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HOST:

AIDAA
ASSOCIAZIONE ITALIANA
DI AERONAUTICA E ASTRONAUTICA

MILAN 2024

75th INTERNATIONAL ASTRONAUTICAL CONGRESS

14 - 18 OCTOBER 2024

MILAN – ITALY

CALL FOR PAPERS & REGISTRATION OF INTEREST

RESPONSIBLE SPACE FOR SUSTAINABILITY

IAC2024.ORG

SUPPORTED BY:

SGAC

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Agenzia Spaziale Italiana

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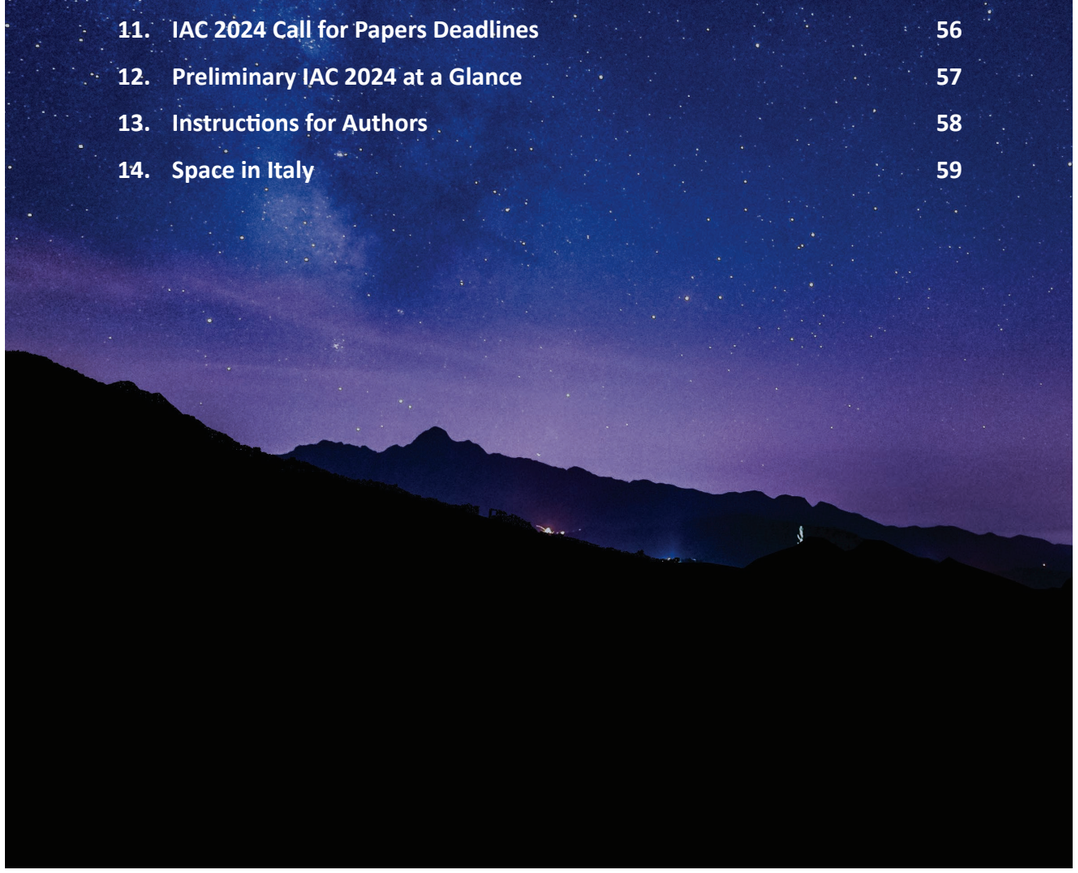

1. Message from the International Astronautical Federation (IAF)

I am pleased to invite you to attend the 75th International Astronautical Congress in Milan, Italy on 14 – 18 October 2024. It is a pleasure organizing this event with our host and longstanding IAF member, the Italian Association of Aeronautics and Astronautics (AIDAA) and the two co-hosts Italian Space Agency (ASI) and Leonardo. While this is the fifth IAC taking place in Italy, it is the first IAC ever to be organized in the city of Milan. The previous IACs in Italy were held in Rome, Turin and most recently Naples in 2012. We look forward returning to Italy and discovering this northern city in the heart of Lombardy with its rich history, vibrant culture, and innovative spirit.

The theme for 75th International Astronautical Congress will be *"Responsible Space for Sustainability"*, our intention is to highlight the importance of Space as an environment that must be kept secure and open to exploration, peaceful use, and international co-operation by present and future generations in the interests of the planet and all nations, regardless of their level of development and without discrimination of any kind. Sustainability in orbit is crucial as even more countries and actors are becoming actively involved in the space economy.

The IAC aims to gather researchers and professionals to discuss new developments in space science and exploration, space applications and operations, space technology, space infrastructure, space and society, and much more. We have the great pleasure of inviting you to propose one or more papers (oral or interactive) in any of the categories scheduled for the different symposia of the Congress. Submit your abstract for a chance to present your latest research to the international space community in Milan at IAC 2024.

The IAC is the one place and time of the year where all global space actors come together. I am sure IAC 2024 will be outstanding and you do not want to miss out on it. Make sure to join us in beautiful Milan with the whole space community in October 2024 for the 75th International Astronautical Congress!

Clay Mowry
President,
International Astronautical Federation (IAF),
France

2. Message from the Local Organizing Committee

The International Astronautical Congress (IAC) is coming back to Italy following successful editions held in Rome, Turin and Naples. The 75th edition of the IAC will be held indeed in the captivating city of Milan, Italy, from 14th to 18th October 2024.

The IAC 2024 is hosted by the Italian Association of Aeronautics and Astronautics (AIDAA), founder member of IAF, and co-hosted by the Italian Space Agency (ASI) and Leonardo, representing together the entire ecosystem of space activities in Italy. AIDAA embodies the academic pursuit of knowledge, with hundreds of academics and PhD students along with thousands of graduate and undergraduate students. ASI, one of the world's most important players in space science and technologies to reach and explore the cosmos, signifies the dedication of agencies and institutions. Finally, Leonardo, developing multi-domain capabilities in the aerospace, defence and security sector and playing a prominent role in major international strategic programs, represents the ingenuity of the Italian thriving space industry.

The motto of the IAC 2024 is "Responsible Space for Sustainability." In line with this theme, we aim to foster a collective commitment to the responsible exploration and utilization of space, ensuring a sustainable future for our planet and the broader cosmos.

This edition of the IAC holds special significance as we commemorate the 60th anniversary of the launch of San Marco 1, the first Italian satellite. Launched on 15th December 1964 by an Italian crew using an American Scout rocket from Wallops Flight Facility, Virginia, US, San Marco 1 was a pioneering achievement in Italy's space endeavors. As we reflect on this historical milestone, we are inspired to build on our past successes and chart a course for a bright and sustainable future in space exploration.

Milan, a city steeped in history, culture, and innovation, offers a vibrant setting for this momentous event. We are confident that this beautiful and dynamic city will provide an ideal backdrop for fruitful discussions, knowledge-sharing, and the formation of new partnerships that will propel our collective vision forward.

The IAC 2024 will be a place to connect with like-minded individuals, exchange insights and ideas, and explore the boundless possibilities that space has to offer for the betterment of humanity. Together, we will address global challenges and seize opportunities to create a sustainable and responsible space ecosystem.

On behalf of the host and co-hosts of IAC 2024, we extend our sincere invitation to each one of you to join us in this exciting journey. Let us unite in Milan and embark on a transformative experience that will shape the future of space exploration and contribute to the well-being of our planet and beyond.

We eagerly await your participation and look forward to welcoming you to Italy in 2024.

Erasmo Carrera
President,
Italian Association of Aeronautics and Astronautics (AIDA),
Italy

Teodoro Valente
President,
Italian Space Agency (ASI),
Italy

Roberto Cingolani
CEO and General Manager,
Leonardo,
Italy

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

On behalf of the International Programme Committee, it is our pleasure invite you to submit an abstract for the 75th International Astronautical Congress which will be hosted in Milan, Italy.

IAC 2024 is being hosted by the Italian Association of Aeronautics and Astronautics (AIDAA), a founding member of the IAF. Collaborating in this endeavour are the Italian Space Agency (ASI) and Leonardo, prestigious co-hosts collectively representing the diverse aspects of Italy's dynamic pursuits in space. Since its foundation and for more than 70 years, the IAF has -indeed- consistently served as a premier global platform and forum for the Italian space academia, industry and diplomacy. Demonstrating its substantial engagement, Italy ranked as the second-leading country worldwide in terms of abstract submissions to technical sessions for IAC 2023 in Baku. This remarkable dedication of Italian representatives extends to various IAF Committees, including the IPC, underscoring Italy's steadfast commitment to space exploration and technological progress. Harnessing the energy of the entire community and underpinned by a vivid national enthusiasm, plans are already in motion to ensure an exceptional scientific and technical experience for IAC 2024.

Our theme, 'Responsible Space for Sustainability' invites our global space community to explore how space can bring the community closer together to work towards common goals. We will bring together students, researchers, industry leaders, young professionals, and national representatives to share recent discoveries and new technologies, and to form connections across national borders.

Space research is emerging globally as not just an exciting field for technological and scientific advancement, but as offering practical solutions for a more sustainable world. We have seen examples worldwide of how earth observation and communications technologies can bring people closer together, enable better disaster management, and make it possible to plan for the future. There is no better time to consider how we can promote responsible uses of space for the promotion of sustainability, on earth and in space. We are certain that contributions will be topical and exciting, and we hope that you will take the opportunity to connect with your international peers in Milan and submit your latest research to one or more of the 180+ technical sessions we will host. All abstracts will be peer reviewed, and a limited selection of papers will be chosen for oral or interactive presentations.

We look forward to receiving your abstracts for IAC 2024 in Milan. We hope to begin important conversations which can be continued in 2025 when IAC will be hosted in Sydney, Australia. IAC 2025 Sydney's theme 'Sustainable Space, Resilient Earth' will pick up where Milan left off, bringing our community together again to focus on how space research and technologies can solve global challenges.

Alfonso Pagani
IPC Co-Chair,
Italian Association of Aeronautics and Astronautics (AIDAA),
Italy

Annie Handmer
IPC Co-Chair,
Faculty of Science,
University of Sydney,
Australia

4. Messages from the Supporting Organizations

Message from the International Academy of Astronautics (IAA)

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

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

The International Academy of Astronautics (IAA) is pleased to invite you to attend the IAA Academy Day open meeting on Sunday and the various IAA symposia throughout the week. The Academy is organizing 13 symposia at next year's IAC in Milan, Italy, 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.

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

John Schumacher
President,
International Academy of Astronautics (IAA)

Message from the International Institute of Space Law (IISL)

On behalf of the International Institute of Space Law, I am pleased to invite you to attend our 67th Colloquium on the Law of Outer Space in Milan, Italy. 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 38th IAA-IISL 'Scientific Legal Roundtable' will provide an opportunity for lawyers, scientists, and engineers to address current developments in space in an interdisciplinary setting. These are all issues, to which, we believe, IISL can and should contribute to. No other Institution has this global inclusive reach and such a top-level experienced expert membership paired with bright young scholars, which guarantees relevant contributions.

The World Finals of the 33rd Manfred Lachs Space Law Moot Court Competition will take place in Milan, welcoming university students from Africa, the Asia Pacific, Europe, Latin America, and North America, and we are proud and honoured that they will, as always, be judged by sitting members of the International Court of Justice. The IISL is proud to be an integral part of the Congress and its Technical Programme and to further the discourse between disciplines so fundamental to our shared ways forward in this new era of the use of space. We are greatly looking forward to welcoming you in Milan!

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

Message from the Space Generation Advisory Council (SGAC)

SGAC is thrilled to invite you to the 22nd annual Space Generation Congress (SGC), which will take place in Milan from 10 to 12 October 2024, right before the 75th International Astronautical Congress (IAC).

SGC is always the most awaited SGAC event, attracting hundreds of students and young professionals from all parts of the world. Every year, the Congress gathers the next generation of space leaders to form critical connections for their professional development and discuss pressing challenges within the global space community. In 2024, alongside the diamond jubilee edition of the IAC and the UN Summit of the Future, SGC will offer a unique opportunity for an intergenerational dialogue on the future of space. Whether you are one of our sponsors and partners, a longstanding SGAC member, or a new part of our community, we assure you that SGC can deliver a significant added value to your IAC experience.

Every IAC manages to set new records, and we are confident that Milan will prove to be an outstanding edition. We highly encourage students and young professionals from all parts of the world to submit abstracts for the IAC in 2024. Gathering scientists, practitioners, engineers, and industry leaders in a single forum, the IAC is the most preeminent space event to discuss research advancements and technological breakthroughs, consolidate partnerships and form new connections, contributing to the sustainable growth of the space sector.

We look forward to seeing you in Milan!

Hamza Hameed
Co-Chair,
Space Generation Advisory Council (SGAC)

Antonino Salmeri
Co-Chair,
Space Generation Advisory Council (SGAC)

5. International Astronautical Federation (IAF)

Founded in 1951, the International Astronautical Federation is the world's leading space advocacy body. The IAF has 513 members from 78 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 @ll Space People for a Sustainable Future"* - the Federation advances knowledge about space and fosters the development and application of space assets by advancing global cooperation.

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

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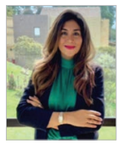

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Martin Feichtinger, Administrative & Project Support
Constance Delaune, *Projects Assistant*
Michel Arnaud, IPC Co-Chairs Advisor (Volunteer)
Elena Feichtinger, Projects Manager and Special Advisor (Volunteer)

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ADA SPACE CO., LTD.	China
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AED Cluster Portugal	Portugal
Aerojet Rocketdyne	United States
Aerospace Industries Association	United States
Aerospace Research Institute	Iran
Aexa Aerospace LLC	United States
Agence Spatiale Algérienne (ASAL)	Algeria
Agencia Espacial Mexicana (AEM)	Mexico
AGI	United States
Agrupacion Astronautica Espanola	Spain
Airbus Defence and Space GmbH	Germany
Airbus Defence and Space SA	Spain
Airbus Defence and Space SAS	France
Airbus Ltd.	United Kingdom
Airbus Netherlands B.V.	The Netherlands
ALE Co., Ltd.	Japan
Alén Space, S.L	Spain
All Nations University	Ghana
Alma Mater Studiorum - University of Bologna	Italy
ALTEC Spa	Italy
American Astronautical Society (AAS)	United States
American Institute of Aeronautics and Astronautics (AIAA)	United States
American Institute of Physics	United States
Andart Global	United Arab Emirates
Andøya Space Center	Norway
Angolan National Space Program Management Office (GGPEN)	Angola
ANU Institute for Space (InSpace)	Australia
ArianeGroup SAS	France
Arianespace	France
Arizona State University	United States
ArkEdge Space Inc.	Japan
Asgardia	Austria
Asher Space Research Institute (ASRI)	Israel
Asia-Pacific Space Cooperation Organization (APSCO)	China
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Asociacion Civil Universidad de Ciencias y Humanidades	Peru
Association for Astronautics and Space Technologies (UAST)	Croatia
Association of Space Explorers (ASE)	United States
Associazione Italiana di Aeronautica e Astronautica (AIDAA)	Italy
Astralintu Space Technologies	Ecuador
Astrax, Inc.	Japan
Astronautic Technology SDN BHD	Malaysia
Astronautical Society of India	India
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Astroscale	Japan
Auspace Pty Ltd	Australia
Australian Space Agency	Australia
Austrian Research Promotion Agency (FFG)	Austria
AUSTROSPACE	Austria
Axiom Space LLC	United States
Azercosmos Space Agency of the Republic of Azerbaijan	Azerbaijan
Baku State University	Azerbaijan
Bauman Moscow State Technical University	Russian Federation
Beihang University	China
Beijing FutureSpace Space Technology Institute	China
Beijing Infinite Education Inc.	China
Beijing Interstellar Glory Space Technology Co., Ltd	China
Beijing Minospace Technologies Co., Ltd	China
Beijing Smart Satellite Technology Co., Ltd.	China
Beijing SpaceD Aerospace Application & Science Education Technology Co.,Ltd.	China
Beijing Sunwise Space Technology Ltd.	China
Belgian Federal Science Policy Office (BELSPO)	Belgium
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Berkeley SETI Research Center	United States
beSpace GmbH	Germany
beyond gravity	Switzerland
Black Engine Aerospace UG	Germany
Blue Origin LLC	United States

Brazilian Space Agency (AEB)	Brazil
Bryce Space and Technology	United States
Bulgarian Aerospace Agency	Bulgaria
C6 Launch Systems, Corporation	Canada
California Polytechnic State University	United States
Canadensys Aerospace Corporation	Canada
Canadian Aeronautics & Space Institute (CASI)	Canada
Canadian Space Agency	Canada
Canadian Space Society	Canada
CAS Space (Guangzhou Zhongke Aerospace Exploration Technology Co., Ltd.)	China
C-Astra Technologies	United States
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Centre National d'Etudes Spatiales (CNES)	France
Centre Royal de Télédétection Spatiale (CRTS)	Morocco
Centro de Investigacion y Difusion Aeronautico Espacial (CIDA-E)	Uruguay
China Head Aerospace Technology Co.	China
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Coactum	Switzerland
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Croatian Astronautical and Rocket Federation (HARS)	Croatia
CSIRO Astronomy & Space Science	Australia
CSL (Centre Spatial de Liège)	Belgium
CubeSpace Satellite Systems RF	South Africa
Curtin University	Australia
CVA (Community of Ariane Cities)	France
Cyprus Astronautical Society	Cyprus
Cyprus Space Exploration Organisation (CSEO)	Cyprus
Czech Space Alliance	Czech Republic
Czech Space Office	Czech Republic
Dalian University of Technology (DUT)	China
Danish Aerospace Company A/S	Denmark
Danish Astronautical Society	Denmark
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Deep Space Exploration Laboratory (Tiandu Laboratory)	China
Deimos Space S.L.	Spain
Delft University of Technology	The Netherlands
Department of Space Studies, University of North Dakota	United States
Dereum Labs S.A. de C.V.	Mexico
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Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)	Germany
Dhruva Space Private Limited	India
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Dynamic Genesis	Sweden
Dynetics	United States
Ecole Polytechnique Fédérale de Lausanne (EPFL)	Switzerland
Edrive Space Technology Co., Ltd	China
Egyptian Space Agency	Egypt
Embry-Riddle Aeronautical University	United States
EMPOSAT CO., LTD	China
EMROD	Germany
EMXYS (Embedded Instruments and Systems S.L)	Spain
EnduroSat AD	Bulgaria
Engineers Australia	Australia
EngineRoom.io Pty Ltd	Australia
EOS Data Analytics Inc.	United States
Equatorial Launch Australia Pty Ltd	Australia
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EUMETSAT	Germany
EURISY	France
Euroconsult	France
EUROLAB Laboratory	Türkiye
European Conference for Aero-Space Sciences (EUCASS)	Belgium
European Organization for Nuclear Research (CERN)	Switzerland
European Space Agency (ESA)	France
European Space Foundation	Poland
European Space Policy Institute (ESPI)	Austria
European Test Services (ETS) B.V.	The Netherlands
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Finnish Astronautical Society	Finland
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Fondazione E. Amaldi	Italy
For all Moonkind Inc.	United States
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Future Space Leaders Foundation	United States
G.A.U.S.S. Srl	Italy
Geo-Informatics and Space Technology Development Agency (GISTDA)	Thailand
Georgia Tech Center for Space Technology and Research	United States
Geoestudios Ingenieria SAS	Colombia
German Aerospace Industries Association (BDLI)	Germany
GIFAS	France
GK Launch Services, JSC	Russian Federation
GKN Aerospace Engine Systems	Sweden
GMV Aerospace & Defence SAU	Spain
Gokmen Space and Aviation Training Center (GUHEM)	Turkey
GomSpace Aps	Denmark
Graz University of Technology (TU Graz)	Austria
Gumush Aerospace & Defense	Turkey
Habitat Company GR	Mexico
HE Space	Germany
Hebrew University of Jerusalem	Israel

Hellenic Space Centre	Greece
Hermann-Oberth-Raumfahrt Museum e.V.	Germany
Hermes Engineering	Bulgaria
High Technology Unit (UAT) Faculty of Engineering - UNAM	Mexico
Hong Kong Aerospace Technology Group Limited (HKATG)	China
Hong Kong Polytechnic University	China
Hungarian Astronautical Society (MANT)	Hungary
IABG Industrieanlagen - Betriebsgesellschaft mbH	Germany
Iceland Space Agency	Iceland
ICEYE	Finland
Ideia Space	Brazil
IHI Aerospace Co, Ltd.	Japan
Indian Space Research Organization (ISRO)	India
Indian Technology Congress Association	India
Indonesian Space Agency Secretariat (INASA)	Indonesia
Infostellar	Japan
IngeniArs Srl	Italy
INNOSPACE Co. Ltd.	Korea, Republic of
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Institute of Mechanics, Chinese Academy of Sciences	China
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Isar Aerospace Technologies GmbH	Germany
ispace, inc	Japan
Israel Aerospace Industries. Ltd.	Israel
Israel Space Agency	Israel
Italian Space Agency (ASI)	Italy
Japan Aerospace Exploration Agency (JAXA)	Japan
Japan Manned Space Systems Corporation (JAMSS)	Japan
Japan Society for Aeronautics and Space Sciences (JSASS)	Japan
Japanese Rocket Society	Japan
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Korea Astronomy and Space Science Institute	Korea, Republic of
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Leviathan Space Industry LLC	United States
Libre Space Foundation	Greece
LIQUIFER Systems Group	Austria
Lithuanian Museum of Ethnocosmology	Lithuania
Lithuanian Space Association (LSA)	Lithuania
Lockheed Martin Corporation	United States
Loft Orbital Solutions Inc	United States
Łukasiewicz Research Network – Institute of Aviation (ILOT)	Poland
Luxembourg Space Agency	Luxembourg
Malaysian Space Agency (MYSA)	Malaysia
Mars Planet	Italy
Massachusetts Institute of Technology	United States
Maxar	United States
McGill Institute for Aerospace Engineering (MIAE)	Canada
MDA Corporation	Canada
MEDES - IMPS	France
Microcosm, Inc.	United States
MicroDrive Space Ltd.	China
Miprons	Italy
Mission Control Space Services Inc.	Canada
Mission Space	Luxembourg
Mitsubishi Electric Corporation	Japan
Mitsubishi Heavy Industries, Ltd.	Japan
Mohammed Bin Rashid Space Centre (MBRSC)	United Arab Emirates
Monaco Office of Space Affairs	Monaco
Monacosat S.A.M.	Monaco
Moon Village Association (MVA)	Austria
Moscow Aviation Institute (MAI)	Russian Federation
MT Aerospace AG	Germany
Mudd Law	United States
Nanjing University of Aeronautics and Astronautics	China
NanoAvionika UAB (NanoAvionics LLC)	Lithuania
Nanoracks	United States
National Aeronautics and Space Administration (NASA)	United States
National Aerospace Agency (NASA) of Azerbaijan Republic	Azerbaijan
National Astronomical Research Institute of Thailand	Thailand
National Autonomous University of Honduras	Honduras
National Institute of Information and Communications Technology (NICT)	Japan
National Oceanic and Atmospheric Administration (NOAA)	United States

National Space Centre	Ireland
National Space Research and Development Agency (NASRDA)	Nigeria
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Netherlands Space Office (NSO)	The Netherlands
Netherlands Space Society (NVR)	The Netherlands
NeuraSpace, SA	Portugal
NeutronStar Systems UG (hb)	Germany
New Zealand Space Agency	New Zealand
NGC Aerospace Ltd.	Canada
Nigerian Meteorological Agency	Nigeria
Norsk Astronautisk Forening	Norway
Northrop Grumman Corporation	United States
Northwestern Polytechnical University	China
Norwegian Space Agency	Norway
Novespace	France
Office for Space Technology & Industry, Singapore	Singapore
Office National d'Etudes et de Recherches Aérospatiales (ONERA)	France
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OHB System AG-Bremen	Germany
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Orbital Express Launch Limited (Orbex)	United Kingdom
Orbital Space Technologies	Costa Rica
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Pacific West Data Pty Ltd - Trading as ACME SpaceTek	Australia
Pakistan Space and Upper Atmosphere Research Commission (SUPARCO)	Pakistan
Paraguayan Space Agency	Paraguay
PJSC "Elmiz"	Ukraine
Planet Labs Germany GmbH	Germany
Plan-S Satellite and Space Technologies	Turkey
Polish Academy of Sciences	Poland
Polish Astronautical Society	Poland
Polish Space Agency (POLSA)	Poland
Politecnico di Milano	Italy
Politecnico di Torino	Italy
Portugal Space Agency	Portugal
Poznan University of Technology	Poland
PRATIAN LLC	Puerto Rico
PricewaterhouseCoopers Advisory (PwC)	France
Privateer Space, Inc.	United States
Proximai	United States
PTS Planetary Transportation Systems GmbH	Germany
Purple Mountain Observatory (PMO)	China
QSTC Inc.	Canada
Qwaltec Inc.	United States
Rafael Advanced Defense Systems Ltd.	Israel
Ramirez de Arellano y Abogados, S.C. Law Firm	Mexico
Reaction Engines	United Kingdom
Redwire Space	United States
Remred Ltd.	Hungary
ReOrbit	Finland
RFA - Rocket Factory Augsburg	Germany
Rocket Research Institute, Inc.	United States
ROKETSAN Roket Sanayi ve Ticaret A.S.	Türkiye
Romanian Space Agency (ROSA)	Romania
ROSCOSMOS	Russian Federation
Rovsing A/S	Denmark
RUDN University	Russian Federation
Rwanda Space Agency	Rwanda
S.P. Korolev Rocket and Space Corporation Energia	Russian Federation
Safran Aircraft Engines	France
SAHA Istanbul Defence & Aerospace Cluster	Turkey
Saint Petersburg State University of Aerospace Instrumentation	Russian Federation
Samara National Research University (Samara University)	Russian Federation
SARS Technology and Innovation Private Limited	India
Sapienza University of Rome	Italy
Satellite Research Center, Nanyang Technological University (NTU)	Singapore
Satellogic	Spain
Satrec Initiative	Korea, Republic of
Saudi Space Commission (SSC)	Saudi Arabia
SDA Bocconi School of Management, Bocconi University	Italy
Secure World Foundation	United States
SEMECCEL Cité de l'Espace	France
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Singapore Technologies Engineering Limited	Singapore
Sirius XM Radio	United States
Sitael Spa	Italy
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SMARTCIRCUITS INNOVATION Private Limited	India
SODERN	France
Solar MEMS Technologies S.L	Spain
South African National Space Agency (SANSA)	South Africa
South African Space Association (SASA)	South Africa
Space Applications Services NV/SA	Belgium
Space Arbitration Association	France
Space Canada Corporation	Canada
Space Center Houston	United States
Space Commercial Services Holdings (Pty) Ltd	South Africa
Space Flight Laboratory (SFL)	Canada
Space Foundation	United States
Space Generation Advisory Council (SGAC)	Austria
Space Industry Association of Australia	Australia
Space Latam	Paraguay
Space Policy Institute, George Washington University	United States
Space Renaissance International (SRI)	Italy
Space Research Institute (IKI), Russian Academy of Sciences (RAS)	Russian Federation

