpace companies are redefining the space sector, with a focus on insurance, financial incentives and funding for space debris mitigation and removal. The role of international cooperation in addressing these issues will be considered.

E8.1 Multilateral Astronautical Terminology Symposium

This symposium, organized by the International Astronautical Federation (IAF), will address two major issues regarding safe and secure operations of space systems via two technical symposia. The symposium aims to bring together experts from various fields to discuss the importance of standardization of definitions in space science and technology. The specific character of emerging space countries will also be discussed.

E9.1 Political, Legal, and Institutional Aspects of Space Debris Mitigation and Removal - SMT Security

This session will address the technical aspects of operations and security in a debris-laden environment. The IAI Symposium will mainly include the technical aspect of space debris mitigation and removal. Political and institutional aspects will be included in the second part of the session.
**GTS.2**
Cyber-based security threats to space missions: establishing the legal, institutional and collaborative framework to counteract them. "In a recent news release, the International Telecommunications Union (ITU) has warned that cyber-based security threats are becoming an increasing concern for space missions. These threats could pose serious risks to the operation and security of space missions, including those related to communications, navigation, and positioning. Therefore, it is crucial to develop a comprehensive framework to counter these threats.

*What is the current level of security in space missions?*
*What are the legal and institutional frameworks that are in place to address cyber-based security threats?*
*What collaborative frameworks are being developed to counteract cyber-based security threats in space missions?*

**Contribution:** 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 abstract per presentation will be broadcast online and all presentations will be included in the Conference Proceedings. The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

-- **E9.2** --

**E9.IP**
Interactive Presentations - UA IAC SYMPOSIUM ON SPACE SECURITY

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any subject of Space Security addressed in the classic sessions. The IP sessions are not restricted to any specific topic related to space law and space security. It’s a great platform for sharing knowledge, ideas, and best practices related to space security. The presentation will be displayed on a digital screen in a dedicated location and made available for all attendees to watch during the Congress week. In addition, one abstract per presentation will be broadcast online. The presentation will be followed by a Q&A session with the audience.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

-- **E5.1** --

**E5.9**
Entrepreneurship Around the World

Entrepreneurship has different characteristics that differ from country to country around the world. Some of the challenges that entrepreneurs face transcend national and cultural borders, but some others don’t. This session welcomes papers and presentations that describe the barriers experienced by entrepreneurs in different countries and regions around the world. The session will discuss the similarities and differences in the nature and scale of entrepreneurial activities, and the unique characteristics of the nature and scale of entrepreneurial activities, as discussed in the papers. This technical session is co-sponsored by the IAC-Entrepreneurship and Investment Committee (UEIC) and the IAC WorldWide Development/Young Professionals Programme Committee. As part of the Global Technical Sessions, presenters can present in person at the IAC or online from their hometown/university location.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

-- **GTS.4** --

**GTS.5**
Small Satellite Missions Global Technical Session

Small Satellite Missions Global Technical Session is a new initiative that has been introduced to provide a unique opportunity for experts in the field of small satellite missions to share their knowledge and discuss the latest developments in the area. This session is designed to bring together experts from all over the world to discuss the latest developments in small satellite missions, and to provide a platform for the exchange of ideas and knowledge.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.1**
Entrepreneurship Around the World

Entrepreneurship has different characteristics that differ from country to country around the world. Some of the challenges that entrepreneurs face transcend national and cultural borders, but some others don’t. This session welcomes papers and presentations that describe the barriers experienced by entrepreneurs in different countries and regions around the world. The session will discuss the similarities and differences in the nature and scale of entrepreneurial activities, and the unique characteristics of the nature and scale of entrepreneurial activities, as discussed in the papers. This technical session is co-sponsored by the IAC-Entrepreneurship and Investment Committee (UEIC) and the IAC WorldWide Development/Young Professionals Programme Committee. As part of the Global Technical Sessions, presenters can present in person at the IAC or online from their hometown/university location.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.2**
Human Spaceflight Global Technical Session

The Human Spaceflight Environments Global Technical Session is designed to bring together individuals and organizations with the objective of sharing best practices, future projects, research and issues for the future of human spaceflight. This is a global session co-sponsored by the Human Spaceflights Environments Committee and the Workforce Development/Young Professionals Programme Committee.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.3**
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 position determination, navigation, and timing. Each satellite is a vital component of the global telecommunications infrastructure, and the session is co-sponsored by the Space Communications and Navigation Committee and the Workforce Development/Young Professionals Programme Committee.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.4**
Student Team Competition

Undergraduate and graduate level student teams present papers on any subject related to space science, industry or technology. These papers represent the work of the authors (three or more students). Students presenting in this session will compete for the Kevin and whole Humber Award. The selection of the oral presentations is made based on the abstract submitted for review. The abstracts must be highly relevant to the conference theme and the monthly work of the student. In addition, a short presentation of the student’s work will be held in an online environment. The guidelines for the student competition are distributed from the session chairman to the authors after abstract acceptance.