Space Sustainability Rating	Switzerland
Space Tech Expo - Smarter Shows Ltd	United Kingdom
Space Trust	United Kingdom
SpaceBrainx	France
SpaceBuzz	The Netherlands
SpaceForest	Poland
SpaceLand Africa	Mauritius
SpaceNav, LLC	United States
SpaceNed	The Netherlands
SPACETIDE Foundation	Japan
Spacety	China
SpaceX	United States
Spade	France
Spartan Space	France
STAR.VISION Aerospace Group Limited	China
Stardust Technologies Inc.	Canada
Starfire 7 LLC	United States
State Space Agency of Ukraine (SSAU)	Ukraine
Stichting Space Professionals Foundation (SSPF)	The Netherlands
STM (Savunma Teknolojileri Muhenislik ve Ticaret A.S.)	Turkey
Surrey Satellite Technology Ltd (SSTL)	United Kingdom
Swedish Society for Aeronautics and Astronautics	Sweden
Swedish Space Coorporation (SSC)	Sweden
Swiss Space Office (SSO)	Swizerland
SwissSpace Association	Switzerland
Teaching Science and Technology, Inc (TSTI)	United States
Technische Universität Dresden	Germany
Technical University of Košice	Slovak Republic
Techno System Developments S.R.L.	Italy
Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences	China
Teledyne Brown Engineering	United States
Telespazio S.p.A.	Italy
Telespazio VEGA UK LTD	United Kingdom
Tensor Tech CO., LTD.	Taiwan, China
Tesat-Spacecom GmbH & Co. KG	Germany
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Thales Alenia Space Italia	Italy
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The University of Winnipeg	Canada
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TNO	The Netherlands
Trapp Networks PR Social Media GmbH	Germany
Tsinghua University	China
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TURKSAT AS	Türkiye
TUW Technische Universität Wien	Austria
U.S. Geological Survey	United States
UAE Space Agency	United Arab Emirates
UK Space Agency	United Kingdom
United Launch Alliance LLC	United States
United States Accreditation, Inc.	United States
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University of Adelaide	Australia
University of Alabama in Huntsville	United States
University of Naples "Federico II"	Italy
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Vieira de Almeida & Associados	Portugal
Vietnam National Space Center (VNSC)	Vietnam
Virgin Galactic L.L.C	United States
Viterbi School of Engineering, USC	United States
VITO nv	Belgium
Von Karman Institute for Fluid Dynamics	Belgium
Voyager Space Holdings	United States
WeMe Global	Austria
WeSpace Technologies Limited	Israel
WFB - Wirtschaftsförderung Bremen	Germany
Women in Aerospace Europe (WIA-E)	The Netherlands
World Space Week Association	United States
Yinhe Hangtian (Beijing) Internet Technology Company Limited (GalaxySpace)	China
Yuzhnoye State Design Office	Ukraine
ZARM Fab GmbH	Germany
Zero2infinity	Spain
Zhuhai Orbita Aerospace Science & Technology Co. Ltd	China

6. International Academy of Astronautics (IAA)

The International Academy of Astronautics is a community of leading experts committed to expanding the frontiers of space, the newest realm of human activity. To foster the development of astronautics, the Academy undertakes a number of activities, including the recognition of outstanding contributors through elections and awards. It also facilitates professional communication, develops and promotes new ideas and initiatives, engages the public and fosters a sense of community among the members. The IAA is a unique independent non-governmental organization established in 1960 and recognized by the United Nations in 1996. It is an honorary society with an action agenda. With about 1200 elected members and corresponding members from 90 nations, the International Academy of Astronautics works closely with space agencies, industry, the academic community and the national science and engineering academies to determine needs and objectives and to help shape policy and forge cooperation by means of studies, position papers, conferences and publications. The IAA has published more than 70 studies to date and is engaged in the preparation of about 40 others. The Academy also publishes four book series and its journal Acta Astronautica ranked 1st in the space area in the world and containing each year about 3500 refereed papers. The Academy organizes about 25 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 Academy 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 these 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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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 fourty 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 the 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.

Email: info@iislweb.org
Website: https://iislweb.space
Facebook: https://www.facebook.com/spacelaw
Twitter: https://twitter.com/iisl_space

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8. Space Generation Advisory Council (SGAC)

The Space Generation Advisory Council in Support of the United Nations Programme on Space Applications is a global non-governmental, non-profit (US 501(c)3) organization and network which aims to represent university students and young space professionals aged 18-35 to the United Nations, space agencies, industry, and academia. Headquartered in Vienna, Austria, the SGAC network of members, volunteers, and alumni has grown to more than 27000 members representing more than 165 countries. SGAC was conceived at UNISPACE III in 1999, as part of the Vienna Declaration, "To create a council to support the United Nations Committee on the Peaceful Uses of Outer Space, through raising awareness and exchange of fresh ideas by youth. The vision is to employ the creativity in advancing humanity through peaceful uses of space". SGAC holds Permanent Observer status at the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) and regularly takes part in the annual meeting, as well as its Legal and Scientific and Technical Subcommittees. SGAC holds consultative status at the United Nations Economic and Social Council (UN ECOSOC), contributing to discussions on the role of space in achieving the UN Sustainable Development Goals. As a volunteer-run organization, SGAC believes in empowering its members and providing them with opportunities for professional development through roles in the SGAC teams.

Further information regarding SGAC can be found at:
www.spacegeneration.org

Space Generation Advisory Council (SGAC)

European Space Policy Institute
Schwarzenbergplatz 6
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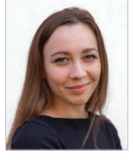


Tatiana Komorná
Operations Officer,
Space Generation Advisory Council (SGAC)

9. Message from the IAF Vice President for Technical Activities

The International Programme Committee (IPC) is pleased to invite you to submit an abstract for consideration for the 75th International Astronautical Congress to be held in Milan, Italy from 14 to 18 October 2024. The Congress is organized by the International Astronautical Federation (IAF), hosted by the AIDAA, ASI and Leonardo, 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 events and symposia.

Under the motto **"Responsible Space for Sustainability"**, the intention of the IAC 2024 is to highlight the importance of Space as an environment that must be kept secure and open to exploration, peaceful use and international co-operation by present and future generations in the interests of the planet and all nations, regardless of their level of development and without discrimination of any kind.

This "Call for Abstracts" is a precursor to a subsequent submission of a final paper, which may be presented at the 75th IAC. Authors are invited to submit an abstract regarding an original, unpublished paper that has not been submitted in any other forum. Abstracts must fit into one of the following IAC categories: A. Science and Exploration; B. Applications and Operations; C. Technology; D. Infrastructure; E. Space and Society. Abstracts must be written in English and the length shall not exceed 400 words. Tables or drawings are not allowed in the abstract. Submitted abstracts can be considered for oral presentations (as 'Short Talks' in the Symposia) and for interactive presentations (IP).

Submit your abstract through the online IAF portal at https://iafastro.directory/iac/account/login/ by 28 February 2024. Submitted abstracts will be evaluated by the Session Chairs based on technical quality and relevance to the session topics. Abstracts will be considered for an oral or interactive presentation. All selected papers will be treated as equally important in the presentation sessions and Congress Proceedings, differing only in the format of the presentation sessions (in other words, Oral Presentation papers will NOT be considered more important than Interactive Presentation papers). Their evaluation will be submitted to the International Programme Committee, which will make the final decision during the IAF Spring Meetings to be held in March 2024 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 2024 and please check the IAF website regularly to get the latest updates on the Technical Programme!

Lionel SUCHET
Vice President, Technical Activities
International Astronautical Federation (IAF)

10. IAC 2024 Technical Sessions

Category A

SCIENCE AND EXPLORATION

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

A1 IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM
A2 IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM
A3 IAF SPACE EXPLORATION SYMPOSIUM
A4 53RD IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – THE NEXT STEPS
A5 27TH IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM
A6 22ND IAA SYMPOSIUM ON SPACE DEBRIS
A7 IAF SYMPOSIUM ON ONGOING AND NEAR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS

Category coordinated by Maria Antonietta Perino, *Thales Alenia Space Italia, Italy*

A1 IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM

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

Coordinators

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

Oleg Orlov
Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS) — RUSSIAN FEDERATION

A1.1 Behaviour, Performance and Psychosocial Issues in Space

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

Co-Chairs

Nick Kanas
University of California, San Francisco (UCSF) — UNITED STATES

Gro M. Sandal
University of Bergen — NORWAY

A1.2 Human Physiology in Space

This session focuses on physiological effects of short- and long-duration spaceflight, and how this affects general health. Research into mitigation (countermeasures) of space effects are also included.

Co-Chairs

Elena Fomina
State Scientific Center of Russian Federation, Institute of Biomedical Problems, Russian Academy of Sciences — RUSSIAN FEDERATION

Jens Jordan
Institute of Aerospace Medicine (DLR) — GERMANY

Rapporteur

Alain Maillet
MEDES - IMPS — FRANCE

Rapporteur

Angelique Van Ombergen
European Space Agency (ESA) — THE NETHERLANDS

A1.3 Medical Care for Humans in Space

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

Co-Chairs

Satoshi Iwase
Aichi Medical University — JAPAN

Oleg Orlov
Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS) — RUSSIAN FEDERATION

Rapporteur

Hasan Birol Cotuk
— TÜRKIYE

Rapporteur

Katrin Stang
DLR (German Aerospace Center) — GERMANY

A1.4 Medicine in Space and Extreme Environments

Over the last decades numerous space missions and experiments have taken place. The use of microgravity as a tool to study new fundamentals of life revealed a substantial number of new scientific insights and surprises. Space is the most famous extreme environment but different extreme environments also exist on Earth, such as high altitudes, confined and isolated environments like Antarctica and Arctica or even submarines. Results from research in these environments can be successfully applied for the benefits of human beings both in space and on Earth. This session will cover the latest scientific results and technological achievements from medical-physiological or psychological research in extreme environments for the benefit on Earth.

Co-Chairs

Oleg Orlov
Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS) — RUSSIAN FEDERATION

Hanns-Christian Gunga
Charité Universitätsmedizin Berlin — GERMANY

Rapporteur

Jeffrey R. Davis
Exploring 4 Solutions — UNITED STATES

Rapporteur

Alexander Choukér
University of Munich — GERMANY

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 radiation risk assessment.

Co-Chairs

Lawrence Pinsky
University of Houston — UNITED STATES

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

Rapporteur

Premkumar Saganti
Prairie View A&M University — UNITED STATES

A1.6 Advancements in Astrobiology and Space Exploration

This session offers an insightful exploration of the latest advancements in astrobiology and space exploration. From ambitious human missions to the Moon and Mars to cutting-edge robotic exploration of Mars subsurface and ocean worlds like Europa, and Enceladus, this session covers all aspects of astrobiology. Therefore, this scientific gathering seeks to foster collaboration and knowledge exchange on extremophiles research, exobiology, biosignature detection, planetary protection, space exploration technology, and the quest to find evidence of habitability and life beyond our home planet.

Co-Chairs

Fathi Karouia
National Aeronautics and Space Administration (NASA), Ames Research Center / UCSF — UNITED STATES

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

A1.7 Life Support, Habitats and EVA Systems

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

Co-Chairs

Ulrich Kuebler
Airbus DS GmbH — GERMANY

Khalid Badri
Mohammed Bin Rashid Space Centre (MBRSC) — UNITED ARAB EMIRATES

Rapporteur

Hong Liu
Beihang University — CHINA

Rapporteur

Gisela Detrell
Institute of Space Systems, University of Stuttgart — GERMANY

A1.8 Biology in Space

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

Co-Chairs

Didier Chaput
Centre National d'Etudes Spatiales (CNES) — FRANCE

Fengyuan Zhuang
Beihang University — CHINA

Rapporteur

Jancy McPhee
The Aerospace Corporation — UNITED STATES

A1.IP Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Life Sciences addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the 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. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Didier Chaput
Centre National d'Etudes Spatiales (CNES) — FRANCE

Jancy McPhee
The Aerospace Corporation — UNITED STATES

A2 IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM

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

Vice-Coordinator

Valentina Shevtsova
Université Libre de Bruxelles — BELGIUM

Vice-Coordinator

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

A2.1 Gravity and Fundamental Physics

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

Co-Chairs

Thomas Driebe
DLR (German Aerospace Center) — GERMANY

Vladimir Pletser
Blue Abyss — UNITED KINGDOM

A2.2 Fluid and Materials Sciences

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

Co-Chairs

Nickolay N. Smirnov
Lomonosov Moscow State University — RUSSIAN FEDERATION

Satoshi Matsumoto
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

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

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

Raffaele Savino
University of Naples "Federico II" — ITALY

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

Rapporteur

Vladimir Pletser
Blue Abyss — UNITED KINGDOM

A2.4 Science Results from Ground Based Research

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

Co-Chairs

Valentina Shevtsova
Université Libre de Bruxelles — BELGIUM

Antonio Viviani
Università degli Studi della Campania "Luigi Vanvitelli" — ITALY

Rapporteur

Nickolay N. Smirnov
Lomonosov Moscow State University — RUSSIAN FEDERATION

A2.5 Facilities and Operations of Microgravity Experiments

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

Co-Chairs

Qiu-Sheng Liu
Institute of Mechanics, Chinese Academy of Sciences — CHINA

Remi Canton
Centre National d'Etudes Spatiales (CNES) — FRANCE

A2.6 Microgravity Sciences on board of Space stations

This session focusses on the presentation of scientific and operational results obtained from microgravity sciences research conducted on large orbital platforms, in particular the ISS, the Chinese Space Station (CSS) and upcoming commercial space stations. Papers on planned or newly developed research topics and experiment scenarios are also invited. The session is not limited to the usage of stations in low Earth orbits (LEO), but comprises the preparation scenarios for further long-term flight opportunities beyond low Earth orbits such as the Deep Space Gateway station.

Co-Chairs

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

Yang Yang
Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences — CHINA

Rapporteur

Thomas Driebe
DLR (German Aerospace Center) — GERMANY

A2.7 Life and Physical Sciences under reduced Gravity

This session focuses on the presentation of scientific and operational results obtained from life and physical sciences research conducted on large orbital platforms, in particular the ISS, the Chinese Space Station (CSS) and upcoming commercial space stations . Papers on planned or newly developed research topics and experiment scenarios are also invited. The session is not limited to the usage of stations in low Earth orbits (LEO), but comprises the preparation scenarios for further long-term flight opportunities beyond low Earth orbits such as the Deep Space Gateway station.

Co-Chairs

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

Remi Canton
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

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

A2.8 In-Space Manufacturing and Production Applications

This session focuses on the presentation of scientific and operational results obtained from life and physical sciences research conducted on large orbital platforms, in particular the ISS, the Chinese Space Station (CSS) and upcoming commercial space stations . Papers on planned or newly developed research topics and experiment scenarios are also invited. The session is not limited to the usage of stations in low Earth orbits (LEO), but comprises the preparation scenarios for further long-term flight opportunities beyond low Earth orbits such as the Deep Space Gateway station.

Co-Chairs

Fathi Karouia
National Aeronautics and Space Administration (NASA), Ames Research Center / UCSF — UNITED STATES

A2.IP Interactive Presentations - IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Microgravity Sciences and Processes addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded 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. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

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

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

A3 IAF SPACE EXPLORATION SYMPOSIUM

This symposium, organized by the International Astronautical Federation (IAF), covers the current and future robotic missions and material plans for initiatives in the exploration of the Solar System.

Coordinators

Vincenzo Giorgio
Thales Alenia Space Italia — ITALY

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

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

A3.1 Space Exploration Overview

This Session covers Space Exploration strategies and architectures, as well as technology roadmaps. Papers of both national and international perspectives are invited, as are papers dealing with the emerging area of commercial space exploration activities.

Co-Chairs

Kathy Laurini
Osare Space Consulting Group — UNITED STATES

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

Rapporteurs

Norbert Frischauf
TU Graz – AUSTRIA

Masaki Fujimoto
Japan Aerospace Exploration Agency (JAXA) — JAPAN

A3.2A Moon Exploration – Part 1

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

Co-Chairs

Bernard Foing
ILEWG "EuroMoonMars" — THE NETHERLANDS

David Korsmeyer
National Aeronautics and Space Administration (NASA), Ames Research Center — UNITED STATES

Rapporteurs

Pierre-Alexis Joumel
Airbus Defence and Space — GERMANY

Nadeem Ghafoor
Avalon Space — CANADA

A3.2B Moon Exploration – Part 2

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

Co-Chairs

Bernard Foing
ILEWG "EuroMoonMars" — THE NETHERLANDS

David Korsmeyer
National Aeronautics and Space Administration (NASA), Ames Research Center — UNITED STATES

Rapporteurs

Pierre-Alexis Joumel
Airbus Defence and Space — GERMANY

Nadeem Ghafoor
Avalon Space — CANADA

A3.2C Moon Exploration – Part 3

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

Co-Chairs

Bernard Foing
ILEWG "EuroMoonMars" — THE NETHERLANDS

David Korsmeyer
National Aeronautics and Space Administration (NASA), Ames Research Center — UNITED STATES

Rapporteurs

Sylvie Espinasse
European Space Agency (ESA) — THE NETHERLANDS

Nadeem Ghafoor
Avalon Space — CANADA

A3.3A Mars Exploration – Missions Current and Future

The planet Mars is being explored now and in the coming years with multiple robotic missions from a variety of nations. This session will cover current results from ongoing Mars missions and the designs for proposed Mars missions.

Co-Chairs

Vincenzo Giorgio
Thales Alenia Space Italia — ITALY

Pierre W. Bousquet
Centre National d'Etudes 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 planet Mars is being explored now and in the coming years with multiple robotic missions from a variety of nations. This session will cover science, instruments and technologies for Mars missions including expected experiments. Papers on any aspects of the search for evidence or extinct Martian life, and forward and backward contamination are particularly welcome.

Co-Chairs

Vincenzo Giorgio
Thales Alenia Space Italia — ITALY

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

Rapporteurs

Cheryl Reed
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 the missions and technological aspects related to the exploration of small bodies including a search for pre-biotic signatures.

Co-Chairs

Cheryl Reed
Northrop Grumman Innovation Systems — UNITED STATES

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

Rapporteurs

Norbert Frischauf
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 technological aspects related to the exploration of small bodies including a search for pre-biotic signatures.

Co-Chairs

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

Cheryl Reed
Northrop Grumman Innovation Systems — UNITED STATES

Rapporteurs

Marc D. Rayman
NASA Jet Propulsion Laboratory — UNITED STATES

Norbert Frischauf
TU Graz — AUSTRIA

A3.5 Solar System Exploration including Ocean Worlds

This session covers robotic missions for Solar System exploration (inner and outer planets and their satellites, and space plasma physics) except the Earth, Moon, Mars, and small bodies covered in other sessions of this symposium. Special emphasis on papers addressing missions to so-called Ocean Worlds (Enceladus, Europa, Titan) is sought. Papers covering both new mission concepts as well as the associated specific technologies are invited.

Co-Chairs

Mariella Graziano
GMV Aerospace & Defence SAU — SPAIN

Junichiro Kawaguchi
Australian National University (ANU) — AUSTRALIA

Rapporteurs

Charles E. Cockrell Jr
National Aeronautics and Space Administration (NASA) — UNITED STATES

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

A3.IP Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Exploration addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded 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. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts

Co-Chairs

Christian Sallaberger
Canadensys Aerospace Corporation — CANADA

Bernard Foing
ILEWG "EuroMoonMars" — THE NETHERLANDS

A4 53RD IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – THE NEXT STEPS

This symposium, organized by the International Academy of Astronautics (IAA), deals with the scientific, technical, and interdisciplinary aspects of the Search for Extra-Terrestrial Intelligence (SETI) on an international scale. SETI researchers are typically looking for anomalies in astronomical data, potentially associated with other technical civilisations in the Milky Way and beyond (so-called "techno-signatures"). The search includes all parts of the electromagnetic spectrum and utilises cutting-edge technologies deployed on some of the largest telescopes in the world. The interdisciplinary aspects of the topic involve the social and societal consequences of detecting a signal, engaging with a very wide variety of human cultural pursuits - including art, language, education, science, anthropology, sociology, psychology, legal, political and institutional issues, interactions with the media, public outreach and risk communication.

Coordinators

Mike Garrett
University of Manchester — UNITED KINGDOM

Andrew Siemion
Berkeley SETI Research Center — UNITED STATES

A4.1 SETI 1: SETI Science and Technology

All scientific and technical aspects associated with the search for extraterrestrial intelligence, including current and future developments and search strategies.

Co-Chair

Patrizia Caraveo
INAF — ITALY

A4.2 SETI 2: SETI and Society

All interdisciplinary aspects of SETI, in particular the social and societal consequences of detecting a signal, engaging with a very wide variety of human cultural pursuits - including art, language, education, science, anthropology, sociology, psychology, legal, political and institutional issues, interactions with the media, public outreach and risk communication.

Co-Chair

John Elliott
SUPA, University of St Andrews — UNITED KINGDOM

A4.IP Interactive Presentations - 53rd IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – The Next Steps

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of SETI addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded 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. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Claudio Maccone
International Academy of Astronautics (IAA) and Istituto Nazionale di Astrofisica (INAF) — ITALY

Steve Croft
University California Berkeley — UNITED STATES

Mike Garrett
University of Manchester — UNITED KINGDOM

A5 27TH 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, Lagrangian Points and NEO's.

Coordinators

Christian Sallaberger
Canadensys Aerospace Corporation — CANADA

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

A5.1 Human Exploration of the Moon and Cislunar Space

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

Co-Chairs

Nadeem Ghafoor
Avalon Space — CANADA

Greg Chavers
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteurs

Marc Haese
DLR, German Aerospace Center — GERMANY

Henrik Petersson
Swedish Space Corporation (SSC) — SWEDEN

A5.2 Human Exploration of Mars

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

Co-Chairs

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

Kathy Laurini
Osare Space Consulting Group — UNITED STATES

Rapporteur

Norbert Frischauf
TU Graz – AUSTRIA

A5.3 B3.6 Human and Robotic Partnerships in Exploration - Joint session of the IAF Human Spaceflight and IAF Exploration Symposia

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

Co-Chairs

Pierre-Alexis Joumel
Airbus Defence and Space — GERMANY

Mark Hempsell
The British Interplanetary Society — UNITED KINGDOM

Rapporteur

Juergen Schlutz
European Space Agency (ESA) — GERMANY

Scott Ritter
University of Bern — SWITZERLAND

A5.4 Deep Space Habitats and Resources

This session will focus on the habitability aspects for Moon and Mars outposts and bases and to sustain human deep space exploration missions and the needed resources, exploring technical solutions like greenhouses, plant-growth in space, harvesting water from the Moon and Mars regolith.

Co-Chairs

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

Barbara Imhof
LIQUIFER Systems Group — AUSTRIA

Rapporteurs

Olga Bannova
University of Houston — UNITED STATES

Sandra Haeuplik-Meusburger
TU Wien — AUSTRIA

A5.IP Interactive Presentations - 27th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Human Exploration of the Solar System addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded 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. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Christian Sallaberger
Canadensys Aerospace Corporation — CANADA

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

A6 22ND IAA SYMPOSIUM ON SPACE DEBRIS

The Symposium will address the complete spectrum of issues associated to space debris, including orbital sustainability and operations in debris dominated environment. It will cover every aspect of Space Environment Management (SEM) including Mitigation and Remediation measures, Space Surveillance and Tracking (SST), Space Situational Awareness (SSA), Space Traffic Management (STM), including all aspects of measurements, modelling, risk assessment in space and on the ground, re-entry, hypervelocity impacts and protection, mitigation and standards, post-mission disposal, remediation, debris removal, Space Surveillance, collision avoidance as well as non-technical topics associated to space debris dominated environment.

Coordinators

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

Mark A. Skinner
The Aerospace Corporation — UNITED STATES

Pierre Omaly
CNES — FRANCE

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

This session will address every 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

Mark A. Skinner
The Aerospace Corporation — UNITED STATES

Vladimir Agapov
— RUSSIAN FEDERATION

Rapporteur

Thomas Schildknecht
SwissSpace Association — SWITZERLAND

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 estimates based on statistical population models and deterministic catalogues, and active collision avoidance.

Co-Chairs

Marlon Sorge
The Aerospace Corporation — UNITED STATES

Dan Oltrogge
COMSPOC Corporation — UNITED STATES

Rapporteur

Carmen Pardini
ISTI-CNR — ITALY

A6.3 Impact-Induced Mission Effects and Risk Assessments

This session addresses disruptions of spacecraft operations induced by hypervelocity impacts including spacecraft anomalies, perturbation of operations, component failures up to mission loss , and spacecraft fragmentations. It includes risk assessments for impact vulnerability studies and corresponding system tools. Further topics are spacecraft impact protection and shielding studies, laboratory impact experiments, numerical simulations, and on-board diagnostics to characterize impacts such as impact sensors, accelerometers, etc.

Co-Chairs

Zizheng Gong
Beijing Institute of Spacecraft Environment Engineering, China Academy of Space Technology (CAST) — CHINA

Yukihito Kitazawa
Japan Aerospace Exploration Agency (JAXA)— JAPAN

Rapporteur

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

A6.4 Mitigation - Tools, Techniques and Challenges - SEM

This session will focus on the Mitigation part of the SEM (Space Environment Monitoring), implementation of debris prevention and reduction measures; vehicle passive protection at system level including end of life strategies and tools to verify the efficiency of the implemented measures. The session will also address practical experiences in the planning and verification of measures and issues and lessons learnt in the actual execution of mitigation actions.

Co-Chairs

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

Satomi Kawamoto
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

Holger Krag
European Space Agency (ESA) — GERMANY

A6.5 Post Mission Disposal and Space Debris Removal 1 - SEM

This session will focus on the Remediation part of the SEM, dealing with ADR (Active Debris Removal), JCA (Just in time Collision Avoidance), LDTM (Large Debris Traffic Management) among solutions. It will address post-mission disposal and active removal techniques "ground and space based", review potential solutions and identify implementation difficulties.

Co-Chairs

Balbir Singh
Manipal Institute of Technology, Manipal Academy of Higher Education — INDIA

Roberto Opromolla
University of Naples "Federico II" — ITALY

Rapporteur

Laurent Francillout
Centre National d'Etudes Spatiales (CNES) — FRANCE

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

This session will focus on the Remediation part of the SEM, dealing with ADR (Active Debris Removal), JCA (Just in time Collision Avoidance), LDTM (Large Debris Traffic Management) among solutions. It will address post-mission disposal and active removal techniques "ground and space based", review potential solutions and Identify implementation difficulties.

Co-Chairs

Marko Jankovic
DFKI GmbH, Robotics Innovation Center — GERMANY

Dmitriy Grishko
Bauman Moscow State Technical University — RUSSIAN FEDERATION

Rapporteur

Jason Forshaw
Astroscale Ltd — UNITED KINGDOM

A6.7 Operations in Space Debris Environment, Situational Awareness - SSA

This session will address the multiple aspects associated to STM (Space Traffic Management) and SSA (Space Situational Awareness) including safe operations in space dealing with Space Debris, operational observations, orbit determination, catalogue build-up and maintenance, data aggregation from different sources, relevant data exchanges standards and conjunction analyses.

Co-Chairs

Vincent Martinot
Thales Alenia Space France — FRANCE

T.S. Kelso
CelesTrak — UNITED STATES

Rapporteur

Noelia Sanchez Ortiz
Arribes Enlightenment — SPAIN

A6.8 / E9.1 Political, Legal, Institutional and Economic Aspects of Space Debris Mitigation and Removal - STM Security

This session will address all non-technical aspects of debris mitigation, debris remediation and STM. Papers may focus on aspects of responsibility, liability and registration, on the role of bodies such as UNCOPUOS or IADC, as well as on insurance, financial incentives and funding. In addition, security-related aspects and the role of international cooperation in addressing these issues may be considered.

Co-Chairs

David Spencer
The Aerospace Corporation — UNITED STATES

Serge Plattard
University College London (UCL) — UNITED KINGDOM

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

Rapporteur

Andrea Capurso
LUISS Guido Carli University — ITALY

Rapporteur

Victoria Samson
Secure World Foundation — UNITED STATES

Rapporteur

Emma Kerr
Deimos Space UK Ltd — UNITED KINGDOM

A6.9 Orbit Determination and Propagation - SST

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

Co-Chairs

Jan Siminski
European Space Agency (ESA) — GERMANY

Juan Carlos Dolado Perez
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteur

Paolo Marzioli
Sapienza University of Rome — ITALY

A6.IP Interactive Presentations - 22ND IAA SYMPOSIUM ON SPACE DEBRIS

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Debris addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded 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. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Francesca Letizia
European Space Agency (ESA) — GERMANY

Paolo Marzioli
Sapienza University of Rome — ITALY

Roberto Opromolla
University of Naples "Federico II" — ITALY

Rapporteur

Marko Jankovic
DFKI GmbH, Robotics Innovation Center — GERMANY

Emma Kerr
Deimos Space UK LTD — AUSTRALIA

Rapporteur

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

A7 IAF SYMPOSIUM ON ONGOING AND NEAR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS

The symposium, organized by the International Astronautical Federation (IAF), invites leaders from the science, space industry, and space-agencies community to share information, insights, and planning for ongoing and near future space missions in exoplanets, astronomy, space physics, fundamental physics, and outer-solar-system planetary science. The Symposium will comprise both invited talks and contributed papers in these five areas of scientific endeavour. For each, the Symposium solicits discussion of phenomena coming within our reach over the next decades; their enabling measurement and system technologies, including significant progress made by industry and research laboratories; mission concepts to implement such investigations, and corporate and space agency strategies to prioritize and invest in bringing them into reality.

Coordinators

Andrew Court
TNO — THE NETHERLANDS

Alessandra Di Cecco
Agenzia Spaziale Italiana (ASI) — ITALY

A7.1 Space Astronomy Missions, Strategies and Plans

The session comprises invited talks by international space-agency division directors about their long-term views, priorities, and plans to implement developments and missions for the four fields (exoplanets, space astronomy, space physics and fundamental physics). The mission scope ranges from flagship-class, large-class, medium-class, and small-class to smallsat platforms. The programme scope includes status updates on current programmes, near-term investment priorities, and long-range directions, including the relationship to community and guiding research panels.

Co-Chairs

Eric Wille
ESA — THE NETHERLANDS

Alessandra Di Cecco
Agenzia Spaziale Italiana (ASI) — ITALY

Rapporteur

Andrew Court
TNO — THE NETHERLANDS

A7.2 Science Goals and Drivers for Future Exoplanet, Space Astronomy and Space Physics

The session has invited and contributed talks about scientific motivations, goals, opportunities, and needs in the four fields (exoplanets, space astronomy, space physics, and fundamental physics). New directions for measurements that are being opened by emergent results and newly understood phenomena will be explored, and science roadmaps to pursue them will be discussed.

Co-Chair

Pietro Ubertini
INAF — ITALY

Maria Cristina Falvella
Italian Space Agency (ASI) — ITALY

Rapporteur

Alessandra Di Cecco
Agenzia Spaziale Italiana (ASI) — ITALY

A7.3 Technology Needs for Future Missions, Systems, and Instruments

The session includes invited and contributed talks about the technology challenges and plans required to enable breakthrough science objectives in: exoplanet detection and characterization; astronomy throughout the electromagnetic spectrum and using gravitational waves; space physics including fractional gravity regimes and heliophysics; and fundamental physics including relativity. Topical focus includes measurement techniques, data types, performance requirements, instrument designs, mission concepts and systems, and associated technology developments.

Co-Chairs

Eric Wille
ESA — THE NETHERLANDS

Andrew Court
TNO — THE NETHERLANDS

Rapporteur

Maria Cristina Falvella
Italian Space Agency (ASI) — ITALY

A7.IP Interactive Presentations - IAF SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SPACE PHYSICS

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Astronomy addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded 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. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Andrew Court
TNO — THE NETHERLANDS

Alessandra Di Cecco
Agenzia Spaziale Italiana (ASI) — ITALY

Category B

APPLICATIONS AND OPERATIONS

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

- B1 IAF EARTH OBSERVATION SYMPOSIUM
- B2 IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM
- B3 IAF HUMAN SPACEFLIGHT SYMPOSIUM
- B4 31ST IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS
- B5 IAF SYMPOSIUM ON INTEGRATED APPLICATIONS
- B6 IAF SPACE OPERATIONS SYMPOSIUM

Category coordinated by Igor V. Sorokin, *S.P. Korolev Rocket and Space Corporation Energia, RUSSIAN FEDERATION*

B1 IAF EARTH OBSERVATION SYMPOSIUM

The Earth Observation Symposium, organized by the International Astronautical Federation (IAF), covers all aspects of Earth observations from space, including observations related to the Earth's environment, societal and economic benefit. Aspects include programs, constellations, missions, and systems; microwave and optical sensors; land, oceanographic, atmospheric, geological, geophysical, societal, economic, and business; the associated science, ground data-processing, applications and services; through all life cycle phases from research and technology through, planning, conceptualization, development, commissioning, operations, retirement and historical retrospective. Participation is encouraged from all sectors including institutional (including Government, Agencies, multi-lateral, non-Governmental, Academic) and Commercial.

Coordinators

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

Luís Ferreira
Airbus Defence and Space — GERMANY

B1.1 International Cooperation and Business Ventures in Earth Observations

Focus is on the planning, governance, business models, management and how to achieve successful program outcomes of space-based Earth Observations missions (including single and constellation missions, one time and sustained observations, programs, and projects), systems (including instruments, spacecraft, communications, processing, archive, distribution, and calibration / validation systems), and applications (user driven value-added products and services for societal and business benefit, and science and technology advancement). Presentations are encouraged which provide plans, status, and experience in developing, implementing, and operating Earth Observations international ventures to better meet societal needs including addressing climate change mitigation, earth system health, underdeveloped and emerging space nations capacity building, entrepreneurial and commercial development, governmental policy, regulation and planning, disaster mitigation and response, news and media, and security.
In addition to cooperations, collaborations and partnerships also are of interest.

Co-Chairs

Mukund Kadursrinivas Rao
— INDIA

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

Rapporteur

Charles Wooldridge
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES

B1.2 Earth Observation Systems

Emphasis is on functional and technical description of envisioned, planned recently launched, and ongoing systems, missions, constellations, and programs for experimental and operational Earth observation. Descriptions of present systems as well as new concepts and innovative Earth Observation systems are encouraged. This session includes governmental / agency programs, public-private partnerships, commercial programs, and academic / non-governmental / non-commercial programs.

Co-Chairs

Annamaria Nassisi
Thales Alenia Space Italia — ITALY

Timo Stuffler
OHB System AG — GERMANY

Rapporteur

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

B1.3 Earth Observation Sensors and Technology

Focus is on Earth Observation sensors and instruments including future concepts being proposed, developed, tested, or calibrated, and those in operations for all aspects of Earth observation. Driven by user and scientific requirements, particular emphasis is on systems and technologies that make innovative measurements and deliver improved performance for science, operational or commercial applications.

Co-Chairs

Andrew Court
TNO — THE NETHERLANDS

Kate Becker
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES

B1.4 Earth Observation Data Systems and Technology

The focus is on the development and operations of Earth Observation-related data processing systems. The emphasis of the session is on the challenges of emerging information and web-based technology (e.g. Big Data, Cloud-based operations, internet of things, crowd sourcing) for acquisition, communication, processing, dissemination and archiving of data. The session also covers innovative methods for making data analysis ready, the extraction of information from these resulting large data sets (e.g. machine learning and artificial intelligence) and methods for making the information available timely to decision makers. This session also includes the evolving data processing infrastructure like federated Cloud systems and digital twin.

Co-Chairs

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

James Graf
Jet Propulsion Laboratory — UNITED STATES

Rapporteur

Ana-Mia Louw
Simera Sense — SOUTH AFRICA

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

The focus of the session is on using Earth Observation data to generate information and deliver applications and services for meeting sustainable development challenges, addressing socio-economic benefits, and delivering commercial applications from the data. Presentation of analyses, methods, algorithms, processing, case studies and results from developing and operating applications and services including consideration of investment cost, economic return, and societal benefits, especially leveraging innovative approaches, are encouraged. Optimized application satellite constellations, which do not focus on individual techniques or single satellites and describe the socio-economic aspects of these collective systems, are also encouraged.

Co-Chairs

Masami Onoda
Japan Aerospace Exploration Agency (JAXA) — UNITED STATES

Na Yao
Qian Xuesen Laboratory of Space Technology, China Academy of Space Technology (CAST) — CHINA

Rapporteur

Michael Kern
European Space Agency (ESA) — FRANCE

B1.6 Assessing and Mitigating the Global Freshwater Crisis

Water is life and with Earth's changing climate, water availability, quality and security are under stress creating a global societal crisis. Despite its importance, the challenges of assessing and monitoring fresh water are poorly understood as is the ability to generate products to inform decision makers. The vantage point of space affords a unique opportunity to make the critical measurements related with fresh water. This session will focus on the past, present and future space flight missions devoted to making freshwater measurements. It will also include modelling systems for predicting availability and address products generated for societal benefits.

Co-Chairs

Parag Vaze
National Aeronautics and Space Administration (NASA), Jet Propulsion Laboratory — UNITED STATES

Elizabeth Seward
— UNITED KINGDOM

Rapporteur

Chen Xiaoli
Beijing Institute of Space Mechanics & Electricity, China Academy of Space Technology (CAST) — CHINA

B1.7 Earth Observations to address Earth's Environment and Climate Challenges

The IPCC reports on climate change articulate the major global environmental challenges that require vast and sustained measurement and information systems to monitor key climate parameters and inform decision makers and enable potential mitigations. Global governmental agencies, commercial and public/private partnerships are investing in creating systems and applications for environmental monitoring and prediction, and climate monitoring and change mitigation. This session focuses on the latest major findings in climate research and the systems being used to address the climate challenges, Earth Observations science, weather, oceanography, and land monitoring. Presentation of algorithms, processing chains and services especially leveraging innovative approaches, are encouraged. Optimized application satellite constellations, which do not focus on individual techniques or single satellites and describe the environmental / climate aspects of these collective systems, are also encouraged.

Co-Chairs

Ole Morten Olsen
Norwegian Space Agency (NOSA) — NORWAY

Shimrit Maman
Ben-Gurion University of the Negev — ISRAEL

Rapporteur

Patrick Castillan
Centre National d'Etudes Spatiales (CNES) — FRANCE

B1.IP Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Earth Observation addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten-minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint 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 B Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Oana van der Togt
Antwerp Space — THE NETHERLANDS

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

Bernard Foing
ILEWG "EuroMoonMars" — THE NETHERLANDS

Parag Vaze
National Aeronautics and Space Administration (NASA), Jet Propulsion Laboratory — UNITED STATESY

Masami Onoda
Japan Aerospace Exploration Agency (JAXA) — UNITED STATES

B2 IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM

This symposium, organized by the International Astronautical Federation (IAF), examines developments in space-based systems, services, applications, and technologies as they relate to communication and navigation. Communication topics include fixed, broadcast, high-throughput, mobile, optical, and quantum communications. Navigation topics include position, velocity, and time determination and tracking for both relative and inertial reference frames. The symposium addresses geostationary, non-geostationary, and extra-terrestrial systems and constellations. The topics of IoT and M2M as they relate to communication and navigation are also applicable to this symposium.

Coordinators

Rita Lollock
The Aerospace Corporation — UNITED STATES

Morio Toyoshima
National Institute of Information and Communications Technology (NICT) — JAPAN

B2.1 Advances in Space-based Navigation Systems, Services, and Applications

This session is focused on advances in space-based navigation systems, including the existing global systems (Beidou, Galileo, GLONASS, GPS) and regional systems (EGNOS, IRNSS, QZSS, WAAS), as well as proposed and emerging new space-based systems. The session also addresses advances in the services and applications of those systems for position, velocity, and time determination and tracking, and integrity assurance on Earth, Moon, and potentially other bodies of the solar system.

Co-Chairs

Giovanni B. Palmerini
Sapienza University of Rome — ITALY

Raj Thilak Rajan
Technical University of Delft — THE NETHERLANDS

Rapporteur

Joshua Critchley-Marrows
Space Generation Advisory Council (SGAC) — AUSTRALIA

Norbert Frischauf
TU Graz — AUSTRIA

B2.2 Advances in Space-based Navigation Technologies

This session is focused on advances in technology applicable to space-based navigation systems. Technologies include hardware or software necessary for the entire navigation system (spacecraft, monitor and control system, end-user equipment) such as: sensors, star trackers, sensor fusion algorithms, space-born frequency standards, crosslink ranging techniques, etc. Technologies should be applicable to position, velocity, and time determination and tracking, and integrity assurance on Earth, Moon, and potentially other bodies of the solar system.

Co-Chairs

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

Joe M. Straus
The Aerospace Corporation — UNITED STATES

Rapporteur

Sanat K Biswas
IIIT Delhi — INDIA

B2.3 Advance Higher Throughput Communications for GEO and LEO satellites

This session is focused on advanced higher throughput communications for LEO constellations, GEO, MEO and Molnya to improve performances (increased capacity, low latency and reduced cost) including all aspects of space communications, services, architecture and infrastructure: fixed, mobile and broadcast services; High-Throughput Satellite (HTS); Very-High Throughput Satellites (VHTS); Ultra-High Throughput Satellites (UHTS); Software Defined Satellite (SDS); 5G integration into satellite networks; Ku- and Ka-band, Q/V/W/E bands and higher frequencies; VSAT/ESIM and radio/television and internet services, including video to users.

Co-Chairs

Robert D. Briskman
Sirius XM Radio — UNITED STATES

Laszlo Bacsardi
Hungarian Astronautical Society (MANT) — HUNGARY

Rapporteur

Dunay Badirkhanov
Azercosmos, Space Agency of Republic of Azerbaijan — AZERBAIJAN

B2.4 Space-based Optical and Quantum Communications

This session is focused on optical and quantum communications in space including all aspects of space-based optical and quantum communications: in-orbit, on-ground demonstrations and results; present and future scenarios; next generation systems and applications; terrestrial-based systems; small satellites; ranging technology with optical communications; imaging technology for optical communications; optical devices; optoelectronic subsystems and components; laboratory demonstration hardware; atmospheric propagation and modeling, transmission effects; compensation techniques; site-diversity techniques; modulation formats; trade-offs between optical and microwave (RF) systems; Quantum Key Distribution (QKD); advances in quantum communications.

Co-Chairs

Morio Toyoshima
National Institute of Information and Communications Technology (NICT) — JAPAN

Otto Koudelka
Joanneum Research — AUSTRIA

Rapporteur

Steven Shumsky
Millennium Space Systems, A Boeing Company — UNITED STATES

B2.5 Extra-Terrestrial and Interplanetary Communications, and Regulations

This session focuses on near-Earth, deep-space and extra-terrestrial communications with particular emphasis on unique concepts, techniques and technologies including all aspects of space communications, services, architecture and infrastructure: ARTEMIS related missions; Earth orbiting, lunar, and planetary missions; flight and ground demonstrations and results; present and future scenarios; next generation systems and applications; science missions; terrestrial-based systems; small satellites; near-Earth and planet observation satellites. It also includes spectrum allocations and regulations issues, and impacts of Space Debris and optical pollution to satellite communications for new systems/services, and systems modeling.

Co-Chairs

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

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

Rapporteur

Sara AlMaeeni
Mohammed Bin Rashid Space Centre (MBRSC) — UNITED ARAB EMIRATES

B2.6 Cubesat, Internet of Things, and Mobile Direct Communications

This session is focused on small satellite, IoT and mobile communication services that can communicate directly with 3GPP mobile phone terminals including all aspects of space communications, services, architecture and infrastructure: Narrow Band (NB)-IoT, 3GPP IoT terminals; LoRa IoT terminals; Low Power Wide Area (LPWA); Non-Terrestrial Network (NTN); cube-, pico-, nano-, micro-satellites; High Altitude Platform Station (HAPS); in-orbit, on-ground demonstrations and results; present and future scenarios; next generation systems and applications; terrestrial-based systems; small satellites; Earth observation satellites; devices; subsystems and components; laboratory demonstration hardware; site-diversity techniques; modulation formats. Both terrestrial and satellite networks will be available at the same terminal, and coverage is expected to expand significantly.

Co-Chairs

Debra Emmons
The Aerospace Corporation — UNITED STATES

Amane Miura
National Institute of Information and Communications Technology (NICT) — JAPAN

Rapporteur

Nader Alagha
ESA — THE NETHERLANDS

B2.7 Advances in Space-based Network and Communication Technologies

This session is focused on all aspects of advanced novel technologies for space-based networks and communications and data relay of payload, spacecraft, and Earth station. It covers applications ranging from those used in nanosatellites to those applicable to large, high throughput systems, and integrated applications and services. It includes modulation and coding, propagation, power amplifiers, adaptive transmit technologies, inter-satellite links, antenna (including phased array) design, Q/V/W/E band technologies, onboard processing, digital payload technologies, security, and other technology relevant to satellite communication.

Co-Chairs

Elemer Bertenyi
Canadian Aeronautics and Space Institute — CANADA

Enrique Pacheco Cabrera
Incomspace — MEXICO

Rapporteurs

K.R. Sridhara Murthi
NIAS — INDIA

Steven Shumsky
Millennium Space Systems, A Boeing Company — UNITED STATES

B2.8 Space Communications and Navigation Global Technical Session

GTS.3

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, velocity, and time determination and tracking for navigation. Both Earth's orbital and interplanetary space communications topics can be addressed. This session is co-sponsored by the Space Communications and Navigation Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Kevin Shortt
Airbus Defence & Space — GERMANY

Joshua Critchley-Marrows
The University of Sydney — AUSTRALIA

Rapporteur

Eric Wille
ESA — THE NETHERLANDS

B2.IP Interactive Presentations - IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Communications and Navigation addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten-minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. 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 IAC abstracts.

Co-Chairs

Morio Toyoshima
National Institute of Information and Communications Technology (NICT) — JAPAN

Rita Lollock
The Aerospace Corporation — UNITED STATES

Behnoosh Meskoob
École de technologie supérieure — CANADA

Hugo Moen
Norwegian Space Agency (NOSA) —

B3 IAF HUMAN SPACEFLIGHT SYMPOSIUM

The symposium, organized by the International Astronautical Federation (IAF), invites papers on all aspects of on-going and planned human spaceflight including the design, development, operations, utilization and future plans of space missions involving humans. The scope covers past, present and planned space missions and programmes in LEO and beyond, both governmental and private. The Human Spaceflight Symposium will also feature discussions on preparations for the launch of new human spaceflight capabilities and collaborative efforts of human and robotic systems and technologies.

Coordinators

Kevin D. Foley
The Boeing Company — UNITED STATES

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

Peter Batenburg
Netherlands Space Society (NVR) — THE NETHERLANDS

B3.1 Governmental Human Spaceflight Programmes (Overview)

The session provides the forum for updates and annual "Overview" presentations on present and evolving governmental Human Spaceflight programmes. Each year, the session will focus on specific themes dealing with human spaceflight exploration. These will be selected by the session chairs based on the received abstracts. The session will accept manuscripts from any organization (agencies, industries, research centers, academia, etc.) dealing with international, Governmental human space programmes initiatives. The range of topic to be addressed in this session include mission to low Earth orbit (LEO) and those beyond Earth orbit (BEO) and include orbital systems, crew and cargo transportation systems, as well as surface systems and operations on the Moon. The format of the session (e.g. panel, pitching presentations, keynote speech) will be a result of such a selection.

Co-Chairs

Sam Scimemi
National Aeronautics and Space Administration (NASA) — UNITED STATES

Juergen Schlutz
European Space Agency (ESA) — GERMANY

Rapporteur

Antonio Fortunato
European Space Agency (ESA) — GERMANY

B3.2 Commercial Human Spaceflight Programmes

This session provides a forum for papers describing commercial human orbital and sub-orbital endeavours including orbital space stations, commercial transportation systems, services, operation and uses, as well as human-tended space station platforms. This session also accepts papers on commercial human spaceflight activities in cis-lunar space and lunar surface operations. Topics include the status of development, testing, operations and utilization; the architecture and performance of various systems; orbital infrastructure development; commercial operations and utilization projects, market and economic development activity, and other pertinent areas of commercial human spaceflight. Examples of activity include but are not limited to commercial utilization and other commercial activity on the International Space Station, international capability for commercial transportation, activities planned for future human spaceflight platforms either in low Earth orbit (LEO) or beyond Earth orbit (BEO) and other applications are appropriate for this session.

Co-Chairs

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

Kevin D. Foley
The Boeing Company — UNITED STATES

Michael E. Lopex Alegria
MLA Space, LLC — UNITED STATES

B3.3 Utilization & Exploitation of Human Spaceflight Systems

This session addresses the utilization and exploitation of space stations, spacecraft, and surface systems and provides the opportunity to discuss achievements, plans and outlooks. Topics for discussion include proposed or available payload facilities, experiments, research, manufacturing, and other on-orbit and surface activity and its related planning, accommodation, and implementation. Additional items appropriate for discussion include scientific and industrial utilization applications and engineering research and technology demonstrations, as well as uses of space stations (ie. International Space Station and Chinese Space Station Tjangong) and other crewed vehicles as test beds for exploration. We also invite papers on challenges for future sustainability of human spaceflight which may be investigated through utilization of on-orbit crew and crewed platforms, and includes those in cis-lunar space and on the surface of the Moon. These may include investigation of in-situ resources and other potential economic and technological enablers, results of advanced manufacturing tests and demonstrations, and reduction and mitigation of risks.

Co-Chairs

Eleanor Morgan
Lockheed Martin Space Systems — UNITED STATES

Kavya K. Manyapu
Department of Space Studies, University of North Dakota — UNITED STATES

Thomas A.E. Andersen
Danish Aerospace Company A/S — DENMARK

B3.4 B6.4 Flight & Ground Operations aspects of Human Spaceflight - 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. 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

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

Annamaria Piras
Thales Alenia Space Italia — ITALY

Rapporteur

Maria Grulich
Deutsches Zentrum fuer Luft- und Raumfahrt (DLR) — GERMANY

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

This session begins with an Astronaut Roundtable where an international group of astronauts from the various programmes will discuss their experiences in a roundtable format. There will be an extended Question and Answer period of interaction with the audience. This session concentrates on all aspects of spaceflight that are unique to the presence of astronauts. It encompasses astronaut activities such as selection, training, workload management, and task division between flight and ground segments. It includes spacecraft systems and robotic tools; interfaces; international command, control and communications; payloads; research; and utilization. It addresses the unique spacecraft systems required to safely accommodate astronauts during intravehicular and extravehicular activities. The session includes astronaut pre-mission, mission, and post-mission support of technological and scientific space-based research and utilization of human space complexes and the space environment.