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**GTS.5**
Small Satellite Missions Global Technical Session

Small Satellite Missions Global Technical Session is a new initiative that has been introduced to provide a unique opportunity for experts in the field of small satellite missions to share their knowledge and discuss the latest developments in the area. This session is designed to bring together experts from all over the world to discuss the latest developments in small satellite missions, and to provide a platform for the exchange of ideas and knowledge.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.6**
Entrepreneurship Around the World

Entrepreneurship has different characteristics that differ from country to country around the world. Some of the challenges that entrepreneurs face transcend national and cultural borders, but some others don’t. This session welcomes papers and presentations that describe the barriers experienced by entrepreneurs in different countries and regions around the world. The session will discuss the similarities and differences in the nature and scale of entrepreneurial activities, and the unique characteristics of the nature and scale of entrepreneurial activities, as discussed in the papers. This technical session is co-sponsored by the IAC-Entrepreneurship and Investment Committee (UEIC) and the IAC WorldWide Development/Young Professionals Programme Committee. As part of the Global Technical Sessions, presenters can present in person at the IAC or online from their hometown/university location.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.7**
Human Spaceflight Global Technical Session

The Human Spaceflight Environments Global Technical Session is designed to bring together individuals and organizations with the objective of sharing best practices, future projects, research and issues for the future of human spaceflight. This is a global session co-sponsored by the Human Spaceflights Environments Committee and the Workforce Development/Young Professionals Programme Committee.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.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 position determination, navigation, and timing. Each satellite is a vital component of the global telecommunications infrastructure, and the session is co-sponsored by the Space Communications and Navigation Committee and the Workforce Development/Young Professionals Programme Committee.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.

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**GTS.9**
Entrepreneurship Around the World

Entrepreneurship has different characteristics that differ from country to country around the world. Some of the challenges that entrepreneurs face transcend national and cultural borders, but some others don’t. This session welcomes papers and presentations that describe the barriers experienced by entrepreneurs in different countries and regions around the world. The session will discuss the similarities and differences in the nature and scale of entrepreneurial activities, and the unique characteristics of the nature and scale of entrepreneurial activities, as discussed in the papers. This technical session is co-sponsored by the IAC-Entrepreneurship and Investment Committee (UEIC) and the IAC WorldWide Development/Young Professionals Programme Committee. As part of the Global Technical Sessions, presenters can present in person at the IAC or online from their hometown/university location.

**Contribution:** The Student Team Competition will be distributed from the session chairs to the authors after abstract acceptance.
10. IAC 2021 Technical Sessions Deadlines Calendar

**Abstracts Submission Period**
Abstract Submission Deadline -> 28 February 2021
Abstract Selection Dates -> 23-25 March 2021

**Papers Submission Period**
Paper Submission Deadline -> 8 October 2021

**Presentations Submission Period**
Presentation Submission Deadline -> 15 October 2021

**Notification Dates**
Notification to Authors -> 21-23 April 2021

11. Preliminary IAC 2021 at a Glance

**72nd IAC**
International Astronautical Congress
25–29 October 2021, Dubai

**Technical Sessions**
- GNF Sessions
- Special Sessions
- Closing Ceremonies

**Industry**
- Special Sessions
- Global Panel Discussions

**YP Programme**
- Special Sessions
- Closing Ceremonies

**Social Events**
- Gala Dinner
- Welcome Reception
- IPC Cocktail
- Welcome Cocktail for MoP
- SGC Gala Dinner

**Please Note:**
- By invitation only; Pre-Congress events as well as the IISL Moot Court are dedicated to the respective participants
12. Instructions to Authors

Abstract Preparation

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

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

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

Abstract Submission

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

Submission
- Go to the new abstract submission page.
- Browse the technical programme and choose the symposium and technical session for which you want to submit your abstract.
- Type the title and content of your abstract into the related fields.
- Choose 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 2020 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 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 IAC Archive is available on the IAF website: www.iafastro.org.

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. Diederiks-Verschoor Award for Best Paper.

Please contact the IISL secretary for the regulations at secretary@iislweb.org.

DEADLINES

Abstract Submission 28 February 2021
Interactive Presentation Submission 1 October 2021
Paper Submission 8 October 2021
Oral Presentation Submission 15 October 2021

Please make sure to check the IAF website (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
Interactive presentations: ts@support@iafastro.org

13. Space in the United Arab Emirates

The UAE has long viewed space exploration as the bridge linking humans to its future — the industry has inspired unparalleled growth and innovation, and has advanced collaboration on a truly global scale. The UAE’s leaders, attuned to the potential and possibilities of a thriving space sector, have therefore firmly integrated it into their vision for the nation’s future. And the UAE’s framework of robust economy, infrastructure and national competencies has made the genesis of strong, flourishing space sector possible.

Today, the UAE’s space sector has its to credit a long, impressive list of achievements. The UAE has a national Space Programme under the umbrella of the Mohammed Bin Rashid Space Centre (MBRSC). Over the last few years it has launched a number of Earth-observation, remote-sensing satellites into space, among which are: Nayif-1 CubeSat, Dubai Sat-1, Dubai Sat-2 and KhalifaSat, the first satellite developed 100% in the UAE by a team of highly qualified Emirati engineers. Aerospace industries, particularly satellites and their services, are among the top drivers of economic growth, and the UAE is set to reap the benefits of its investments. The nation’s satellites can capture images of unprecedented accuracy, which will be supplied to government and private sectors organisations around the world.

The UAE has now also successfully completed its first manned mission into space under the UAE Astronaut Programme that is managed by the Mohammed Bin Rashid Space Centre (MBRSC), having sent the first Emirati astronaut to the International Space Station (ISS). Meanwhile, MBRSC is on course to launch the Emirates Mars Mission (EMM) — Hope Probe in 2020, which will mark the first-ever Arab space exploration of the Red Planet. In addition to the development of the Mars 2117 vision to build a human colony on Mars.

This is but a prelude to the ground-breaking trajectory the UAE has set down. Piece by piece, the nation is stitching together a promising future for itself, and for the generations that will follow. The space sector was established to help drive the UAE’s shift to a knowledge-based economy. Its objectives include creating new generations of Emirati scientists, engineers, researchers, academics and experts to support an information-based infrastructure.

The UAE has the infrastructure and the dedication to move to the forefront of the global space industry, and now positioned to make significant contributions to the growth of space science and technology, and ultimately, the future of humankind.
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