Co-Chairs

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

Alan T. DeLuna
American Astronautical Society (AAS) — UNITED STATES

Rapporteur

Keiji Murakami
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Andrea Boyd
European Space Agency (ESA) — GERMANY

B3.6 A5.3 Human and Robotic Partnerships in Exploration - Joint session of the IAF Human Spaceflight and IAF Exploration Symposia

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

Co-Chairs

Pierre-Alexis Joumel
Airbus Defence and Space — GERMANY

Mark Hempsell
The British Interplanetary Society — UNITED KINGDOM

Rapporteurs

Jan Marius Bach
DLR (German Aerospace Center) — GERMANY

Scott Ritter
University of Bern — SWITZERLAND

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

This session is designed to examine and identify the potential evolution of key elements of Human Spaceflight missions, especially those driven by advanced technologies and innovations. Papers are solicited that address potential future subsystems, technologies, innovations, logistics, processes, procedures, etc. Papers are also encouraged that address key factors in enabling innovation and new system insertion in human space flight, including reliability, availability, first time use, learning by doing, early testing and integration results, and prototyping. Topics which enable or significantly improve future human space mission objectives are of interest including for exploration, commercial initiatives, tourism, and industrial undertakings. Also, lessons learned from past missions and their application to future missions are essential topics in this session.

Co-Chairs

Michele Gates
NASA Headquarters — UNITED STATES

Sebastien Barde
Centre National d'Etudes Spatiales (CNES) — FRANCE

Mauro Augelli
UK Space Agency — UNITED KINGDOM

Rapporteur

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

B3.8 Human Space & Exploration

This session addresses current and future missions, applications and preparatory plans for human lunar and planetary exploration activities. The session covers human exploration of the Moon including its surface and cislunar space as well as Mars missions. Papers that delve into the programmatic and technical aspects of these activities are encouraged. Both national and international perspectives are invited as are emerging areas of commercial human exploration activities.

Co-Chair

Dan King
MDA Corporation – CANADA

Tara Ruttley
Blue Origin LLC — UNITED STATES

Rapporteur

Joost van Tooren
ArianeGroup SAS — FRANCE

B3.9 GTS.2 Human Spaceflight Global Technical Session

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

Co-Chairs

Guillaume Girard
Zero2infinity — SPAIN

Andrea Jaime
Isar Aerospace Technologies GmbH — GERMANY

Rapporteur

Joao Lousada
GMV Aerospace & Defence SAU — GERMANY

B3.IP Interactive Presentations - IAF HUMAN SPACEFLIGHT SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Human Spaceflight addressed in the classic Sessions. The presentation will be displayed on digital screens 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 ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. 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 IAC abstracts.

Co-Chair

Peter Batenburg
Netherlands Space Society (NVR) — THE NETHERLANDS

Matej Poliacek
Space Generation Advisory Council (SGAC) — SLOVAK REPUBLIC

B4 31ST IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS

The International Academy of Astronautics (IAA) Symposium on Small Satellite Missions is focused on recent advances in small satellite class missions weighing much less than 1000kg, addressing needs in government, commerce, or academia. Papers should focus on how microsatellites, nanosatellites, CubeSats and small and "megaconstellations" amongst others enable valuable results for the mission end-user. Papers should benefit the wider smallsat community, and demonstrate a degree of ingenuity and innovation in small satellite utilization, design, manufacture and/or engineering. Papers can report on important lessons-learned, describe notable missions in the planning stages, or include topics that demonstrate the value of small satellites and their constellations, their applications. Sessions cover the role that small satellites can play in developing space nations, science, exploration, "NewSpace", communications and Earth Observation. Sessions also cover cost-effective operations, affordable and reliable access to space through launch, and emerging and promising smallsat technologies and techniques.

Coordinators

Alex da Silva Curiel
Surrey Satellite Technology Ltd (SSTL) — UNITED KINGDOM

Jian Guo
Delft University of Technology (TU Delft) — THE NETHERLANDS

Support

Rhoda Shaller Hornstein
— UNITED STATES

B4.1 25TH Workshop on Small Satellite Programmes at the Service of Developing Countries

This workshop is organized jointly by the United Nations Office for Outer Space Affairs (UNOOSA) and the International Academy of Astronautics (IAA). It shall review the needs that could be satisfied and results achieved by developing nations through using small satellites. National space plans and examples of application results and benefits shall be included. Small satellite programmes in Africa, Middle-East, and Central Asia would be of particular interest to the session. The workshop shall also review the results of international cooperation, technology transfer, lessons learned and the extent to which these efforts have contributed to the space maturity of developing countries.

Co-Chairs

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

Nathalie Ricard
United Nations Office for Outer Space Affairs — AUSTRIA

Taiwo Raphael Tejumola
International Space University — FRANCE

Rapporteurs

Danielle Wood
Massachusetts Institute of Technology (MIT) — UNITED STATES

Pierre Molette
— FRANCE

B4.2 Small Space Science Missions

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

Co-Chairs

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

Norbert M.K. Lemke
OHB System AG - Oberpfaffenhofen — GERMANY

Rapporteurs

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

Oana van der Togt
Antwerp Space — THE NETHERLANDS

B4.3 Small Satellite Operations

This session covers the planning for, and execution of, cost-effective approaches for Small Satellite Operations, with emphasis on new missions, including constellations of small satellites, with new models of operation to reduce mission lifecycle costs and to minimize the cost impact of mission extensions. Papers addressing innovation, an entrepreneurial approach to new business opportunities, novel finance and business models, management techniques, and international cooperation in support of Small Satellite Operations are particularly encouraged. Papers that discuss the application of novel technology to mission operations, such as automation and autonomy, constraint resolution, and timeline planning, as well as reports on missions recently accomplished and lessons learned, are also welcome. For papers not addressing small satellites, please refer to Symposium B6.

Co-Chairs

Andreas Hornig
AerospaceResearch.net — GERMANY

Nijin Jose Thykkathu
Science and Technology Facilities Council — UNITED KINGDOM

Stephan Roemer
Antwerp Space — BELGIUM

Rapporteur

Lynette Tan
Singapore Space and Technology LTD (SSTL) — SINGAPORE, REPUBLIC OF

B4.4 Small Earth Observation Missions

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

Co-Chairs

Carsten Tobehn
European Space Agency (ESA) — THE NETHERLANDS

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

Eugene D Kim
Satrec Initiative — KOREA, REPUBLIC OF

Rapporteurs

Werner R. Balogh
European Space Agency (ESA) — FRANCE

Marco Gomez Jenkins
— UNITED KINGDOM

B4.5 Access to Space for Small Satellite Missions

A key challenge facing the viability and growth of the small satellite community is affordable and reliable space access. Topics of interest for this session include the utilization of dedicated launches; development of ride-share systems, auxiliary payload systems, and separation and dispenser systems; and responsive integration approaches that will enable efficient small satellite access to space. Includes lessons learned from users on technical and programmatic approaches. For a dedicated discussion of small satellite propulsion systems, please refer to session B4.5A-C4.8. For a discussion of small launchers concepts and operations, please refer to session D2.7.

Co-Chairs

Yves Gerard
Airbus Defence & Space — FRANCE

Philip Davies
Surrey Satellite Technology Ltd (SSTL) — UNITED KINGDOM

Rapporteurs

Jeffery Emdee
The Aerospace Corporation — UNITED STATES

Carlos Niederstrasser
Northrop Grumman Corporation — UNITED STATES

B4.5A 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, operations 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 electric propulsion systems for major orbit changes, fine orbit control and maintenance, and end-of-life disposal. This session will be accepting submissions for oral presentations only. For papers with an emphasis on the small satellite and its system design, refer to other B4 sessions. For a focus on other propulsion systems and technologies, refer to other C4 sessions.

Co-Chairs

Jeff Emdee
The Aerospace Corporation — UNITED STATES

Arnau Pons Lorente
Space Generation Advisory Council (SGAC) — UNITED STATES

Rapporteurs

Elena Toson
Space Generation Advisory Council (SGAC) — ITALY

Vito Salvatore
CIRA Italian Aerospace Research Center, Capua — ITALY

B4.6A Generic Technologies for Small/Micro Platforms

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

Co-Chairs

Philip Davies
Surrey Satellite Technology Ltd (SSTL) — UNITED KINGDOM

Joost Elstak
Airbus Defence and Space Netherlands — THE NETHERLANDS

Rapporteurs

Jian Guo
Delft University of Technology (TU Delft) — THE NETHERLANDS

Thomas Terzibaschian
DLR, German Aerospace Center — GERMANY

B4.6B Generic Technologies for Nano/Pico Platforms

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

Chairman

Andy Vick
RAL Space — UNITED KINGDOM

Co-Chair

Zeger de Groot
Innovative Solutions in Space BV — THE NETHERLANDS

Rapporteurs

Martin von der Ohe
Lacuna Space — GERMANY

Eugene D Kim
Satrec Initiative — KOREA, REPUBLIC OF

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 new, emerging, or enabling technologies that can be used or are being used to create networked data collection systems via small satellites. Specifically, Session B4.7 focuses on Constellations (e.g. Constellation missions for Earth Observation, IoT/M2M and LEO Communications), distributed architectures (e.g. Distributed SAR systems) and sensor systems and how these low-cost and rapidly delivered technologies offer the potential to fulfill complex user needs, working in coordination with other small or large space infrastructures (e.g. mega-constellations), as well as with airborne or terrestrial assets. Papers should show how cross-platform compatibility (both hardware and software aspects) can be used to enable these systems, any standards that are proposed or adopted, design techniques that enable this cross-platform compatibility, etc. We are particularly interested in technologies that enable small spacecraft to play an important role in upcoming applications, such as (but not limited to) civil security, telecommunications in remote areas, navigation support (e.g., along the new foreseen routes in the Arctic), natural disaster management (e.g., damage assessment and first responders support), and planetary exploration. In this regard, the development and usage of Commercial-off-the-shelf (COTS) technologies are also of specific interest to the session. Distributed systems and their impact in terms of new opportunities for the emerging Commercial Space Industry and new commercial space missions with small platforms is also of specific interest to the session. The integrated applications of these sensor systems are covered in Symposium Session B5.2, and the broader view of tools and technologies to enable integrated applications are covered in B5.1. In B4.7 authors are also invited to analyze technological enhancements and new developments needed to guarantee small satellite integration with existing and scheduled assets from both the bus and payload perspectives. Also analysis of inter-operability within integrated systems can be addressed, like payload data management, spacecraft operation, and formation flying.

Co-Chairs

Rainer Sandau
International Academy of Astronautics (IAA) — GERMANY

Michele Grassi
University of Naples "Federico II" — ITALY

Rapporteurs

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

Maria Daniela Graziano
University of Naples "Federico II" — ITALY

B4.8 Small Spacecraft for Deep-Space Exploration

This session focuses on innovative small spacecraft designs, systems, missions and technologies for the exploration and commercialization of space beyond Earth orbit. Target destinations for these miniaturized space probes include the Earth's Moon, Mars, comets and asteroids, as well as other destinations that are targets for in-situ resource utilization (ISRU). Small exploration probes covered by this session may come in many different forms including special-purpose miniature spacecraft, standard format small platforms such as Cubesats or other microsats, nanosats, picosats, etc. Topics include new and emerging technologies including the use of commercial off the shelf (COTS) technologies, miniaturized subsystems including propulsion, avionics, guidance navigation & control, power supply, communication, thermal management, and sensors and instruments. The main focus of this session is on new and emerging systems, missions, driving technologies and applications that are both government-funded as well as driven by commercial ventures.

Co-Chairs

Leon Alkalai
Mandala Space Ventures — UNITED STATES

Rene Laufer
Luleå University of Technology — SWEDEN

Rapporteurs

Amanda Stiles
Rocket Lab — UNITED STATES

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

B4.9 GTS.5 Small Satellite Missions Global Technical Session

The Small Satellite Missions Global Technical Session (GTS) is a collaboration between the International Academy of Astronautics (IAA) Small Satellite Missions Symposium and the International Astronautical Federation (IAF) Workforce Development/Young Professionals Programme Committee. This session is unique in that it allows for sharing of information on a global scale with presenters and audience both at the IAC venue and online at their home/work/university locations. Abstracts are solicited regarding operational missions or mature proposals for small satellite systems and related topics. These must have clear relevance on an international scale or at a business level, and must also provide young professionals a taste of what the space sector has to offer. Where possible, abstracts should have a wide interest in the community and should include transferable knowledge or lessons learned. Abstracts highlighting ingenuity or innovation are preferred. Examples include space missions utilizing small satellites that address specific new societal, scientific or commercial challenges, or novel technologies that have the potential to revolutionize space missions and/or enable their access to space. Papers are to describe the specific need, the small satellite approach that addresses this need, the benefits of this approach and the use of space technology, and demonstrate that other non-space approaches provide inferior solutions. Papers from, or directed at the young professional community are preferred. This session will be accepting submissions for oral presentations only.

Co-Chairs

Matthias Hetscher
DLR (German Aerospace Center) — GERMANY

Norbert M.K. Lemke
OHB System AG - Oberpfaffenhofen — GERMANY

Rapporteurs

Alex da Silva Curiel
Surrey Satellite Technology Ltd (SSTL) — UNITED KINGDOM

Victoria Barabash
Luleå University of Technology — SWEDEN

B4.IP Interactive Presentations: 31ST IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects on small satellite missions addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. 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 IAC abstracts.

Co-Chairs

Danil Ivanov
Keldysh Institute of Applied Mathematics, RAS — RUSSIAN FEDERATION

Balbir Singh
Manipal Institute of Technology, Manipal Academy of Higher Education — INDIA

Andreas Hornig
AerospaceResearch.net — GERMANY

Rapporteur

Klaus Schilling
Zentrum für Telematik — GERMANY

Jian Guo
Delft University of Technology (TU Delft) — THE NETHERLANDS

B5 IAF SYMPOSIUM ON INTEGRATED APPLICATIONS

Space systems are more and more involved in the delivery of global services to end-users. Integrated Applications are built on the exploitation of space and terrestrial technologies for the benefit of the global population. This symposium will address various aspects of space-based downstream services with a special emphasis to the sustainable development of our planet in line with the objectives defined by the UN Sustainable Development Goals. Integrated applications combine data from existing space assets, such as Satellite Communications, Earth Observation, Satellite Navigation with airborne and ground-based systems, in addition to other technologies, such as big data, drone, analytics, IOT, 5G and others to deliver sustainable solutions and services responding to users' needs. The goal of the symposium is to discuss the different types of systems, tools and technologies, such as the kind of space and non-space data to be collected, how are data collected and integrated, that can enable the development of end-to-end solutions.

Coordinators

Jeanne Holm
City of Los Angeles — UNITED STATES

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

B5.1 Tools and Technology in Support of Integrated Applications

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 kind of data to be collected, how are data collected and how the data are integrated and distributed to address key user needs. Integrated Applications are built on the exploitation of space and terrestrial technologies for the benefit of the global population. Emerging technologies, such as Machine Learning, Artificial Intelligence, Digital Twin, Internet of Things, and other advanced technologies are rapidly revolutionizing and reshaping infrastructure and global-local economies. Leveraging these new transformative developments and understanding their disruptive potential with respect to technology, shifting demographics and global connectivity is essential for space technologies. Possible topics include: ground-truthing of data collected from space platforms; innovative, low-cost solutions for data distribution and access that focus on the space segment; new ways of integrating space and non-space data; data fusion and visualization tools; enabling technologies in support of new developments, models in support of applications, managing integrated applications programmes and public outreach efforts to connect the public to these applications.

Co-Chairs

Jeanne Holm
City of Los Angeles — UNITED STATES

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

Rapporteur

Marion Allayioti
European Space Agency (ESA) — UNITED KINGDOM

B5.2 Integrated Applications End-to-End Solutions

The session will be a forum for end-to-end solutions, case studies, proof-of-concept applications and current projects that aim to provide innovative , and sustainable solutionsthat combine terrestrial and space-based data sources with models and other technologies to address specific user requirements. These examples can cover a variety of sectors, like disaster/crisis monitoring and management, energy, food security, smart cities, transport, health, maritime, education, tourism, etc. The user needs, the organizations of the user communities, the service value chain, the business case and the societal impact of the solutions are among the many aspects that can be considered. Examples of projects with established partnerships between space and non-space stakeholders are appreciated. The different ways of assessing the impact of specific integrated applications in addressing the users and stakeholders needs and requirements could also be discussed.

Co-Chairs

Boris Penne
OHB System AG — GERMANY

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

Rapporteur

Marion Allayioti
European Space Agency (ESA) — UNITED KINGDOM

B5.3 Satellite Commercial Applications

The emergence of "New Space" and satellite-based IoT solutions has contributed to the rise of commercial satellite applications. There is an increasing demand for connectivity in several vertical markets such as agriculture, energy, transport and satellite IoT plays a key role to increase productivity. Meanwhile that the downstream market is evolving through innovative approaches to amplifying satellite services, M2M and 5G/6G technologies are changing the traditional satellite services with satellite IoT as the key application. This session solicits papers pertinent to several areas such as the Commercial Space and Space Culture; A Commercial Space Model for Public Users; Atmosphere, Ecosphere, Environment; New Application Video Optics & Video SAR ; New Application-Travellers (Outdoors, Automobiles, Sailboat, General Aviation); Global communications; Commercialising data about the Earth; Case Analysis of Satellite Commercial Applications. This session solicits papers pertinent to several areas such as the commercial space and space culture; a commercial space model for public users; atmosphere, ecosphere, environment; new application video optics and video SAR; new application-travelers (outdoors, automobiles, sailboat, general aviation); global communications; commercializing data about the Earth; and case analysis of satellite commercial applications.

Co-Chairs

John M. Horack
The Ohio State University College of Engineering — UNITED STATES

Dengyun Yu
China Aerospace Science and Technology Corporation (CASC) — CHINA

Rapporteur

Samuel Malloy
The Ohio State University — UNITED STATES

B5.IP Interactive Presentations - IAF SPACE OPERATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of integrated applications addressed in the classic Sessions. The IP session is not restricted to any specific topic related to space law and invites authors to contribute presentations on any interesting, relevant and current space law issues. 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 ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. An award will also be presented to the author of the best Interactive Presentation in the E Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

Jeanne Holm
City of Los Angeles — UNITED STATES

B6 IAF SPACE OPERATIONS SYMPOSIUM

The Space Operations Symposium, organized by the International Astronautical Federation (IAF), addresses all aspects of spaceflight operations. The sessions address space operations including human spaceflight and robotic space missions, from low-Earth and geosynchronous orbit, to lunar, planetary, science and exploration missions. The symposium covers both flight and ground systems, and included mission planning, training, and real time operations. Particular focus is provided for commercial space operations, advanced systems, new operations concepts, and small satellite operations.

Coordinators

Andreas Rudolph
European Space Agency (ESA) — GERMANY

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

Zeina Mounzer
Telespazio VEGA Deutschland GmbH — GERMANY

B6.1 Ground Operations - Systems and Solutions

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

Co-Chairs

Sean Burns
EUMETSAT — GERMANY

Claude Audouy
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteurs

Regina Mosenkis
Airbus Defence & Space — GERMANY

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

B6.2 Innovative Space Operations Concepts and Advanced Systems

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

Co-Chairs

Mario Cardano
Thales Alenia Space France — ITALY

Andreas Ohndorf
DLR (German Aerospace Center) — GERMANY

Rapporteurs

Jackelynne Silva-Martinez
NASA — UNITED STATES

Yuichiro Nogawa
Japan Manned Space Systems Corporation (JAMSS) — JAPAN

B6.3 Mission Operations, Validation, Simulation and Training

This session addresses the broad topic of operations, from preparation through validation, simulation and training, including operations concepts, execution and lessons learned. This includes both flight and surface operations.

Co-Chairs

Andreas Rudolph
European Space Agency (ESA) — GERMANY

Zeina Mounzer
Telespazio VEGA Deutschland GmbH — GERMANY

Rapporteurs

Borre Pedersen
Kongsberg Satellite Services AS — NORWAY

Matthew Duggan
The Boeing Company — UNITED STATES

B6.4 / B3.4 Flight & 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. 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

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

Annamaria Piras
Thales Alenia Space Italia — ITALY

Rapporteurs

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

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

B6.5 Large Constellations & Fleet Operations

Access to space has been simplified, and opened the door to a wider range of missions. Organisations are opting for distributed architectures of small satellite constellations instead of single-satellite missions. The complexity of the overall system has shifted, and necessitated a focus on efficient management and operation of a multitude of heterogeneous smaller elements. This session addresses the operations of large constellations, covering all related elements and phases; the operations concepts and solutions, the required ground segment architecture, the scale-up, deployment, and exploitation, the space traffic management approaches, end-of-life management, as well as the advantages, challenges, the outlook and foreseen developments.

Co-Chairs

Simon Plum
European Space Agency (ESA-ESOC) — GERMANY

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

Rapporteur

Rapporteurs

Shawn Linam
Qwaltec, Inc. — UNITED STATES

Mario Cardano
Thales Alenia Space Italia — ITALY

B6.IP Interactive Presentations - IAF SPACE OPERATIONS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Operations addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for 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 ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. 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 IAC abstracts.

Co-Chairs

Andreas Rudolph
European Space Agency (ESA) — GERMANY

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

Category C

TECHNOLOGY

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

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

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

C1 IAF ASTRODYNAMICS SYMPOSIUM

This symposium addresses advances in orbital mechanics, attitude dynamics, guidance, navigation and control of space systems

Coordinators

Daniel Scheeres
Colorado Center for Astrodynamics Research, University of Colorado — UNITED STATES

Vincent Martinot
Thales Alenia Space France — FRANCE

C1.1 Attitude Dynamics (1)

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

Co-Chairs

Giovanni B. Palmerini
Sapienza University of Rome — ITALY

Zhanfeng Meng
China Academy of Space Technology (CAST) — CHINA

Rapporteur

Robert G. Melton
Pennsylvania State University — UNITED STATES

C1.2 Attitude Dynamics (2)

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

Co-Chairs

Toshio Kamiya
NEC Corporation — JAPAN

Mikhail Ovchinnikov
Keldysh Institute of Applied Mathematics, RAS — RUSSIAN FEDERATION

Rapporteur

Bang Hyochoong
Korea Advanced Institute of Science and Technology (KAIST) — KOREA, REPUBLIC OF

C1.3 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 formation flying, rendezvous and docking.

Co-Chairs

Guo Linli
Institute of Manned Space System Engineering,China Academy of Space Technology (CAST) — CHINA

Krishna Kumar
Ryerson University — CANADA

Rapporteur

Juan Carlos Bastante
OHB System AG-Bremen — GERMANY

C1.4 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 formation flying, rendezvous and docking.

Co-Chairs

Mai Bando
Kyushu University — JAPAN

Eberhard Gill
Delft University of Technology — THE NETHERLANDS

Rapporteur

Hanspeter Schaub
Colorado Center for Astrodynamics Research, University of Colorado — UNITED STATES

C1.5 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 formation flying, rendezvous and docking.

Co-Chairs

Jean de Lafontaine
NGC Aerospace Ltd. — CANADA

Yung Fu Tsai
National Cheng Kung University — TAIWAN, CHINA

Rapporteur

Miguel Bello Mora
Deimos Space SLU — SPAIN

C1.6 Mission Design, Operations & Optimization (1)

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

Co-Chairs

Yury Razoumny
Peoples's Friendship University of Russia (RUDN) — RUSSIAN FEDERATION

Mauro Pontani
Sapienza University of Rome — ITALY

Rapporteur

Liang Tang
Beijing Institute of Control Engineering, China Academy of Space Technology (CAST) — CHINA

C1.7 Mission Design, Operations & Optimization (2)

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

Co-Chairs

Erick Lansard
Thales Research & Technology — FRANCE

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

C1.8 Orbital Dynamics (1)

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

Co-Chairs

Yuichi Tsuda
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Elena Fantino
Khalifa University of Science and Technology (KUST) — UNITED ARAB EMIRATES

Rapporteur

Kathleen Howell
Purdue University — UNITED STATES

C1.9 Orbital Dynamics (2)

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

Co-Chairs

Othon Winter
UNESP - São Paulo Sate University — BRAZIL

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

Rapporteur

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

C1.IP Interactive Presentations - IAF ASTRODYNAMICS SYMPOSIUM

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

Co-Chairs

Diane Davis
National Aeronautics and Space Administration (NASA), Johnson Space Center — UNITED STATES

Florian Renk
European Space Agency (ESA) — GERMANY

C2 IAF MATERIALS AND STRUCTURES SYMPOSIUM

The IAF Materials and Structures Committee addresses materials and structures technologies applicable to space transportation, space exploration and in orbit operation. Three sessions are allocated for the design, verification of qualification of launcher, spacecraft, large orbital structures and in-orbit operating vehicles and robotic systems. It concerns their structures, propellant tanks, propulsive subsystem mechanical components, fluidic and thermal control systems. Six sessions deal with specific technical topics related to the aforementioned different types of applications. Mastering the space structures control, dynamics and micro-dynamics is an important technical field of expertise ensuring the proper functioning of space transportation systems and in-orbit structures and robotic systems. The structures require for high reliability and performance a thorough selection, characterization and qualification of materials, considering the space environmental conditions covering a temperature range from cryogenic conditions up to extreme high temperatures during re-entry in the atmosphere. Protection systems are mandatory especially for in-orbit operating structures, vehicles, space stations and robotic systems. The application of additive manufacturing technologies allow to design and produce multifunctional structures. New smart materials, adaptive structures and nanotechnologies pave the way for new advanced designs of e.g. Sensors and actuators. Reduction of production cost are nowadays playing a very important role. A specific session has been set-up which is addressing the manufacturing and industrialization for Launch Vehicle and Space Vehicle Structures and components.

Coordinator

Jochen Albus
ArianeGroup — GERMANY

Alwin Eisenmann
IABG Industrieanlagen - Betriebsgesellschaft mbH — GERMANY

C2.1 Space Structures I Design, Development and Verification (Launch Vehicles and Space Vehicles, including their Mechanical/Thermal/ Fluidic Systems)

The topics addressed in this session cover the aspects of the design, development and verification of space launch system structures (e.g. pressurized propellant tanks, non-pressurized structures of space vehicles, control surfaces) and their components (e.g. fluidic equipment and propulsive lines, thermal control systems). The aspects of design, development, verification, and qualification concern: • Thermo-Mechanical loads and environment • New structural concepts (e.g. multi-functional structures, design concepts for reusability) • Structure design and verification (stiffness, strength, static and dynamic stability, damage tolerance, reusability) • design, verification and qualification of fluidic and thermal control systems • Structure optimization • Materials • Static and dynamic ground testing • Exploitation of flight measurements and in-orbit testing • Lessons learned related to space vehicle structures and components development, verification and qualification.

Co-Chairs

Alwin Eisenmann
IABG Industrieanlagen - Betriebsgesellschaft mbH — GERMANY

Jochen Albus
ArianeGroup — GERMANY

Rapporteurs

Zijun Hu
China Academy of Launch Vehicle Technology (CALT) — CHINA

Coraline Dalibot
Women in Aerospace Europe (WIA-E) — UNITED KINGDOM

C2.2 Space Structures II Development and Verification (Orbital deployable and dimensionally stable structures, including mechanical and robotic systems and subsystems)

The topics to be addressed within this session concern all aspects of deployable and dimensionally stable structures e.g. reflectors, telescopes, antennas etc. It includes structural design, analysis and verification, shape control and thermal distortion as well as evaluation of analysis versus test results, of both on-ground and in-orbit testing. Furthermore, related mechanical, thermal and robotic systems and subsystems/mechanisms will be covered.

Co-Chairs

Paolo Gasbarri
University of Rome "La Sapienza" — ITALY

Pavel Trivailo
RMIT University (Royal Melbourne Institute of Technology) — AUSTRALIA

Rapporteurs

Jiawen Qiu
— CHINA

Thomas Sinn
DcubeD (Deployables Cubed GmbH) — GERMANY

C2.3 Space Structures III Design, Development and Verification (Orbital infrastructure for in orbit service & manufacturing, Robotic and Mechatronic systems, including their Mechanical/Thermal/ Fluidic Systems)

The topics to be addressed include all aspects of orbital infrastructures design, development and verification, including their mechanical/robotic/thermal/fluidic systems and subsystems, such as manned and unmanned spacecraft, space stations, re-entry vehicles and small satellites. Advanced subsystems and design of future exploration missions will be covered, considering issues arising from material selection, cost efficiency and reliability, and advancements in development with respect to engineering analysis, manufacturing, and test verification. Furthermore, design and testing of robotic and mechatronics systems for exploration, in-orbit servicing and manufacturing of space structures will be addressed. It is also planned to discuss the issues of experimental and computational simulation of functioning and full-scale tests of space infrastructures and their systems/subsystems. Attention will be paid to the problem of verification and validation of mathematical models for the design and experimental development of these objects at various phases of their life cycle.

Co-Chairs

Thierry Pichon
ArianeGroup — FRANCE

Oleg Alifanov
MAI — RUSSIAN FEDERATION

Rapporteur

Ijar M. Da Fonseca
ITA-DCTA — BRAZIL

Ijar M. Da Fonseca
ITA-DCTA — BRAZIL

Paolo Gasbarri
Sapienza University of Rome — ITALY

C2.4 Space Structures Control, Dynamics and Microdynamics

The topics to be addressed include dynamics analysis and testing, modal identification, landing and impact dynamics, pyro-shock, test facilities, vibration suppression techniques, damping, micro-dynamics, in-orbit dynamic environment, wave structural propagation, excitation sources and in-orbit dynamic testing. Attention will be paid to dynamics modelling and control of robotic and mechatronic systems (e.g. manipulators for the servicing and/or assembly of space structures, pointing mechanisms, etc).

Co-Chairs

Federica Angeletti
University of Rome "La Sapienza" — ITALY

Élcio Jeronimo de Oliveira
Associazione Italiana di Aeronautica e Astronautica (AIDAA) — BRAZIL

Rapporteur

Harijono Djojodihardjo
Bandung Institut of Tecnology — INDONESIA

C2.5 Space Structures and Materials for Extreme Environment (High-temperature and cryogenic-temperature applications including thermal insulation concepts)

The topics to be addressed include structures and materials for extreme environments, including both cryogenic applications and high temperature applications in space related domains. The session covers the full spectrum of material, design, manufacturing and testing. Operation of structures and mechanisms in cryogenic environment is quite challenging. This concerns the components design as well as the materials they are made of or lubricants needed for proper functioning. Tanks for storage of cryogenic propellants for launch vehicle application or long term storage of cryogenic liquids require an appropriate material selection and characterization, especially when organic composite materials are considered. Cryogenic insulation for propellant tanks and lines, especially for reusable launch vehicles exposed to aerothermal loads might require a combination with high temperature thermal protection systems. (Foam with metallic protection, vacuum insulated sandwich, stand-off thermal protection…). For the elevated temperature regime, this session includes carbon-carbon and ceramic matrix composites, ultra-high temperature ceramic matrix composites, ablative materials, ceramic tiles and insulations, together with innovative structural concepts making use of the above, for propulsion systems, launchers, hypersonic vehicles, re-entry vehicles, aero capture, power generation.

Co-Chairs

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

Andreas Rittweger
DLR (German Aerospace Center) — GERMANY

Rapporteurs

Zijun Hu
China Academy of Launch Vehicle Technology (CALT) — CHINA

James Tucker
— UNITED STATES

C2.6 Space Environmental Effects and Spacecraft Protection

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

Co-Chairs

Antonio Del Vecchio
CIRA Italian Aerospace Research Centre — ITALY

Anatolii Lohvynenko
Yuzhnoye State Design Office — UKRAINE

Rapporteur

Kyeum-rae Cho
Pusan National University — KOREA, REPUBLIC OF

C2.7 Manufacturing and industrialization for Launch Vehicle and Space Vehicle Structures and components (High volume production, industrialization, automatization and digitalization)

This session will focus on manufacturing, inspection and testing technologies to enable efficient high volume production for launch vehicle and spacecraft structures as well as components. This includes industrialization aspects of series production as e.g. high cadences automatization design, design-to-manufacturing concepts and lean production principles. Other topics covered are the use of digitalization in particular of artificial intelligence, AR, VR, machine learning, digital twins and real-time manufacturing data evaluation to support spacecraft production.

Co-Chairs

Oliver Kunz
Beyond Gravity — SWITZERLAND

Aicke Patzelt
MT Aerospace AG — GERMANY

Rapporteur

Elizabeth Barrios
National Aeronautics and Space Administration (NASA) — UNITED STATES

C2.8 Advancements in Materials Applications, Additive Manufacturing, and Rapid Prototyping Manufacturing and Rapid Prototyping

The topics to be addressed include advancements in materials applications, novel technical concepts in the rapid prototyping of space systems, and materials and processes for in space manufacturing and construction. Continuous improvements in materials and structural concepts are always needed to achieve extremely demanding goals in performance, reliability, and affordability of space components, especially in terms of greater accuracy/dimensional stability, longer life, greater survivability to both natural and threat environments, and producibility capability for high volume production. Different additive manufacturing (AM) processes are currently used for different materials in the fabrication of metal, ceramic, and plastic parts. New and different processes are being developed for utilization of lunar regolith materials for manufacturing and construction. As a very new technique, AM is strongly emerging due to the capability of optimization of structural parts for space applications as it concerns weight reduction, improvement of mechanical properties and reduction of development and lead times as well as cost reduction. The ability to utilize in situ resources for manufacturing and construction is very attractive for logistics reduction for deep space exploration.

Co-Chairs

Raymond Clinton
NASA — UNITED STATES

Pierre Rochus
CSL (Centre Spatial de Liège) — BELGIUM

Rapporteur

Bangcheng Ai
China Aerospace Science and Industry Corporation — CHINA

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

C2.9 Smart Materials and Adaptive Structures & Specialized Technologies, Including Nanotechnology

The focus of the session will be on application of smart materials to spacecraft and launch vehicle systems, novel sensor and actuator concepts and new concepts for multi-functional and intelligent structural systems. Also included in the session will be new control methods for vibration suppression and shape control using adaptive structures as well as comparisons of predicted performance with data from ground and in-orbit testing. Specialized material and structures technologies are explored in a large variety of space applications both to enable advanced exploration, and science/observation mission scenarios to perform test verifications relying on utmost miniaturization of devices and highest capabilities in structural, thermal, electrical, electromechanical/ optical performances offered by the progress in nanotechnology. Examples are the exceptional performances at nano-scale in strength, electrical, thermal conduction of Carbon nanotubes which are experiencing first applications at macro-scale such as nano-composite structures, high efficiency energy storage wheels, MEMS and MOEMS devices. Molecular nanotechnology and advances in manipulation at nano-scale offer the road to molecular machines, ultracompact sensors for science applications and mass storage devices. The Session encourages presentations of specialized technologies, in particular of nanomaterial related techniques and their application in devices offering unprecedented performances for space applications.

Co-Chairs

Behnam Ashrafi
National Research Council — CANADA

Aashish Agrawal
Space Applications Centre (ISRO) — INDIA

Rapporteur

Kanjuro Makihara
Tohoku University — JAPAN

C2.IP Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM

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

Co-Chairs

Jochen Albus
ArianeGroup — GERMANY

Alwin Eisenmann
IABG Industrieanlagen - Betriebsgesellschaft mbH — GERMANY

C3 IAF SPACE POWER SYMPOSIUM

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

Coordinator

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

Koji Tanaka
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN

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

Co-Chairs

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

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

Rapporteurs

Leopold Summerer
European Space Agency (ESA) — THE NETHERLANDS

Koji Tanaka
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN

C3.2 Wireless Power Transmission Technologies and Application

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

Co-Chairs

Nobuyuki Kaya
Kobe University — JAPAN

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

Rapporteurs

Massimiliano Vasile
University of Strathclyde — UNITED KINGDOM

Haroon B. Oqab
Space Canada Corporation — CANADA

C3.3 Advanced Space Power Technologies

This session covers all types of advanced space power technologies and concepts for the satellites, moon/asteroid/planetary exploration and manned space activities. These include technologies and concepts related to power generation (solar, nuclear, other) and harvesting, power conditioning, management and distribution, power transmission and energy storage.

Co-Chairs

Matthew Perren
Airbus Defence & Space — UNITED KINGDOM

Gary Barnhard
XISP-Inc — UNITED STATES

Lisa May
Lockheed Martin (Space Systems Company) — UNITED STATES

Rapporteurs

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

Koji Tanaka
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN

C3.4 Space Power System for Ambitious Missions

This session is devoted to emerging concepts ranging from very small power (micro and milli-watt power) to very large power systems toward future ambitious space missions and space utilizations such as future moon village. These include concepts and technology developments of space power system for the increasing spacecraft market by the nano-, micro- and mini spacecraft. This session is dedicated to power systems for such applications as well as for long-duration exploration probes and sensors.

Co-Chairs

Massimiliano Vasile
University of Strathclyde — UNITED KINGDOM

Shoichiro Mihara
Japan Space Systems — JAPAN

Lisa May
Lockheed Martin (Space Systems Company) — UNITED STATES

Rapporteurs

Xinbin Hou
CAST — CHINA

Koji Tanaka
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN

C3.5 C4.10 Joint Session on Advanced and Nuclear Power and Propulsion Systems

This session, organized jointly between the Space Power and the Space Propulsion Symposia, addresses all aspects related to nuclear power and propulsion systems for space applications. The session also addresses all types of propellantless propulsion including (but not limited to) solar sails, magnetic sails, laser propulsion, tethers, etc.

Co-Chairs

Leopold Summerer
European Space Agency (ESA) — THE NETHERLANDS

Christian Bach
Technical University Dresden — GERMANY

Lisa May
Lockheed Martin (Space Systems Company) — UNITED STATES

Rapporteurs

Markus Jaeger
The Exploration Company GmbH — GERMANY

Saroj Kumar
University of Alabama in Huntsville — UNITED STATES

C3.IP Interactive Presentations - IAF SPACE POWER SYMPOSIUM

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

Coordinators

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

Koji Tanaka
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN

C4 IAF SPACE PROPULSION SYMPOSIUM

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

Coordinators

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

Elena Toson
Space Generation Advisory Council (SGAC) — ITALY

Riheng Zheng
Beihang University — CHINA

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

C4.1 Liquid Propulsion (1)

The session Liquid Propulsion (1) is dedicated to Liquid Rocket Engines (mono-propellant or bi-propellant), with particular emphasis on full engine systems. The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modelling, applications, science and fundamentals.

Co-Chairs

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

Markus Jaeger
The Exploration Company GmbH — GERMANY

Rapporteurs

Annafederica Urbano
ISAE - Institut Supérieur de l'Aéronautique et de l'Espace — FRANCE

Hidenori Hara
Mitsubishi Heavy Industries, Ltd. — JAPAN

C4.2 Liquid Propulsion (2)

The session Liquid Propulsion (2) is dedicated to Liquid Rocket Engines (mono-propellant or bi-propellant), with particular emphasis on sub-systems and specific components (including propellants). The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modelling, applications, science and fundamentals.

Co-Chairs

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

Annafederica Urbano
ISAE - Institut Supérieur de l'Aéronautique et de l'Espace — FRANCE

Rapporteurs

Christian Bach
Dresden University of Technology (DUT) / Technische Universität Dresden — GERMANY

Hidenori Hara
Mitsubishi Heavy Industries, Ltd. — JAPAN

C4.3 Solid and Hybrid Propulsion (1)

The session Solid and Hybrid Propulsion (1) is dedicated to Solid and Hybrid Rocket motors, with particular emphasis on full systems. The session welcomes manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modelling, applications, science and fundamentals.

Co-Chairs

Marco Di Clemente
Italian Space Agency (ASI) — ITALY

Ozan Kara
Technology Innovation Institute (TII) — UNITED ARAB EMIRATES

Rapporteurs

Adam Okninski
Łukasiewicz Research Network – Institute of Aviation (ILOT) — POLAND

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

C4.4 Solid and Hybrid Propulsion (2)

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

Co-Chairs

Didier Boury
ArianeGroup SAS — FRANCE

Adam Okninski
Łukasiewicz Research Network – Institute of Aviation (ILOT) — POLAND

Rapporteurs

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

Arif Karabeyoglu
Koc University — TURKEY

C4.5 Electric Propulsion (1)

The sessions Electric Propulsion (1) and Electric Propulsion (2) are dedicated to all aspects of Electric Propulsion, including full systems, sub-systems and specific components. The sessions welcome manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modelling, applications, science and fundamentals.

Co-Chairs

Garri A. Popov
Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI — RUSSIAN FEDERATION

Vito Salvatore
CIRA Italian Aerospace Research Center, Capua — ITALY

Rapporteur

Marco Di Clemente
Italian Space Agency (ASI) — ITALY

C4.6 Electric Propulsion (2)

The sessions Electric Propulsion (1) and Electric Propulsion (2) are dedicated to all aspects of Electric Propulsion, including full systems, sub-systems and specific components. The sessions welcome manuscripts on all research and development areas: design, testing (including diagnostics and test facilities), analysis and calculations, modelling, applications, science and fundamentals.

Co-Chairs

Davina Maria Di Cara
— Italy

Nicoletta Wagner
European Space Agency (ESA) — FRANCE

Rapporteur

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

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, ramjet, Scramjet, detonation engine, Turbine Based Combined Cycle (TBCC), Rocket Based Combined Cycle (RBCC), Hypersonic Pre-cooled Propulsion, Air Turbo Rocket (ATR) and other types of hypersonic combined cycle propulsion, together with the associated vehicle.

Co-Chairs

Arif Karabeyoglu
Koc University — TÜRKIYE

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

Rapporteurs

Didier Boury
ArianeGroup SAS — FRANCE

Riheng Zheng
Beihang University — CHINA

C4.8 B4.5A 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, operations 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 major orbit changes, fine orbit control and maintenance, and end-of-life disposal. For papers with an emphasis on the small satellite and its system design, refer to other B4 sessions. For a focus on other propulsion systems and technologies, refer to other C4 sessions.

Co-Chairs

Arnau Pons Lorente
Space Generation Advisory Council (SGAC) — UNITED STATES

Jeff Emdee
The Aerospace Corporation — UNITED STATES

Rapporteurs

Elena Toson
T4i — ITALY

Vito Salvatore
CIRA Italian Aerospace Research Center, Capua — ITALY

C4.9 Disruptive Propulsion Concepts for Enabling New Missions

This session will explore advanced and disruptive propulsion technologies, systems, ideas (including integration of different propulsion concepts) showing potential to enable new mission concepts, or to enhance the capabilities of current mission concepts.

Co-Chairs

Elena Toson
T4i — ITALY

Nicoletta Wagner
European Space Agency (ESA) — FRANCE

Rapporteurs

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

Arnau Pons Lorente
Space Generation Advisory Council (SGAC) — UNITED STATES

C4.10 C3.5 Joint Session on Nuclear Power and Propulsion Systems, and Propellantless Propulsion

This session, organized jointly between the Space Power and the Space Propulsion Symposia, addresses all aspects related to nuclear power and propulsion systems for space applications. The session also addresses all types of propellantless propulsion including (but not limited to) solar sails, magnetic sails, laser propulsion, tethers, etc.

Co-Chairs

Leopold Summerer
ESA - European Space Agency — THE NETHERLANDS

Christian Bach
Technical University Dresden — GERMANY

Rapporteurs

Markus Jaeger
The Exploration Company GmbH — GERMANY

Saroj Kumar
University of Alabama in Huntsville — UNITED STATES

C4.IP Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM

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

Coordinators

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

Ozan Kara
Technology Innovation Institute (TII) — UNITED ARAB EMIRATES

Riheng Zheng
Beihang University — CHINA

Category D

INFRASTRUCTURE

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

- D1 IAF SPACE SYSTEMS SYMPOSIUM
- D2 IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM
- D3 22ND IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT
- D4 22ND IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE
- D5 57TH IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES
- D6 IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES

Category coordinated by Roberta Mugellesi-Dow, *European Space Agency (ESA), UNITED KINGDOM*

D1 IAF SPACE SYSTEMS SYMPOSIUM

The Space Systems Symposium, organized by the International Astronautical Federation (IAF), addresses the present and future development of space systems, architectures, and technologies, with sessions on Innovative Systems toward Future Architectures, Technologies that Enable Space Systems, Emergent Space Systems, Cooperative Systems, Systems Engineering Modeling and Analysis, Systems Engineering Approaches, Processes and Methods, and Lessons Learned in Space Systems.

Coordinators

Reinhold Bertrand
European Space Agency (ESA) — GERMANY

Jill Prince
National Aeronautics and Space Administration (NASA) — UNITED STATES

Tibor S. Balint
Jet Propulsion Laboratory — UNITED STATES

D1.1 Innovative Systems toward Future Architectures

This session explores innovative system concepts, technical capabilities that enable future architectures, new applications, new business models and evolution of the global ecosystem. It also analyses how new challenges such as reduction of environmental impact (space debris, CO2 footprint reduction) can induce new space system architectures, applications, eventually proposing solutions to reduce global warming and debris mitigation. As examples: Could Space based Solar Power contribute to reduction of CO2 emission and make an economically and technically feasible option to meet the energy needs? Will in-space transportation and logistics develop in association with reusable launchers? Which new applications could be enabled i.e., Active Debri Removal (ADR), In-orbit Service and Manufacturing (IOSM) or recycling? How would these changes affect the ecosystems? This session objective is to connect innovators and researchers in building a vision of transformation of space systems architecture. In this perspective, the dreams of yesterday are the hope of today and the reality of tomorrow.

Co-Chairs

Xavier Roser
Thales Alenia Space France — FRANCE

Peter Dieleman
National Aerospace Laboratory (NLR) — THE NETHERLANDS

Rapporteur

Mamatha Maheshwarappa
UK Space Agency — UNITED KINGDOM

D1.2 Technologies that Enable Space Systems

This session focuses on innovative and technological developments that are often high risk, but which have the potential to significantly enhance the performance of existing and new space systems. Leading-edge technologies that enable space applications come in many diverse forms, from system level innovations down to the subsystem or component level. Examples include instrumentation, sensors, biotechnology, components, micro- and nano-technology, advanced new structures and software techniques. Additionally, architectural solutions incorporating technologies such as artificial intelligence, machine learning, virtual/augmented reality, autonomy and automation are also of interest. The scope of the session includes architectures for single satellite systems or multiple satellite systems, such as constellations, formations, swarms, distributed systems, and system-of-systems (including hybridization with terrestrial systems). Ground-versus-space allocation of functionality and aspects of autonomy, both on-board and on-ground, may be addressed.

Co-Chairs

Matteo Emanuelli
Airbus Defence and Space — GERMANY

Steven Arnold
The Johns Hopkins University Applied Physics Laboratory — UNITED STATES

Rapporteur

Audrey Berquand
European Space Agency (ESA) — THE NETHERLANDS

D1.3 Emergent Space Systems

This session focuses on the novel aspects of currently emerging systems, with a special emphasis put on new system design paradigms related to Human-Centered Design (HCD). In this context, we seek ideas on how and where HCD, Human System Integration (HSI), User Experience/User Interface (UX/UI) design, Augmented and Virtual Reality (AR/VR) systems, as well as designerly processes may broaden technical fields and provide demonstrable benefit throughout the full lifecycle, from formulation through implementation to operations. Our session addresses today's challenges by leveraging novel approaches for current and emerging space systems, but also for system of systems, where the space element represents key contributions to overall system topology.

Co-Chairs

Tibor Balint
Jet Propulsion Laboratory — UNITED STATES

Reinhold Bertrand
European Space Agency (ESA) — GERMANY

Publication officer

Hui Du
Institute of Spacecraft System Engineering,China Academy of Space Technology (CAST) — China

Rapporteur

Igor V. Belokonov
Samara National Research University (Samara University) — RUSSIAN FEDERATION

D1.4. Cooperative Systems

Emphasis of this session is on innovative cooperative and self-organizing approaches to address increasing complexities in space systems coordinating several actors. Examples concern the following fields: formations in multi-satellite systems, in-space servicing, robotics in planetary explorations or in satellite production. Contributions related to algorithms, software simulations, testbeds and in-orbit experiences for cooperative systems are highly encouraged.

Co-Chairs

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

Klaus Schilling
University Wuerzburg — GERMANY

Rapporteurs

Eberhard Gill
Delft University of Technology — THE NETHERLANDS

Avid Roman-Gonzalez
Business on Engineering and Technology S.A.C. (BE Tech) — PERU

D1.5 Systems Engineering Modeling and Analysis

This session focuses on digital applications for improved systems engineering modeling and analysis across the product life-cycle. The session will gather a community of those on "the front lines" of implementing system modeling. Papers are sought in three topical areas: 1. Tactical results, use cases or examples, which validate mission, systems or sub-system application and subsequent return on investment for traditional versus future SE approaches. 2. Strategic results, organizational progress toward a fully integrated enterprise digital solution, including how SE modeling fits into that solution space. 3. Innovative approaches, more forward looking or lower TRL tooling advances which offer large improvement opportunities and their potential application (AI/ML for example). Lessons learned on challenges and opportunities within the three topic areas are of special interest and highly desired.

Co-Chairs

Jon Holladay
National Aeronautics and Space Administration (NASA) — UNITED STATES

Thierry Floriant
CNES — FRANCE

Rapporteur

Sapna Rao
Lockheed Martin (Space Systems Company) — UNITED STATES

D1.6 Systems Engineering Approaches, Processes and Methods

This session focuses on state-of-the-art systems engineering methodologies to deliver space systems of high quality that meet stakeholder needs at a manageable risk, reducing the development time and life cycle cost. Of special interest are papers on multi-disciplinary approaches, processes, methods, tools, and training used for improving development and life cycle productivity and risk management, and increasing safety, availability, reliability, resilience, dependability, testability, ease of operation, serviceability and quality of life cycle cost estimates. Papers are sought in four topical areas: 1) space systems architecting, which includes campaign analysis and design, mission analysis and design, and systems of systems (SoS); 2) trade off studies, optimization, and simulation tools and decision analysis; 3) AIV&V (assembly, integration, verification and validation); and 4) space systems management, which includes stakeholder management, technical planning, control and assessment of space system design, earned value management, technical risk management, requirements management, configuration management, and information management.

Co-Chairs

Geilson Loureiro
National Institute for Space Research - INPE — BRAZIL

Timothy Cichan
Lockheed Martin Corporation — UNITED STATES

Rapporteur

Norbert Frischauf
SpaceTec Partners SPRL — BELGIUM

D1.7 Lessons Learned in Space Systems

Lessons learned are essential to significantly improve space projects implementation practices and, in turn, increase their success-rate. Collecting and sharing information regarding analysis of past and recent successes/failures is deemed the key element to support that and, in addition, it is also highly valuable since it can foster setting up of a collaborative paradigm where people from different Systems Engineering & Management cultures, in different projects, and at different maturity stages, share knowledge among teams, organizations and people, to contribute to the above common practice. For the above practice to be effective, this retrospective viewpoint shall come from a variety of sources. In this regard, the scope of the D1.7 session covers the full spectrum of a space project life-cycle activities such as: project management and systems engineering; systems and missions design; systems MAIVT (manufacturing, assembly, integration, verification, and testing); mission execution, systems exploitation, and post-mission evaluation. Additional added-value can also come from discussion and examination on side-aspects (yet important) as: diversity of standards/practices including lessons learned yielded from their adoption interpretation and application; as well as project-data management approaches (design results, engineering models, documentation, mission results, etc.) to preserve and make them available to future missions.

Co-Chairs

Giuseppe Guidotti
Deimos Space SLU — SPAIN

Yoshihisa Arikawa
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteurs

Dapeng Wang
China HEAD Aerospace Technology Co. — CHINA

Hamed Gamal
Mynaric — GERMANY

D1.IP Interactive Presentations - IAF SPACE SYSTEMS SYMPOSIUM

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 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 ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. An award will also be presented to the author of the best Interactive Presentation in the D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

Reinhold Bertrand
European Space Agency (ESA) — GERMANY

Jill Prince
National Aeronautics and Space Administration (NASA) — UNITED STATES

D2 IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM

Topics of this symposium, orgit be possible some social media advertismenet conncetanized by the International Astronautical Federation (IAF), address worldwide space transportation solutions and innovations as well as relevant technologies needed and ground support infrastructure. The symposium addresses existing vehicles, vehicles in development and future space transportation solutions.

Coordinators

Yuguang Yang
China Aerospace Science & Industry Corporation (CASIC) — CHINA

Markus Jaeger
The Exploration Company GmbH — GERMANY

Rapporteurs

Randolph Kendall
The Aerospace Corporation — UNITED STATES

John M. Horack
The Ohio State University College of Engineering — UNITED STATES

D2.1 Launch Vehicles in Service or in Development

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

Co-Chairs

Aaron Weaver
National Aeronautics and Space Administration (NASA) — UNITED STATES

Yorichika Mihara
Mitsubishi Heavy Industries, Ltd. — JAPAN

Rapporteur

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

D2.2 Launch Services, Missions, Operations and Facilities

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

Co-Chairs

Vincent Taponier
Centre National d'Etudes Spatiales (CNES) — FRANCE

Xiaowei Wang
China Academy of Launch Vehicle Technology (CALT) — CHINA

Rapporteur

Jeremy Pinier
National Aeronautics and Space Administration (NASA), Langley Research Center — UNITED STATES

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

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

Co-Chairs

Oliver Kunz
Beyond Gravity — SWITZERLAND

Bryan Smith
NASA Glenn Research Center — UNITED STATES

Rapporteur

Nicole Viola
Politecnico di Torino — ITALY

D2.4 Future Space Transportation Systems

Discussion of future overall transportation system designs and operational concepts for both expendable and reusable systems for Earth-to orbit transportation and exploration missions considering also emerging space ventures and deep space transportation.

Co-Chairs

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

Nicolas Bérend
ONERA - The French Aerospace Lab — FRANCE

Rapporteur

Emmanuelle David
Ecole Polytechnique Fédérale de Lausanne (EPFL) — SWITZERLAND

D2.5 Technologies for Future Space Transportation Systems

Discussion of technologies enabling new reusable or expendable launch vehicles and in-space transportation systems. Emphasis is on early TRL hardware development and verification prior to flight, including ground testing and/or innovative technology prototype demonstrations not yet involving flight.

Co-Chairs

Lin Shen
China Academy of Launch Vehicle Technology (CALT) — CHINA

Rapporteur

Shana Diez
SpaceX — UNITED STATES

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

Discussion of atmospheric and in-space flight testing and qualification of system, sub-system, and advanced technologies for future launch vehicles and in-space transportation systems. Emphasis is on higher TRL in-flight experimentation, demonstration, and qualification, including test plans and innovative technology prototype demonstrations involving or leading to flight as well as new and unique test platforms and capabilities.

Co-Chairs

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

Christie Maddock
University of Strathclyde — UNITED KINGDOM

Rapporteur

Tetsuo Hiraiwa
Japan Aerospace Exploration Agency (JAXA) — JAPAN

D2.7 Suborbital Rockets and Small Launchers: Concepts and Operations including Student Rocketry

Discussion of existing, planned and future Launchers for small payloads ranging from 1500 kg to as low as 1 kg into Low Earth Orbit. Includes innovative solutions such as airborne systems, evolutions from sub-orbital concepts, combinations of existing / emerging elements and new elements, reusable, partially reusable and expendable concepts, and flexible, highly responsive concepts... considering also student rocketry technical achievements for the development of their sounding rockets : development of subsystems, safety issue, uses of novel technologies.

Co-Chairs

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

Ulf Palmnäs
Swedish Space Corporation (SSC) — SWEDEN

Rapporteur

Florian Ruhhammer
MT Aerospace AG — GERMANY

D2.8 In-Space Transportation Solutions and Space Logistics: Space Rider, the first European reusable Space Transportation System

This session is focused on in-space transportation capabilities and mission architectures, existing or under study. Related enabling and support missions, such as robotic servicing and supply, as well as technology roadmaps shall be discussed. The session will also to implement large scale exploration missions.

Co-Chairs

Kenneth Bruce Morris
Sierra Space — UNITED STATES

Josef Wiedemann
MT Aerospace AG — GERMANY

Rapporteur

Gennaro Russo
Campania Aerospace District, DAC — ITALY

D2.9 D6.2 Sustainable Approaches and Impact of Space Transportation Solutions on Earth + Space Environment and on General Safety

This session is dedicated to the study of the impact of space transportation solutions on the earth and space environment and on the relevant safety aspects. This session can address methodologies for life cycle analysis, environmental impact mitigation and assessment, sustainability, and eco-design for space transportation. It will also address new and emerging technologies for space transportation systems to mitigate the impact on the earth and space environments, yet guaranteeing Space and Ground Safety.

Co-Chairs

Aline Decadi
European Space Agency (ESA) — FRANCE

Charles E. Cockrell Jr.
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Francesco Santoro
Altec S.p.A. — ITALY

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

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Transportation Solutions and Innovations addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint 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 D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

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

Jens Lassmann
ArianeGroup — GERMANY

Rapporteur

Markus Jaeger
The Exploration Company GmbH — GERMANY

D3 22ND IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT

This symposium, organised by the International Academy of Astronautics (IAA), will involve papers and discussion that traverse a wide range of highly valuable future space capabilities (FSC) – in other words "building blocks" for future space exploration, development and discovery – that could enable dramatic advances in global space goals and objectives. The international discussion of future directions for space exploration and utilisation is fully underway, including activities involving all major space-faring nations. Decisions are now being made that will set the course for space activities for many years to come. New approaches are needed that establish strategies, architectures, concepts and technologies that will lead to sustainable human and robotic space exploration and utilisation during the coming decades. The symposium will examine the possible paths, beginning with current capabilities such as the International Space Station, which may lead to ambitious future opportunities for space exploration, discovery and benefits. The sessions that comprise this symposium are key elements of current or planned International Academy of Astronautics (IAA) studies.

Coordinators

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

Alain Pradier
European Space Agency (ESA) — THE NETHERLANDS

D3.1 Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development

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

Co-Chairs

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

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

Rapporteur

Anouck Girard
University of Michigan — UNITED STATES

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

The emergence of novel systems and infrastructures will be needed to enable ambitious scenarios for sustainable future space exploration and utilization. New, reusable space infrastructures must emerge in various areas include the following: (1) infrastructures that enable affordable and reliable access to space for both exploration systems and logistics; (2) infrastructures for affordable and reliable transportation in space, including access to/from lunar and planetary surfaces for crews, robotic and supporting systems and logistics; (3) infrastructures that allow sustained, affordable and highly effective operations on the Moon, Mars and other destinations; and, (4) supporting in space infrastructures that provide key services (such as communications, navigation, etc.). Considering its focus on design and operation solutions for future crewed missions, in 2024 this session will be jointly curated with the recently-formed IAF Space Habitats Committee, whose aims include fostering research and partnerships in the design, the construction, the scalability, the commercialization, the disassembling and the sustainability of space habitats and associated infrastructures, emphasizing Moon and Mars surface structures and orbital stations. Papers are solicited in all areas related to the scope of this session, from a variety of disciplinary approaches.

Co-Chairs

Paivi Jukola
Aalto University — FINLAND

Gary Barnhard
XISP-Inc — UNITED STATES

Julie Patarin-Jossec
Spartan Space — FRANCE

Rapporteurs

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

Junjiro Onoda
ISAS/JAXA — JAPAN

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

The emergence of new technologies will be essential to realizing the various systems and infrastructures that will be needed to enable ambitious scenarios for sustainable future space exploration, utilization and eventual settlement. Technologies for new, reusable space infrastructures are needed, including the following: (1) infrastructures that enable affordable and reliable access to space for both exploration systems and logistics; (2) infrastructures for affordable and reliable transportation in space, including access to/from lunar and planetary surfaces for crews, robotic and supporting systems and logistics; (3) infrastructures that allow sustained, affordable and highly effective robotic and human operations on the Moon, Mars and other destinations; and, (4) supporting in space infrastructures that provide key services (such as communications, navigation, etc.). Papers are solicited in these and related areas.

Co-Chairs

Alain Pradier
European Space Agency (ESA) — THE NETHERLANDS

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

Rapporteur

Gary Barnhard
XISP-Inc — UNITED STATES

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 is the next in an ongoing series at the International Astronautical Congress that provides a unique international forum to further the development of a family of 'best practices and tools' in this important field. Specific areas of potential interest include: (1) Technology Management Methodologies and Best Practices; (2) R&D Management Software Tools and Databases; and (3) Systems Analysis Methods and Tools. The full range of R&D activities is appropriate for discussion, ranging from technology development long-term planning, through technology R&D programmes, to system development projects, with special emphasis on the transition of new technologies from one stage to the next. Particular topics could include: Technology Readiness Levels (TRLs) and Technology Readiness Assessments, Technology R&D Risk Assessments and Management, Advanced Concepts Modeling Approaches and Tools, etc. Either more theoretical discussions, or examples of applications of R&D management techniques and/or tools to specific R&D programmes and projects are of interest for the session.

Co-Chairs

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

Paivi Jukola
Aalto University — FINLAND

Rapporteur

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

D3.IP Interactive Presentations Interactive Presentations - 22ND IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT

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

Co-Chairs

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

Alain Pradier
European Space Agency (ESA) — THE NETHERLANDS

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

D4 22ND IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE

This 22nd symposium is organized by the International Academy of Astronautics (IAA). In Space Activities the focus is usually kept on the short term developments, at the expense of future goals. The Symposium will discuss topics with at least 20 to 30 years prospective lead time and identify technologies and strategies that need to be developed. These developments will be examined with the goal to support also short/medium term projects and to identify priorities required for their development. The Sessions in the Symposium will address innovative technologies and Strategies to develop Space Elevator as well as Interstellar Precursor Missions. A session will address also how the Moon Village can contribute to the resolution of World Societal Changes as well as increasing the countries engaged in lunar activities.

Coordinators

Giuseppe Reibaldi
Moon Village Association (MVA) — AUSTRIA

Yu Lu
China Academy of Launch Vehicle Technology, China — CHINA

D4.1 Innovative Concepts and Technologies

1) In order to realize future, programs of space exploration and resource utilization, a focused suite of transformational new system concepts and enabling technologies must be developed during the coming decades. The technical objectives to be pursued should be drawn from a broad, forward-looking view of the technologies and system needed, but must be sufficiently focused, to allow tangible progression and dramatic improvements over current capabilities. 2) Ideally, the concepts should be presented in three categories: 1. Concepts which represent a significant advance, but require laboratory advancement, and 2. Concepts which have been demonstrated to some level in the laboratory, but require demonstration to validate their utility, and 3. Concepts which identify cross-cutting advances which, when combined can be successfully developed to support transformational new system concept. Papers are solicited in these and related areas.

Co-Chairs

Ayman Ahmed
Egyptian Space Agency (EgSA) — EGYPT

Timothy Cichan
Lockheed Martin Corporation — UNITED STATES

Rapporteur

Xiaowei Wang
China Academy of Launch Vehicle Technology (CALT) — CHINA

D4.2 Contribution of Moon Village to Solving Global Societal Issues

Moon Village is a concept that brings together efforts, world-wide, from the private sector, governments, academics and others to explore and use the Moon in a sustainable manner. Moon Village is a community of projects carried out by stakeholders from different fields (for example, technical, scientific, cultural, economic) working together. The implementation of the Moon Village has already started with missions and activities in line with its spirit, It is a major step forward for the peaceful development of humankind. Moon Village can offer a new start to humanity on the Moon and on the Earth by contributing to solve global societal issues. The session will discuss the contributions of the Moon Village to the solution of global challenges (e.g., energy, population, sustainable development, many others). How the Moon Village will support the understanding of the global societal issues and bring benefits to society on a global scale will also be discussed. The session will include also the identification of the related technologies that need to be developed. The definition of a roadmap complementary to the UN Agenda 2030 will be also discussed.

Co-Chairs

Giuseppe Reibaldi
Moon Village Association (MVA) — AUSTRIA

Yu Lu
China Academy of Launch Vehicle Technology, China — CHINA

Rapporteur

Paivi Jukola
Aalto University — FINLAND

D4.3 Modern Day Space Elevator Transformational Strengths and their Applications

Modern Day Space Elevator design concepts are driven from many arenas. The customer is of course the first driver of design for the future; however, the transformational strengths determine the mission fulfillment. Once the 100,000 km tether is in place and the tether climbers start raising customer payloads, the remarkable characteristics will start to dominate the movement of mass for customers. This symposia will address how the following characteristics impact mission success for the customers: (a) Unmatched efficiencies with daily, routine, safe, and inexpensive delivery of logistics payloads, (b) Unmatched massive movement (initial operational capability (IOC) at 30,000 tonnes/yr with full operational capability (FOC) 170,000 tonnes/yr), (c) Unmatched velocity (starting at 7.76 km/sec at 100,000 altitude enables rapid transits to the Moon, Mars and beyond), (d), Ensures environmentally neutral operations as a green road to space, (e) Reduces rocket fairing design limitations, (f) Assembly at the top of the gravity well, and (g) Transforming the economic strengths of strategic investment, ubiquitous access, and uninterrupted exchange of resources. The Keynote Speech for this technical session will be entitled the "Jerome Pearson Memorial Lecture."

Co-Chairs

Peter Swan
Teaching Science and Technology, Inc (TSTI) — UNITED STATES

Yoji Ishikawa
Obayashi Corporation — JAPAN

Rapporteur

Jerry Eddy
International Space Elevator Consortium (ISEC) — UNITED STATES

D4.4 Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond

Knowledge about space beyond our solar system and between the stars—that is interstellar space —is lacking data. Even as IBEX, NASA's Interstellar Background Explorer, studies the edge of our solar system, it still is confined to earth orbit. Arguably, some of the most compelling data to understand the universe we live in will come from sampling the actual environment beyond our solar system as Voyager 1 and Voyager 2 spacecraft are on the threshold of doing. In the 36 years since the Voyager probes' launches, significant advances in materials science, analytical chemistry, information technologies, imaging capabilities, communications and propulsion systems have been made. The recently released IAA study: "Key Technologies to Enable Near-Term Interstellar Scientific Precursor Missions" along with significant initiatives like the DARPA seed-funded 100 Year Starship and the Breakthrough Starshot project, signal the need, readiness and benefits to aggressively undertaking interstellar space missions. This session seeks to define specific strategies and key enabling steps to implement interstellar precursor missions within the next 10-15 years. Suggestions for defined projects, payloads, teams, spacecraft and mission profiles that leverage existing technological capacities, yet will yield probes that generate new information about deep space, rapidly exit the solar system and which can be launched before 2040 are sought.

Co-Chairs

Mae Jemison
100 Year Starship — UNITED STATES

Giancarlo Genta
Politecnico di Torino — ITALY

Rapporteur

Les Johnson
National Aeronautics and Space Administration (NASA), Marshall Space Flight Center — UNITED STATES

D4.5 Space Resources, the Enabler of the Earth-Moon Econosphere

1) With NASA announcing the Artemis Program to return to the Moon by 2024, and increasing numbers of companies investing in extraterrestrial resource utilization, this session is dominated by technology assessments and legal analyses associated with space resources. 2) In particular, the National Aeronautics and Space Administration is seeking commercially developed payloads to exploit lunar resources for supplies, fuel and other consumables. There are many opportunities to participate. 3) One issue which nags U.S. investors is the lack of a legal regime for authorization and continuing oversight of commercial entities seeking to exploit space resources for profit. Fortunately, Luxembourg has defined such a legal regime for its country's payloads. 4) This session seeks innovative ideas and concepts in the legal and technological regime. This session also seeks willing investors to present concepts for financing concepts to exploit space resources.

Co-Chairs

Roger X. Lenard
LPS — UNITED STATES

Mark Sundhal
Cleveland State University — UNITED STATES

Rapporteur

Peter Swan
Teaching Science and Technology, Inc (TSTI) — UNITED STATES

D4.IP Interactive Presentations - 22ND IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE

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

Co-Chairs

Helen Tung
NewSpace2060 — AUSTRALIA

Gongling Sun
International Space University — FRANCE

D5 57TH IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES

Increasingly complex challenges around quality, safety, and security reflect how a space system can be developed and operated to perform its functions at its best with the proper robustness. In that environment, where radiation is not the least stress and possible ill-intentioned actions may occur, decreasing the level of failures in space activities is a must. Knowledge management (the proper capturing, protecting, and sharing of knowledge) and application of lessons learned and experience are key factors. This International Academy of Astronautics Symposium will be a lively discussion and raise awareness of new and innovative approaches to: obtain and run reliable and safe space systems: design solutions, validation, and tests; software development, validation, and security; and methods, management approaches, and regulations to improve the quality, efficiency, and collaborative ability of space programs and operations. All aspects are considered: risk management, complexity and security of systems and operations, knowledge and information management, human factors, economical constraints, international cooperation, norms, and standards.

Coordinators

Jeanne Holm
City of Los Angeles — UNITED STATES

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

D5.1 For a Successful Space Program: Quality and Safety!

Space is a difficult challenge, and no complex program can be successful without a creative and thoughtful approach to quality and safety! Relying on luck cannot be the only way to proceed! Beginners or veterans, for training, for science or for industry, for small or large programs, share your projects, methods, observations, analyses of successes or failures... This session deals with methods, tests, standards for the analysis and mitigation of the many risks to maintain the desired quality and required safety. It offers an opportunity to discuss all aspects of the life cycle (including design, development and production philosophy, operations) and the associated risk management approach. It concerns all types of space missions: transportation systems, orbital systems, exploration vehicles, and is also a management, manpower and education issue.

Co-Chairs

Alexander S. Filatyev
Lomonosov Moscow State University — RUSSIAN FEDERATION

Rapporteur

Kaitlyn Holm
University of Pennsylvania — UNITED STATES

D5.2 Emerging Trends of Knowledge Management in Organizations

Digital transformation and innovations, such as cloud computing, new collaboration tools, intelligent search technologies, AI, are changing how people access and share the knowledge. Therefore, knowledge management needs to evolve adapting to the new environment and users needs. Technology is undoubtedly a big part of the growing need for a more effective knowledge management. Although technology plays crucial roles, KM will fail if end users and stakeholders are not in the centre of the strategy, design, implementation, and operations. Key themes addressed during the session are trends, innovations, concerns as well as practical challenges encountered, and solutions and technologies adopted in the field of Knowledge Management in Organisations to sustain, energise and invigorate the ability to learn, innovate, and share knowledge. The session aims to include case studies that demonstrate how KM strategies have been applied and the lessons learned, the challenges faced by the organizations, and innovative solutions that facilitates knowledge sharing and collaboration as well as search mechanisms.

Co-Chairs

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

Jeanne Holm
City of Los Angeles — UNITED STATES

Rapporteur

Daniel Galaretta
Centre National d'Etudes Spatiales (CNES) — FRANCE

D5.3 Prediction, Testing, Measurement and Effects of Space Environment on Space Missions

The space environment can strongly impact the performance and reliability of space missions. It has several natural and induced components, including high-energy radiation, plasma, atomic oxygen, planetary dust, extreme temperature, vacuum, micro-gravity, micrometeoroid and debris, molecular and particulate contamination, etc. Environmental conditions yield constraints at design phase, and consideration of significant risks in the course of the mission. The evaluation of the nominal and worst-case conditions to be met, mitigation and protection options, and of their impact on missions and flight systems are thus of prime importance. This session will encompass the following topics: Space Weather, Plasma, Spacecraft Charging, Radiation, Atomic Oxygen, Planetary Dust, Molecular and Particulate Contamination, Plume Induced Contamination Effects and Interactions, and Combined Environments. The key themes addressed during this session are flight measurements, physical processes, prediction of nominal and worst-case conditions, ground-based testing, flight experiments and lessons learned.

Co-Chairs

Henry de Plinval
Office National d'Etudes et de Recherches Aérospatiales (ONERA) — FRANCE

Teppel Okumura
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

Carlos Soares
NASA Jet Propulsion Laboratory — UNITED STATES

D5.4 Cybersecurity in Space Systems, Risks and Countermeasures

In the past few years our society and economy have become largely dependent on information technology, computer networks, and IoT solutions. Managing cyber-related risks and protecting against cyberattacks is therefore a growing concern requiring the identification and deployment of relevant cybersecurity measures and solutions. This session covers several topics focused on cyber-security: tools & methods aiming at preventing & forecasting attacks, risk assessment and cyber intelligence, protecting systems, infrastructures and data, space-enabled solutions, making secure the use of satellite communications, earth observation and satellite navigation, addressing all the means to mitigate risks and raising awareness via specific training, information sharing and analysis, addressing new areas candidates for standardisation. New technologies and practices emerging in cyberse-curity are also relevant such as the development of quantum cryptography and quantum key distribution, combining big data analytics, artificial intelligence and machine learning to analyse communications patterns and operations data. New trends include the development of cyber security test ranges and certification schemes specific to each domain of activities, to better identify threats and vulnerabilities and develop customised solutions.

Co-Chairs

Julien Airaud
Centre National d'Etudes Spatiales (CNES) — FRANCE

Stefano Zatti
University of Rome "La Sapienza" — ITALY

Rapporteur

Nil Angli
European Space Agency (ESA) — UNITED KINGDOM

D5.IP Interactive Presentations - 57TH IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of safety, quality, cybersecurity, and knowledge management in space activities. 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 ten-minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as powerPoint charts, embedded links, pictures, audio and video clips. 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.

Co-Chairs

Jeanne Holm
City of Los Angeles — UNITED STATES

Roberta Mugellesi-Dow
European Space Agency (ESA) — UNITED KINGDOM

D6 IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES

Topics of this symposium, organized by the International Astronautical Federation (IAF), address commercial safety and regulatory policy issues for orbital and suborbital space transportation and spaceports. The goal is to identify issues common to commercial operators of both human and robotic space vehicles to increase international safety and interoperability.

Coordinator

Francesco Santoro
Altec S.p.A. — ITALY

D6.1 Commercial Space Flight Safety and Emerging Issues

Topics for this session cover commercial space transportation and safety issues including human and robotic vehicles, spaceports, reentry vehicles, in-space transportation vehicles, and regulations. Papers related to commercial space transportation are also encouraged on: policy and law; operations and training; best practices and standards; pilot, crew and participant safety; and ground operations and launch site safety.

Co-Chairs

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

Francesco Santoro
Altec S.p.A. — ITALY

Rapporteur

Gennaro Russo
Campania Aerospace District, DAC — ITALY

D6.2 D2.9 Sustainable Approaches and Impact of Space Transportation Solutions on Earth + Space Environment and on General Safety

This session is dedicated to the study of the impact of space transportation solutions on the earth and space environment and on the relevant safety aspects. This session can address methodologies for life cycle analysis, environmental impact mitigation and assessment, sustainability, and eco-design for space transportation. It will also address new and emerging technologies for space transportation systems to mitigate the impact on the earth and space environments, yet guaranteeing Space and Ground Safety.

Co-Chairs

Aline Decadi
European Space Agency (ESA) — FRANCE

Charles E. Cockrell Jr.
National Aeronautics and Space Administration (NASA) — UNITED STATES

Rapporteur

Francesco Santoro
Altec S.p.A. — ITALY

D6.3 Enabling Safe Commercial Spaceflight: Vehicles and Spaceports

This session addresses new and existing spaceports and factors that launch vehicle and spaceplane operators may use in evaluating the selection of a launch and/or landing location. Topics include: safety, air and spaceport facilities, runways, geography, air and space traffic, weather, population density, access to workforce and technical support, customer needs, regulations, and other areas. Papers are welcome from spaceports, airports, space transportation providers, support equipment providers, academia, commercial companies and governments.

Co-Chairs

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

Francesco Santoro
Altec S.p.A. — ITALY

Rapporteur

Gennaro Russo
Campania Aerospace District, DAC— ITALY

D6.IP Interactive Presentations - IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES

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

Category E

SPACE AND SOCIETY

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

E1 IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM
E2 51ST STUDENT CONFERENCE
E3 36TH IAA SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS
E4 57TH IAA HISTORY OF ASTRONAUTICS SYMPOSIUM
E5 34TH IAA SYMPOSIUM ON SPACE AND SOCIETY
E6 IAF BUSINESS INNOVATION SYMPOSIUM
E7 IISL COLLOQUIUM ON THE LAW OF OUTER SPACE
E8 IAA MULTILINGUAL ASTRONAUTICAL TERMINOLOGY SYMPOSIUM
E9 IAF SYMPOSIUM ON SECURITY, STABILITY AND SUSTAINABILITY OF SPACE ACTIVITIES
E10 IAF SYMPOSIUM ON PLANETARY DEFENSE AND NEAR-EARTH OBJECTS
E11 IAF SYMPOSIUM ON EMERGING SPACE ECOSYSTEMS

Category coordinated by Lyn Wigbels, *American Astronautical Society (AAS) – UNITED STATES*

E1 IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM

This symposium, organized by the International Astronautical Federation (IAF) Space Education and Outreach Committee (SEOC), explores best practices and innovative approaches to space education and outreach at all levels. Through its sessions, the symposium showcases activities, methods and techniques for education, outreach to the general public, and workforce development. • The symposium keynotes, including the one by the winner of the IAF Frank J. Malina Astronautics Medal, highlight some of the best education and outreach programs from around the world. • When submitting abstracts for this symposium, please note that: • Abstracts should present a coherent story or idea, and follow a logical sequence. • The work should be the original work of the authors. • It should share information that is innovative and new or put a new spin on an old subject. The novelty can be in idea, methodology and approach, or in results and recommendations. • Papers should have clear education or outreach content. They should also be in the scope of the session they are submitted to. • Authors are encouraged to clearly identify target groups, benefits, lessons-learned, recommendations and include measures of critical assessment. • Abstracts providing technical details of projects, even if carried out in an educational context, will not usually be accepted. Preference is given to papers which present the pedagogical theories behind the work presented. • Papers reporting on programmes/activities that have already taken place and evaluated will be given preference over papers dealing with concepts and plans for the future. • Papers covering topics/activities which have been reported at a prior IAC must state this explicitly and detail both the additional information to be presented and the added value that this represents.

Coordinators

Jessica Culler
NASA Ames Research Center — UNITED STATES

Seyed Ali Nasseri
Space Generation Advisory Council (SGAC) — CANADA

E1.1 Lift Off: Primary and Secondary Education

This session will explore innovative programmes and curricula focusing on space education and outreach to students up to the age of 18. Emphasis will be placed on programmes that effectively engage primary and secondary school students in Science, Technology, Engineering, Arts and Mathematics (STEAM), help them develop key skills, and foster a long-term passion for space. This session will also consider programmes and activities that focus on the professional development of primary and secondary school teachers, or on educational methodologies of relevance to primary and secondary education. When submitting abstracts for SEOC sessions, please: • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

Kaori Sasaki
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Seyed Ali Nasseri
Space Generation Advisory Council (SGAC) — CANADA

Rapporteurs

Kerrie Dougherty
— Australia

Jacqueline Carpenter
Space Industry Association of Australia — AUSTRALIA

E1.2 Space for All: Decolonial Practices in Space

This session will focus on the examination, identification and impact of oppressive narratives and behaviors rooted in colonial practices in the space sector while taking into account the systemic character and historical repetition of such narratives in present day disparities. This session will showcase and provide examples of solutions via education, culture and outreach activities as well as Belonging, Accessibility, Diversity, Equity, Justice and Inclusivity (BADEJI, EDI, DEIA) protocols in the workplace, organisations and space agendas. Learnings and recommendations from the perspectives of professionals, scholars, experts, educators, artists and cultural institutions including museums, space agencies and non-profit organisations will be included. From code of ethics to pluralistic commitments towards achieving equity and accessibility, all relevant methodologies and formats are welcomed. This session is a showcase of demonstrated practices and/or experiential learning, and work presented should already have been implemented before the presentation. When submitting abstracts for this session, please: • Clearly identify both the historical context and decolonial praxis, and its connection to space activities.• Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

Seyed Ali Nasseri
Space Generation Advisory Council (SGAC) — CANADA

Alina Vizireanu
Space Generation Advisory Council (SGAC) — UNITED KINGDOM

E1.3 On Track: Undergraduate Space Education

This session will explore innovative space education and outreach programmes for undergraduate students. This can include the development and delivery of innovative courses, project-based work, and work placements. Emphasis should be placed on how the programme is structured for maximum impact, how the impact is measured and how the lessons learned are being applied to other courses. This session will also consider programmes and activities that focus on the professional development of undergraduate educators, or on educational methodologies of relevance to undergraduate education. When submitting abstracts for SEOC sessions, please: • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

Kathryn Robison Hasani
Flinders University — AUSTRALIA

Andoh Michael Afful
RMIT University, Australia — AUSTRALIA

Rapporteurs

Seyed Ali Nasseri
Space Generation Advisory Council (SGAC) — CANADA

Gillian Chin
Singapore Space and Technology LTD (SSTL) —

E1.4 In Orbit: Postgraduate Space Education

This session will explore innovative space education and outreach programmes for postgraduate students. This can include the development and delivery of innovative courses, project-based work, and work placements. Emphasis should be placed on how the programme is structured for maximum impact, how the impact is measured and how the lessons learned are being applied to other courses. This session will also consider programmes and activities that focus on the professional development of postgraduate educators, or on educational methodologies of relevance to postgraduate education. When submitting abstracts for SEOC sessions, please: • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

David Spencer
The Aerospace Corporation — UNITED STATESY

Sandra Haeuplik-Meusburger
TU Wien — AUSTRIA

Rapporteurs

Scott Madry
International Space University (ISU) — UNITED STATES

Andoh Michael Afful
RMIT University, Australia — AUSTRALIA

E1.5 Enabling the Future: Developing the Space Workforce

This session will focus on the challenges, opportunities and innovative approaches to developing the current and future global space workforce. The work presented in this session may include but is not limited to formal professional development and accreditation programmes and professional development activities by companies, nonprofits and other actors. When submitting abstracts for SEOC sessions, please: • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

Kathleen Coderre
Lockheed Martin (Space Systems Company) — UNITED STATES

Olga Zhdanovich
Modis — THE NETHERLANDS

Rapporteurs

Gillian Chin
Singapore Space and Technology LTD (SSTL) —

Andoh Michael Afful
RMIT University, Australia — AUSTRALIA

E1.6 Calling Planet Earth - Space Outreach to the General Public

This session will highlight activities, programmes and strategies for communicating with and engaging the general public in space activities. Topics should involve outreach outside the formal education system with demonstrated or projected reach in the many thousands or millions. Presentations in the session focus on measurable outcomes and demonstrate the strategic nature and thinking in the design of the work. Presenters will be expected to show objective assessment of results or thoroughly describe the design of their evaluation plans. When submitting abstracts for SEOC sessions, please: • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

Remco Timmermans
International Space University (ISU) — UNITED KINGDOM

Alina Vizireanu
Space Generation Advisory Council (SGAC) — UNITED KINGDOM

Rapporteurs

Jessica Culler
NASA Ames Research Center — UNITED STATES

Milica Milosev
Econnects — SERBIA

E1.7 Sending out a Signal: Innovative Outreach and Communications Initiatives

This session will highlight non-traditional, inventive, innovative, and new types of outreach activities, programmes and strategies for engaging audiences general public in space activities, outside the formal education system, with demonstrated outcomes. This could involve new outreach strategies, tactics, or storytelling mechanisms, new audiences, or using new technologies. The session will focus on results and evaluation of the activity, if it has been completed, or a thorough description of the expected outcomes of the activity. Presenters will provide information about how participants/audience were drawn to the activity (e.g., how it was promoted or disseminated). When submitting abstracts for SEOC sessions, please: • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work

Co-Chairs

Victoria Mayorova
Bauman Moscow State Technical University — RUSSIAN FEDERATION

Olga Zhdanovich
Modis — THE NETHERLANDS

Rapporteurs

Carol Christian
STScI — UNITED STATES

Kaori Sasaki
JAXA — JAPAN

E1.8 Show Us Space: Demonstration of Hands On Education and Outreach

Presenters in this session will demonstrate effective hands-on activities and experiments to explore, teach and reinforce space-related concepts. Hands-on space education and outreach is a powerful way to introduce and teach space concepts and Science, Technology, Engineering, Arts and Math (STEAM) concepts, especially with diverse learners. During the session, presenters will not only present the ideas behind the activity, but also physically demonstrate it hands-on and engage the session audience at the IAC. Note: A physical in-person demonstration of the activity is mandatory for this session. If you would like to make a presentation only, please submit your abstract to a different session. Submissions that cannot be physically demonstrated on-site (for example CubeSats) will be rejected. When submitting abstracts for SEOC sessions, please: • Clearly identify the hands-on nature of the work presented, how the audience at the IAC will sample this work, and its space connection. • Include any special technical requirements you will need for your demonstration such as "live webcam connection to remote location", "four long tables for audience members to gather around to build a model", or "ability to be near a window to view the sky for the demonstration." • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

Lyn Wigbels
American Astronautical Society (AAS) — UNITED STATES

Valerie Anne Casasanto
NASA Goddard/University of Maryland, Baltimore County (UMBC) — UNITED STATES

Rapporteurs

Carol Carnett
International Space University (ISU) — UNITED STATES

Kevin Stube
The Planetary Society — UNITED STATES

E1.9 Space Culture: New Processes of Public Engagement in Space through Culture and Art

This session will focus on the education and outreach activities of institutions such as museums, space agencies, non-profit organisations and individual contributions, which link space with culture, humanities and critical thinking. This session will specifically look at papers elaborating on new and original processes used in public engagement through culture and art. Presenters will be required to explain how their projects informed critical reflection and what mechanics in public engagement through culture and art were used to allow it. When submitting abstracts for SEOC sessions, please: • Clearly identify the connection to the session's described scope and to space. • Briefly describe what you will present, including results and evaluation of your work, if it has been completed, or a thorough description of the expected outcomes of the work. • Include information about what makes your work unique, original or innovative and worth sharing with the international space community. • State your work's goal, the intended audience, the measurable objectives that were set, and if the work is in planning or has already occurred. • Provide context describing the research and/or analysis you conducted in choosing the purpose of the activity, the intended audience, and the design of the activity. • Include reference to quantitative or qualitative data gathered through evaluations, surveys or other means. • If any theories are developed, please include information about the practical applicability of the information. • Consider that your audience is international and focus on what others working in the field can learn from your work. Include lessons learned, recommendations or other takeaway messages. • Make sure that the abstract provides a coherent idea or narrative for someone unfamiliar with your work.

Co-Chairs

Nelly Ben Hayoun
SETI Institute — UNITED KINGDOM

Athiye Jawad
— INDIA

Rapporteurs

Franck Marchis
SETI Institute — UNITED STATES

Kerrie Dougherty
— AUSTRALIA

E1.IP Interactive Presentations - IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM

This session offers a unique opportunity to share your education and outreach activities through an interactive presentation on any of the subjects of the symposium. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations presented by the authors. Authors will be assigned a ten- minute slot to present the topic and interact with the attendees present. The Interactive Presentation may take advantage of digital capabilities, including Powerpoints, embedded hyperlinks, pictures, audio and video clips. An award will be presented to the author of the best Interactive Presentation in the E Category at a special ceremony. When submitting abstracts for this session, please: Provide context describing the research and/or analysis you conducted when choosing the purpose of the activity, targeting an audience, and designing the activity. Clearly state the goal of the activity, the intended audience, the measurable objectives that were set, and if the activity is in planning or has already occurred. Provide a short but clear description of the activity or the programme. Include information about anything that makes the activity unique, original or innovative. Provide information about how your participants/audience were drawn to the activity (e.g., how it was promoted or disseminated). Set up the analysis you'll provide in your presentation, which should include results and evaluation of the activity, if it has been completed, or a thorough description of the expected outcomes of the activity. You will be expected to assess results against your measurable objectives that indicate if your goal was met. Include your top-level lessons learned, best practices, recommendations for future activities, practical applicability of theoretical work, or other takeaway findings.

Co-Chairs

Scott Madry
International Space University (ISU) — UNITED STATES

Eberhard Gill
Delft University of Technology — THE NETHERLANDS

E2 52ND IAF STUDENT CONFERENCE

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

Coordinators

Franco Bernelli-Zazzera
Politecnico di Milano — ITALY

Marco Schmidt
University Wuerzburg — GERMANY

E2.1 Student Conference – Part 1

Undergraduate and graduate level students (no more than 28 years of age) present technical papers on any project in space sciences, industry or technology. These papers will represent the specific work of the author(s) (no more than two students). The students presenting in this session will compete in the 51st International Student Competition. This session is NOT for team projects. Team project papers should be submitted to session E2.3. To accommodate for the different national education schemes, the distinction between undergraduate and graduate students is based uniquely upon the number of years of university education, as follows: - undergraduate students: students who did their work within the 4th year at university level, for instance a Bachelor thesis. - graduate students: students who did their work from the 5th year at university level, for instance a Master thesis. If appropriate, faculty members that advised students during the preparation of their work can be listed as a co-author (never as a first author) and their status of advisors must be clearly indicated. Principle responsibilities for a submitted student conference paper fall with the student author/s and as such they must be listed first. The content of the paper should mainly reflect the contribution of the student. Faculty co-authors cannot present the paper or answer questions at the student conferences. The selection of the oral presentations is solely based on the submitted abstracts. We strongly recommend that you submit an abstract with an extensive description of your topic, including a detailed explanation of your contribution and the novelty of your work. French, German, US, UK and Canadian students submitting abstracts for the sessions E2.1 and E2.2 will be forwarded to the corresponding national competition coordinators. The following contact persons are available for more information: For the French national competition: Emmanuel Zenou – emmanuel.zenou@isae-supaero.fr For the German national competition: Marco Schmidt – marco.schmidt@uni-wuerzburg.de For the US national competition - Michael Lagana - MichaelL@aiaa.org For the UK national competition: Vix Southgate - iac_comp@bis-space.com For the Canadian national competition: Natasha Isloor – stim-stem@asc-csa.gc.ca Paper accepted for the competition and the presentations will be evaluated along the following criteria: Technical Content, Originality, Practical Application, General Presentation, Knowledge of the Subject.

Co-Chairs

Franco Bernelli-Zazzera
Politecnico di Milano — ITALY

Emmanuel Zenou
Institut Supérieur de l'Aéronautique et de l'Espace (ISAE) — FRANCE

Rapporteur

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

E2.2 Student Conference – Part 2

Undergraduate and graduate level students (no more than 28 years of age) present technical papers on any project in space sciences, industry or technology. These papers will represent the specific work of the author(s) (no more than two students). The students presenting in this session will compete in the 51st International Student Competition. This session is NOT for team projects. Team project papers should be submitted to session E2.3. To accommodate for the different national education schemes, the distinction between undergraduate and graduate students is based uniquely upon the number of years of university education, as follows: - undergraduate students: students who did their work within the 4th year at university level, for instance a Bachelor thesis. - graduate students: students who did their work from the 5th year at university level, for instance a Master thesis. If appropriate, faculty members that advised students during the preparation of their work can be listed as a co-author (never as a first author) and their status of advisors must be clearly indicated. Principle responsibilities for a submitted student conference paper fall with the student author/s and as such they must be listed first. The content of the paper should mainly reflect the contribution of the student. Faculty co-authors cannot present the paper or answer questions at the student conferences. The selection of the oral presentations is solely based on the submitted abstracts. We strongly recommend that you submit an abstract with an extensive description of your topic, including a detailed explanation of your contribution and the novelty of your work. French, German, US, UK and Canadian students submitting abstracts for the sessions E2.1 and E2.2 will be forwarded to the corresponding national competition coordinators. The following contact persons are available for more information: For the French national competition: Emmanuel Zenou – emmanuel.zenou@isae-supaero.fr For the German national competition: Marco Schmidt – marco.schmidt@uni-wuerzburg.de For the US national competition - Michael Lagana - MichaelL@aiaa.org For the UK national competition: Vix Southgate - iac_comp@bis-space.com For the Canadian national competition: Natasha Isloor – stim-stem@asc-csa.gc.ca Paper accepted for the competition and the presentations will be evaluated along the following criteria: Technical Content, Originality, Practical Application, General Presentation, Knowledge of the Subject.

Co-Chairs

Marco Schmidt
University Wuerzburg — GERMANY

Ioana-Roxana Perrier
Institute of Polytechnic Science and Aeronautics (IPSA) — FRANCE

Rapporteur

Emmanuel Zenou
Institut Supérieur de l'Aéronautique et de l'Espace (ISAE) — FRANCE

E2.3 GTS.4 Student Team Competition

Undergraduate and graduate level student teams (students no more than 28 years of age) present papers on any subject related to space sciences, industry or technology. These papers will represent the work of the authors (three or more students). Students presenting in this session will compete for the Hans von Muldau Team Award. If appropriate, faculty members that advised students during the preparation of their work can be listed as a co-author (never as a first author) and their status of advisors must be clearly indicated. Principle responsibilities for a submitted student conference paper fall with the student authors and as such they must be listed first. The content of the paper should mainly reflect the contribution of the students. Faculty co-authors cannot present the paper or answer questions at the student conferences. The selection of the oral presentations is solely based on the submitted abstracts. We strongly recommend that you submit an abstract with an extensive description of your topic, including a detailed explanation of your contribution and the novelty of your work. Furthermore, a short description how your team worked together to achieve the project goal should be included. Paper accepted for the competition and the presentations will be evaluated along the following criteria: Technical Content, Originality, Practical Application, General Presentation, Knowledge of the Subject.

Co-Chairs

Emmanuel Zenou
Institut Supérieur de l'Aéronautique et de l'Espace (ISAE) — FRANCE

Franco Bernelli-Zazzera
Politecnico di Milano — ITALY

Rapporteur

Kathleen Coderre
Lockheed Martin (Space Systems Company) — UNITED STATES

E2.4 Educational Pico and Nano Satellites

Joint session with SUAC. The session covers all aspects related to educational small satellites.

Co-Chairs

Xiaozhou Yu
Dalian University of Technology (DUT) — CHINA

Franco Bernelli-Zazzera
Politecnico di Milano — ITALY

Anna Guerman
Centre for Mechanical and Aerospace Science and Technologies (C-MAST) — PORTUGAL

Igor V. Belokonov
Samara National Research University (Samara University) — RUSSIAN FEDERATION

E3 37TH IAA SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS

This Symposium, organized by the International Academy of Astronautics (IAA), will provide overview of the current trends in space policy, regulations and economics, by covering national as well as multilateral space policies and plans. The symposium also integrates the IAA/IISL Scientific-Legal Roundtable.

Coordinators

Jacques Masson
European Space Agency (ESA) — THE NETHERLANDS

Bernard Schmidt-Tedd
Leuphana University — GERMANY

Pieter Van Beekhuizen
Stichting Space Professionals Foundation (SSPF) — THE NETHERLANDS

E3.1 International Cooperation In Using Space For Sustainable Development: The "Space2030" agenda

As the societal benefits of space technologies and applications are growing, the international community has increasingly shifted its attention to their contributions to the global agendas on sustainability and development, in particular the Sustainable Development Goals (SDGs). In this regard, the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) has decided to develop a "Space2030" agenda and its implementation plan. This session provides the opportunity to discuss the agenda as finalized at COPUOS 2021, its implementation, especially how international cooperation in space activities can contribute to these objectives.

Co-Chairs

Dumitru-Dorin Prunariu
Commission d'Astronautique de l'Academie Roumaine — ROMANIA

Rapporteurs

Alexander Soucek
Austrian Space Forum — AUSTRIA

Peter Stubbe
DLR (German Aerospace Center) — GERMANY

E3.2 The Future of Space Exploration and Innovation

Space exploration missions and plans have been emerging around the world, targeting different destinations from LEO, to the Moon and Mars, and with an increasing participation of new public and private actors. The session will focus on the current plans of future exploration missions of various space exploration stakeholders and will provide a forum to reflect on the trends and present the latest developments in the field.

Co-Chairs

Marc Haese
DLR, German Aerospace Center — GERMANY

Nicolas Peter
International Space University (ISU) — FRANCE

Rapporteurs

Devanshu Ganatra
International Institute of Space Law (IISL) — UNITED STATES

Anmol Dhawan
International Institute of Space Law (IISL) — THE NETHERLANDS

E3.3 Space Economy Session – A focus on space sustainable operations and the role of governments I to stimulate sustainable economic development for both in space and on earth.

Economic motivations towards space sustainability Space sustainability will be a theme and a topic of concern for the International Astronautical Congress this year. This session will prioritize papers addressing the economics of sustainability. Sustainability may refer to the space environment itself, such as debris in orbits or on celestial bodies, the allocation of spectrum, or the Earth's environment and related climate issues involving space activities. Examples of more specific economic topics should involve identifiable objectives of sustainability such as: government funded R&D and specific programs incentives or regulatory actions involving private sector space initiatives, cost-benefit analyses, and quantification of risk and impact assessments of space activities. Impacts from such programs on the Earth are also important elements of economic studies of space sustainability.

Co-Chairs

Pieter Van Beekhuizen
Stichting Space Professionals Foundation (SSPF) — THE NETHERLANDS

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

Rapporteurs

Luigi Scatteia
PricewaterhouseCoopers Advisory (PwC) — FRANCE

Bhavya Lal
National Aeronautics and Space Administration (NASA) — UNITED STATES

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

Space launches from Earth have long been the defining technical and legal qualification for states and other entities desiring to engage in the exploration and utilization of the outer space region. Representing a hard-won scientific and technological achievement, space launches are also the basis for assigning legal jurisdiction, supervision, and liability to the launching state under the five foundational outer space treaties. Rapidly growing numbers of non-governmental commercial space companies and facilities are soon moving space launch operations to the Moon and other celestial bodies, augmenting and in some cases replacing governmental space launch entities. Prospects for an extensive expansion of deep space explorations on the Moon, asteroids, and planets will include a greatly diversified range of space launch technologies and regulatory regimes. Space exploration will require both crewed and uncrewed launches, while sample return missions from asteroids, planets, and their moons will also feature dynamically evolving technologies as well as concerns for contamination and environmental protection. This 37th Joint IAA IISL Roundtable will examine the scientific, technical, legal, and regulatory aspects of space launches from celestial bodies.

Co-Chairs

Peter Stubbe
German Aerospace Center (DLR) — GERMANY

Jana Robinson
The Prague Security Studies Institute — CZECH REPUBLIC

Rapporteur

Gina Petrovici
German Aerospace Center (DLR) — GERMANY

E3.5 E7.6 38TH IAA/IISL Scientific Legal Roundtable: "Cyberspace Security in Outer Space: Scientific, Technical and Legal Dimensions of a Dilemma"

Outer space and cyberspace are realms opened to human exploration and exploitation through scientific discovery, technological innovation and increasingly, commercial application. Spacecraft operating in near-earth orbital regions or in inter-planetary expanses rely on forms of electronic communication, often referred to as "cyberspace" to carry out their missions. Best practices and usage norms to ensure safe passage through outer space have evolved as direct counterparts to the rules and norms governing use of the radio spectrum and telecommunications technologies to avoid harmful, mission-endangering radio frequency interference. The technological shift to Internet-based telecommunications infrastructures is exposing space-based systems to terrestrial cyber-disruptions that are challenging long-standing technological practices and governance regimes in outer space. On-going earthbound military hostilities employing cyber-disruptions rooted in Internet network architectural vulnerabilities are already disabling or interfering with space-based communications. This IAA-IISL Roundtable will discuss whether scientific/technological trends as well as governance institutions and rules are sufficient to ensure space activities and systems may operate in a setting of cyber-security and not cyber-disruption.

Rapporteur

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

E3.6 Space Sector's Commercial Transformation: Procurement Opportunities and Financial Transparency

The space sector is experiencing a significant shift towards commercialization. Private companies and investors are taking on roles that were once solely the domain of government Space Agencies, such as satellite launches, human space flights or in the future, space resource mining. This shift is opening doors to new economic opportunities and attracting investments from various industries. Simultaneously, space agencies are reassessing their procurement practices to encourage competition and involvement of the private sector. Traditional procurement models are being re-evaluated to foster innovation and cost-effectiveness. Initiatives such as public-private partnerships are examples of procurement approaches that aim to leverage private industry capabilities. As the space sector increasingly embraces commercialization and private sector involvement, there is a greater focus on financial transparency and accountability. To ensure that funds are utilized efficiently and in line with established regulations, regular audits by government agencies [and stakeholders] are becoming more critical to assess financial practices and avoid mismanagement of resources. The purpose of this session is to discuss the procurement and financial consequences of an increasing shift towards commercialization and to exchange on measures taken to ensure transparency and accountability from Industry and Space Agencies' perspectives. The session will be divided in two parts: the first being a panel discussion on the topic and the second part in which authors are invited to provide abstracts dealing with the subject.

Co-Chairs

Christine Klein
European Space Agency (ESA) — FRANCE

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

Rapporteur

Karina Miranda Sanchez
ESA — THE NETHERLANDS

E3.IP Interactive Presentations - 37TH IAA SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS

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

Co-Chairs

Jacques Masson
European Space Agency (ESA) — THE NETHERLANDS

Bernhard Schmidt-Tedd
Leuphana University — GERMANY

E4 58TH IAA HISTORY OF ASTRONAUTICS SYMPOSIUM

The symposium covers the entire spectrum of space history, at least 25 years old. History of space science, technology & development, rocketry, human spaceflight and personal memoirs are included. This year a special focus is laid on the origin (technical & political, science and social aspects) of Italian space activities & programs.

Coordinators

A. Ingemar Skoog
— GERMANY

Tal Inbar
— ISRAEL

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

Sandra Haeuplik-Meusburger
TU Wien — AUSTRIA

E4.1 Memoirs & Organizational Histories

Autobiographical & biographical memoirs of individuals who have made original contributions to the development & application of astronautics & rocketry. History of government, agencies, industrial, academic & professional societies & organisations long engaged in astronautical endeavors. This will include the entire spectrum of space history, at least 25 years old.

Co-Chairs

Kerrie Dougherty
— AUSTRALIA

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

Rapporteurs

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

Philippe Cosyn
Independent scholar — BELGIUM

E4.2 Organizational, Scientific and Technical Histories

The symposium will cover the history of space science, exploration, innovation & technology. Furthermore reflection on the cultural and socio-political impact are parts of it. This will include the entire spectrum of space history, at least 25 years old.

Co-Chairs

Vera Pinto Gomes
European Commission — BELGIUM

Sandra Haeuplik-Meusburger
TU Wien — AUSTRIA

Rapporteurs

Hannes Mayer
Karl Franzens Universität Graz — AUSTRIA

Randy Liebermann
— UNITED STATES

E4.3 History of Western Asia Contribution to Astronautics

This Session will focus on the history of Italy in space, including topics on Italian space programs, technical contributions, political influences and effects, space science activities, space architecture, and social and cultural influences. Contributions must address events that occurred at least 25 years ago.

Co-Chair

Sandra Haeuplik-Meusburger
TU Wien — AUSTRIA

Michael Ciancone
National Aeronautics and Space Administration (NASA), Johnson Space Center — UNITED STATES

Giovanni Caprara
Corriere della Sera — ITALY

Rapporteurs

Nathalie Tinjod
European Space Agency (ESA) — FRANCE

Kerrie Dougherty
— AUSTRALIA

E4.IP Interactive Presentations - 57TH IAA HISTORY OF ASTRONAUTICS SYMPOSIUM

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of the history of astronautics addressed in the classic Sessions. The IP session is not restricted to any specific topic related to space law and invites authors to contribute presentations on any interesting, relevant and current space law issues. 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 ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. An award will also be presented to the author of the best Interactive Presentation in the E Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair

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

E5 35TH IAA SYMPOSIUM ON SPACE AND SOCIETY

This 35th symposium is organized by the International Academy of Astronautics (IAA). Presentations will review the impact and benefits of space activities on the quality of life on Earth and in space. A broad range of topics may be covered including arts and culture, space architecture, and society's expectations from space exploration and research, as well as technology and knowledge transfer.

Coordinators

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

Olga Bannova
University of Houston — UNITED STATES

E5.1 Space Architecture: Habitats, Habitability, and Bases

Space Architecture integrates all topics related to designing and building human environments for use in space. The session welcomes papers in three areas: 1) research, design, prototype testing, manufacture, and operation of habitats for space and analog terrestrial environments; 2) how habitats influence human health, psychology, and efficiency, and requirements based on the "human factor"; 3) fabrication and construction of habitable complexes on planetary surfaces or in orbit and 4) human systems integration design implications.

Co-Chairs

Olga Bannova
University of Houston — UNITED STATES

Anna Barbara Imhof
Liquifer Systems Group (LSG) — AUSTRIA

Rapporteur

Anne-Marlene Rüede
Ecole Polytechnique Fédérale de Lausanne (EPFL) — SWITZERLAND

E5.2 Is Space R&D Truly Fostering A Better World For Our Future?

This session solicits papers for a panel discussion focusing on the distinct benefits to society from products derived from space research and development (R&D). The goal of this session is to examine and discuss cases of both emerging and established goals, best practices, and associated outcomes of knowledge sharing, technology transfer, and technology commercialization programmes as they relate specifically to societal benefits. Presenters will identify distinctive ways their organizations are promoting the relevance of space R&D to diverse societies. Attendees will develop a broader awareness of how they can also identify and promote the benefits of space R&D in order to influence broader support of space R&D investments. Panel Members are asked to introduce novel practices which: - Increase attendee understanding of how innovations resulting from space R&D have changed, and will continue to change, the world. - Promote productive thinking about optimizing space R&D investments in order to maximize societal benefits. - Increase the understanding of technology transfer policies and practices for both space and non-space utilization. - Demonstrate the correlation and synergies between technology transfer and STEM education for interdisciplinary space careers and technical entrepreneurship. - Measurably demonstrate the impact of innovation derived from space R&D when transferred into new products, services and processes.

Co-Chairs

Olga Bannova
University of Houston — UNITED STATES

Nona Minnifield Cheeks
Innovatyr, LLC — UNITED STATES

Rapporteurs

Anna Barbara Imhof
Liquifer Systems Group (LSG) — AUSTRIA

Kerry Leonard
National Aeronautics and Space Administration (NASA), Goddard Space Flight Center — UNITED STATES

E5.3 Contemporary Arts Practice and Outer Space: A Multi-Disciplinary Approach

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

Co-Chairs

Richard Clar
Art Technologies — UNITED STATES

Daniela De Paulis
— THE NETHERLANDS

Rapporteur

Yuri Tanaka
Kyoto City University of Arts — JAPAN

E5.4 Space Assets and Disaster Management

This session will explore the role space assets can play in situations requiring disaster management and emergency response. Papers will discuss how space assets and applications can be brought to bear to assist with situation monitoring and assessment, shortening response times and mitigating impact on affected populations.

Co-Chairs

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

Jillianne Pierce
Space Florida — UNITED STATES

E5.5 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, non-profit organizations and other organizations interested in space activities. Some have a large membership of 10 000 or more, others can be small; a few are already a century old, others are just being created. They exist in traditional and emerging space nations. Together they champion the interests of an impressive number of individuals and organizations connected to space. Space Museums are the visible face of space for most of the general public. This symposium offers a podium for ideas and proposals to enhance the interaction between the organizations, their members and the Federation. Papers may address proposals to exchange experiences and best practices; sharing articles, exhibitions or educational material; novel ideas to help outreach to the general public, etc. Of particular interest are papers exploring ways to foster communication and collaboration and to develop mutual benefits amongst young societies, representatives of emerging space nations and museums within and outside the IAF family.

Co-Chairs

Scott Hatton
The British Interplanetary Society — UNITED KINGDOM

Jean-Baptiste Desbois
SEMECCEL Cité de l'Espace — FRANCE

Ines Prieto
SEMECCEL Cité de l'Espace — FRANCE

E5.6 Simulating Space Habitation: Habitats, Design and Simulation Missions

This session covers all topics related to preparing for and simulating future extra-terrestrial habitats and its associated facilities. This includes lessons learned as well as experimental and concrete design proposals for future habitats, either orbital or surface structures, from analog programs to XR solutions and other cutting-edge approaches. The session especially welcomes papers with an interdisciplinary wide-range focus relevant for future crewed missions. Themes may span across innovative technologies, architectural, interior and design approaches and elements, human factors, social-cultural dynamics of space missions, the legal and policy aspects of analog or future crewed missions, as well as the economics of such missions.

Co-Chairs

Anna Barbara Imhof
Liquifer Systems Group (LSG) — AUSTRIA

Julie Patarin-Jossec
Spartan Space — FRANCE

Rapporteur

Sandra Haeuplik-Meusburger
TU Wien — AUSTRIA

E5.IP Interactive Presentations - 35TH IAA SYMPOSIUM ON SPACE AND SOCIETY

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space and Society addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location 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 ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. An award will also be presented to the author of the best Interactive Presentation in the E Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chairs

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

Olga Bannova
University of Houston — UNITED STATES

E6 IAF BUSINESS INNOVATION SYMPOSIUM

The Business Innovation Symposium, organized by the International Astronautical Federation (IAF), is designed to offer papers that observe, study, analyze, describe, and/or propose any topic related to space activities that have commercial objectives, whether from an academic and/or practitioner perspective.

Coordinators

Ken Davidian
— UNITED STATES

Nancy C. Wolfson
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES

E6.1 Space Entrepreneurship and Investment: The Practitioners' Perspectives

This session contains a broad spectrum of entrepreneurship, innovation, finance and investment presentations from the practitioner's perspective. Suggested topics suitable for this session can be at any level of analysis, including (from macroscopic to microscopic) the space sector, industries (e.g., propulsion), industry segments (e.g., chemical propulsion), individual firms, a portion of or a group of individuals within a firm, or an individual. Example entrepreneurship and innovation topics suitable for this session include descriptions related to entrepreneurship and innovation such as new market sectors, new businesses, new business plans, new projects, recent experiences of start-up companies. Suitable finance or investment topics apply to large programmes, new firms, the analysis methodologies of markets, or new developments in the finance and investment communities (including angel investors, venture capital organizations, and investment banks).

Co-Chair

Joerg Kreisel
JOERG KREISEL International Consultant (JKIC) — GERMANY

Daria Stepanova
German Orbital Systems GmbH — GERMANY

E6.2. Public-Private Partnerships: Traditional and New Space Applications

This innovative session convenes experts from different sectors within the space industry and leaders from both the private sector and government agencies to explore their roles and emerging best practices that encourage public and private partnerships (PPP). Therefore, we welcome submissions that explore recent advancements and facilitate the commercialization of space, innovative business models, markets, the diversification of space economy budgets, including sustainability principles, and the attraction of private investments across various fields within the industry that highlight the following topics: 1. Traditional space industry applications, such as satellite-based services encompassing Earth observation, navigation, and communications. 2. New space industry applications mainly focus on space resource extraction, utilization, and asteroid mining (ongoing and future missions, including the Psyche mission, challenges, opportunities from various perspectives, cutting-edge technologies, and any related research or activity that encourage the development of this field and new markets), along with space tourism, space industrialization, commercial space debris, and related activities. This session will open with an invited keynote speaker, followed by a panel of experts for a discussion and Q&A period, and will conclude with paper presentations.

Co-Chairs

Nancy C. Wolfson
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES

Kenneth Bruce Morris
Sierra Space — UNITED STATES

Nicholas Florio
SPACE GENERATION ADVISORY COUNCIL (SGAC) — UNITED STATES

E6.3 Innovation: The Academics' Perspectives

This session will contain academic presentations, at any level of analysis, and on any aspect of entrepreneurship, innovation, finance, or investment, organization theory, investment, etc. Variance and phenomenological studies are encouraged. Qualitative, quantitative, or mixed methods approaches are all accepted. Academic domains of interest include strategic management, economics, leadership, innovation management, and all perspectives of organization theory (including organizational economics, cognition and interpretation, power and dependence, technology, learning, complexity and computation, institutions, networks, ecology, and evolution). At a minimum, submissions are expected to be at the level of working papers performed as part of any graduate degree programme (i.e., masters, doctoral, and post-graduate). This work can include theoretical and applied research.

Co-Chairs

Ken Davidian
— UNITED STATES

Michele Cristina Silva Melo
— BRAZIL

E6.4 Strategic Risk Management for Successful Space & Defence Programmes

The space economy has arrived. Today, space is a vital component in spurring innovation and driving the development of state-of-the-art capabilities; Creating vast market opportunities; Accelerating global economic growth; Promoting collaboration; Building the capacity for scientific excellence; and Contributing to our safety and quality of life. By 2030, the space economy is projected to reach 1 trillion dollars. Nevertheless, in the current fraught geopolitical and economic context, it appears that no organization is fully prepared to capitalize on this near-term explosion of growth and avoid a "space hype bubble." There will be extensive new markets, scientific advancements, and human benefits if we can mitigate risks and realize opportunities. Abstracts would be welcome on the following topics: - How are geopolitical and socio-economic changes affecting our risk management practices? What are the major consequences of current and future crises on our risk predictions? - Are we better prepared to foresee the "unpredictable" and grasp opportunities linked to the changing world? - Do we have the right capacity to face such changes in terms of Human resources and other capabilities?

Co-Chairs

Maria-Gabriella Sarah
European Space Agency (ESA) — FRANCE

Helen Tung
NewSpace2060 — AUSTRALIA

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

Rapporteur

Andrew Court
TNO — THE NETHERLANDS

E6.5 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 do not. This session welcomes papers and presentations that describe the barriers experienced by real entrepreneurs in their different countries and regions around the world. A summary discussion will identify the commonalities and unique characteristics of nation-specific entrepreneurial barriers as identified by the presenters. This is a technical session co-sponsored by the IAF Entrepreneurship and Investment Committee (EIC) and the IAF Workforce Development/Young Professionals Programme Committee, as part of the Global Technical Sessions – presenters can present in person at the IAC or from their home/work/university location.

Co-Chairs

Samuel Peterson
Swedish Space Corporation — UNITED STATES

George A. Danos
Cyprus Space Exploration Organisation (CSEO) — CYPRUS

Nancy C. Wolfson
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES

Susana Fornies Rodriguez
— FRANCE

E6.IP Interactive Presentations - IAF BUSINESS INNOVATION SYMPOSIUM

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

Co-Chair

Ken Davidian
— UNITED STATES

E7 IISL COLLOQUIUM ON THE LAW OF OUTER SPACE

The 2024 IISL Colloquium focuses on how the latest technological developments are impacting the development of the law of outer space, and on whether space law should embrace new fields of activities, such as cyber, within its scope. The Colloquium looks at current discussions about questions related to the ethics and understanding of what is meant by treaty law terms freedom of exploration and use. It examines how space situational awareness (SSA), space surveillance and tracking (SST) can be integrated as elements within a greater framework for effective space traffic management. It serves as a forum to discuss developments of national space law as a constitutive element of the overall framework of space law enforcing and detailing the principles and general norms of space law, in particular within the field of security. It looks at whether existing legal concepts, particularly responsibility and liability for autonomous systems driven by artificial intelligence, are sufficiently regulated, and whether there is a homogenous approach to licensing at national level. It also provides insights as to how disruptive NewSpace activities can and should be accommodated by space law.

Coordinators

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

Catherine Doldirina
International Institute of Space Law (IISL) — ITALY

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

E7.1 Young Scholars Session with Keynote Lecture

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

Co-Chairs

Ilgar Abdullayev
Azercosmos, Space Agency of Republic of Azerbaijan — AZERBAIJAN

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

E7.2 UNCOPUOS and ITU Registration of Large Constellations

UNCOPUOS and ITU are two different international structures with interest in space activities. They have a contrasting history, material scope, and membership. Their diverging working methods manifest themselves in their approach to obtaining information about space objects. Whereas the method of advance publication, coordination and notification of frequency assignments used by radio stations onboard space objects, as well as their recording in the Master International Frequency Register used for decades by the ITU allows to obtain an early information about satellite systems, the 1975 UN Registration Convention elaborated by the UNCOPUOS requires limited information on space objects already launched into outer space. These differences become obvious in recent cases of registration of large constellations. The session invites papers which observe the methods of registration of large constellations, discuss the relation of UNCOPUOS and ITU, and analyze the possibility of their further synergies leading to the enhanced information of the space community about satellite networks and systems.

Co-Chairs

Tare Brisibe
OnAir — SWITZERLAND

Frans G. Von der Dunk
University of Nebraska, College of Law — THE NETHERLANDS

Rapporteur

Dimitra Stefoudi
Leiden University — THE NETHERLANDS

E7.3 Legal Issues Relating to Emerging Space Activities on Celestial Bodies

Plans to engage in activities on the Moon and other celestial bodies are rapidly developing. These range from possible resource exploitation activities all the way to permanent human settlements. Whilst the fascination with life 'off-earth' and the creation of a cis-lunar economy are inspiring many, they also require careful consideration regarding a range of legal issues and will necessitate the development of a clear legal framework to guide the way humanity engages in such activities. Among other issues, this session aims to explore questions about appropriate off-earth governance requirements, the rules that will regulate the interactions between humans living on celestial bodies and the regulation of any in situ resource exploitation and associated activities. This will involve an assessment of the existing legal framework for space as well as a 'gap analysis' as to what areas require further consideration.

Co-Chairs

Alexander Soucek
Austrian Space Forum — AUSTRIA

Jenni Tapio
International Institute of Space Law (IISL) — FINLAND

Rapporteur

Anne-Sophie Martin
Sapienza University of Rome — ITALY

E7.4 Key Governance Issues in the New Space Age

The New Age Space is qualified by new age technologies, applications and the use of space for new age space activities - in and off the Earth's orbit. To consistently ensure safe, sustainable and secure use of outer space for peaceful purpose will become an ever more critical space governance concern. Therefore, given the general uncertainty around concepts like " Benefit and Uses of Outer Space to all Humankind" , could we explore New Age Space qua the UN Development Goals 2030 in context to: (i) Role of New Age space technologies – telecommunications/RS&EO/GNSS to extend the benefits of space to developing and least developed countries; (ii) Space Environment Governance; (iii) Long Term Economic Development on Earth; (iv) Global Governance for Space Security and (iv) Capacity Building in Global Space Governance.

Co-Chairs

Gérardine Goh Escolar
Bynkershoek Law Institute — THE NETHERLANDS

Kuan-Wei Chen
Institute of Air and Space Law, McGill University — CANADA

Rapporteur

Antonino Salmeri
Space Generation Advisory Council (SGAC) — ITALY

E7.5 Supervision of Space Activities

Corresponding to the important transformation of the space sector there is a growing importance to ensure that outer space remains free for exploration and use, and that all actors uphold the fundamental principles. Hence, the national regulators responsible for the authorization and continuing supervision of national space activities are required to put in place adequate means in place to ensure that the national activities are conducted with due regard to the corresponding interests of other countries. This is also reflected by inclusion of 'supervision' as Guideline A.3 of the LTS Guidelines (the Guidelines for the long-term sustainability of outer space activities adopted by COPUOS in 2019). What should be the role of space situational awareness (SSA) data, or how should various non-legally binding instruments pertaining to space activities be considered in this process?

Co-Chairs

Ulrike M. Bohlmann
ESA — FRANCE

Bernhard Schmidt-Tedd
Leuphana University — GERMANY

Rapporteur

Laetitia Zarkan Cesari
University of Luxembourg — LUXEMBOURG

E7.6 E3.5 38TH IAA/IISL Scientific Legal Roundtable: "Cyberspace Security in Outer Space: Scientific, Technical and Legal Dimensions of a Dilemma"

Outer space and cyberspace are realms opened to human exploration and exploitation through scientific discovery, technological innovation and increasingly, commercial application. Spacecraft operating in near-earth orbital regions or in inter-planetary expanses rely on forms of electronic communication, often referred to as "cyberspace" to carry out their missions. Best practices and usage norms to ensure safe passage through outer space have evolved as direct counterparts to the rules and norms governing use of the radio spectrum and telecommunications technologies to avoid harmful, mission-endangering radio frequency interference. The technological shift to Internet-based telecommunications infrastructures is exposing space-based systems to terrestrial cyber-disruptions that are challenging long-standing technological practices and governance regimes in outer space. On-going earthbound military hostilities employing cyber-disruptions rooted in Internet network architectural vulnerabilities are already disabling or interfering with space-based communications. This IAA-IISL Roundtable will discuss whether scientific/technological trends as well as governance institutions and rules are sufficient to ensure space activities and systems may operate in a setting of cyber-security and not cyber-disruption.

Rapporteur

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

E7.7 Recent Developments in Space Law with Particular Focus on Space Debris Remediation

The pollution of the most important orbits by space debris belongs to the pressing challenges for the international community. As a consequence a set of non-binding principles on space debris mitigation were drafted and agreed upon. Now the even greater challenge is the elimination of the waste from the orbits. In view of new existing technologies contributions are encouraged that highlight a possible legal framework for space debris remediation. Space debris remediation will be the special focus of this panel that moreover invites other contributions containing recent challenges for space legislation.

Co-Chairs

Peter Stubbe
German Aerospace Center (DLR) — GERMANY

Maria-del-Carmen Muñoz-Rodríguez
University of Jaen — SPAIN

Rapporteur

Gina Petrovici
German Aerospace Center (DLR) — GERMANY

E7.IP Interactive Presentations - IISL COLLOQUIUM ON THE LAW OF OUTER SPACE

The IP session is not restricted to any specific topic related to space law and invites authors to contribute presentations on any interesting, relevant and current space law issues.

Co-Chair

Antonino Salmeri
Space Generation Advisory Council (SGAC) — ITALY

Gina Petrovici
ECSL — GERMANY

E8 IAA MULTILINGUAL ASTRONAUTICAL TERMINOLOGY SYMPOSIUM

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

Coordinators

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

Tetsuo Yoshimitsu
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN

E8.1 Multilingual Astronautical Terminology

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

Co-Chairs

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

Tetsuo Yoshimitsu
Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN

Rapporteur

Fabrice Dennemont
International Academy of Astronautics (IAA) — FRANCE

E9 IAF SYMPOSIUM ON SPACE SECURITY, STABILITY AND SUSTAINABILITY OF SPACE ACTIVITIES

This symposium, organized by the International Astronautical Federation (IAF), will address two major issues regarding safe and secure operations of space systems via two separate sessions: i) policy, legal, institutional and economic aspects of space debris detection, mitigation and removal, jointly with the IAA Symposium on Space Debris, and, ii) cyber security threats to space missions and countermeasures to address them, jointly with the IAA Symposium on Safety, Quality and Knowledge Management on Space Activities. Papers dealing with non-technical aspects of space debris mitigation and removal, as well as planetary defence against asteroid impact threats, and case studies focusing on countermeasures needs, including cryptography processes, operational security, supply chain and other aspects relevant to ensure a "cyber secure" mission will be well received in this Symposium.

Coordinators

Serge Plattard
University College London (UCL) — UNITED KINGDOM

Stefano Zatti
University of Rome "La Sapienza" — ITALY

E9.1 A6.8 Policy, Legal, Institutional, Economic and Security Aspects of Debris Mitigation, Debris Remediation and STM

This session will address all non-technical aspects of debris mitigation, debris remediation and STM. Papers may focus on aspects of responsibility, liability and registration, on the role of bodies such as UNCOPUOS or IADC, as well as on insurance, financial incentives and funding. In addition, security-related aspects and the role of international cooperation in addressing these issues may be considered.

Co-Chairs

David Spencer
The Aerospace Corporation — UNITED STATES

Serge Plattard
University College London (UCL) — UNITED KINGDOM

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

Rapporteurs

Andrea Capurso
LUISS Guido Carli University — ITALY

Emma Kerr
Deimos Space UK Ltd — UNITED KINGDOM

Victoria Samson
Secure World Foundation — UNITED STATES

E9.2 Cyber-based Security Threats to Space Missions: Establishing the Legal, Institutional and Collaborative Framework to Counteract them

The increasingly pervasive network connectivity following the Internet explosion introduces a whole new families of cyber-security threats to space missions. To send commands to a spacecraft now you would not need to build a ground station, but you can penetrate from your home or office the existing ground infrastructures, bypassing their protection measures, from anywhere in the world. The questions to be addressed in the session will span across the following issues: - What is the interest of cyber-crime and cyber-activism with respect to space activities? - How are aerospace organisations managing the ability to introduce the right level of security measures in the process to plan and develop new missions? - What legal and protection framework is or has to be put in place to enable secure cooperation across corporate and international boundaries? - How is knowledge about security threats captured, shared, and used to follow the evolution of cyber threats? - Which ones of these specific threats are to be expected to target space missions, from the ground and from space? - What is particularly to be expected from the cyber-space to target outer space? Contribution are expected to focus on cyber-specific legislation, best practices, processes, collaboration methods between law enforcement and institutional partners, and any other aspects of the organization of space missions that are all constituting the formal components to keep a mission "cyber secure".

Co-Chairs

Julien Airaud
Centre National d'Etudes Spatiales (CNES) — FRANCE

Stefano Zatti
University of Rome "La Sapienza" — ITALY

E9.3 Norms and Standards for Safe and Responsible Behaviour in Space

The rapid expansion and evolution of the global space arena is characterized by an increasing number and diversity of space actors and the emergence of new kinds of space systems, some of which involve very large constellations of satellites numbering in the thousands to tens of thousands, and also new kinds of space activities, such as on-orbit servicing, refueling, in-orbit assembly and manufacturing, active debris removal, and so on. With increasing congestion in the Earth's orbital environment, these new kinds of space activities raise questions about the safety of space operations, particularly when contingency situations arise (such as conjunctions), or when spacecraft operate in close proximity to each other and there are no clear, widely accepted international standards or norms of behaviour. For this reason, it is important to identify and leverage best practices from government and industry to ensure safety of flight and safe rendezvous and proximity operations of spacecraft. These best practices may subsequently be codified as norms and standards for safe and responsible behaviour in space. This session is intended to be a forum to allow practitioners to discuss and socialize the types of norms, standards and behaviours that would be conducive to the safety of space operations.

Co-Chairs

Peter Martinez
Secure World Foundation — UNITED STATES

Annamaria Nassisi
Thales Alenia Space Italia — Italy

Rapporteur

Rachel Venn
Space Generation Advisory Council (SGAC) — UNITED KINGDOM

E9.IP Interactive Presentations - IAF SYMPOSIUM ON SPACE SECURITY, STABILITY AND SUSTAINABILITY OF SPACE ACTIVITIES

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Security addressed in the classic Sessions. The IP session is not restricted to any specific topic related to space law and invites authors to contribute presentations on any interesting, relevant and current space law issues. 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 ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as: PowerPoint charts, embedded hot links, pictures, audio and video clips etc. An award will also be presented to the author of the best Interactive Presentation in the E Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Coordinator

Serge Plattard
University College London (UCL) — UNITED KINGDOM

E10 IAF SYMPOSIUM ON PLANETARY DEFENSE AND NEAR-EARTH OBJECTS

This symposium, organized by the International Astronautical Federation (IAF), will address all aspects of the hazards associated with the impact of asteroids and comets on Earth and their mitigation. Due to the multidisciplinary nature of planetary defense, the symposium additionally aims to establish joint sessions with other symposiums investigating synergies and lessons learned.

Coordinators

Alex Karl
Space Applications Services — BELGIUM

Alissa J. Haddaji
Harvard University — UNITED STATES

E10.1 Planetary Defense from Asteroids and Comets

This session will address all aspects of the hazards associated with the impact of asteroids and comets on Earth and their mitigation, covering these broad areas of interest: 1. An overview about the latest developments and mission summaries related to recent, ongoing or upcoming missions with a focus on planetary defense. 2. Advances in pre-impact determinations and prevention of impacts, such as discovery and characterisation, along with mission & campaign designs to deflect or disrupt a hazardous object. 3. Advances in preparation for impact, such as impact consequences & disaster management and response coordination on local and international levels. 4. General considerations such as the influence of legal, social and economic aspects on the decision to act by decision makers, the deflection methods used as well as public education and communication to various audiences 5. Lessons learned from other missions and endeavours that could benefit planetary defense and vice versa.

Co-Chairs

Daniel Mazanek
NASA — UNITED STATES

Aurélie Moussi
Centre National d'Etudes Spatiales (CNES) — FRANCE

Rapporteurs

Alejandro J. Roman Molinas
Paraguayan Space Agency — PARAGUAY

Alex Karl
Space Applications Services — BELGIUM

E10.2

Informing Planetary Defense

This session will address all aspects that contribute towards informing future planetary defense, including: 1. Results from the first impact deflection test with DART (e.g., results, including ground-based observations regarding the orbital period change, physical characteristics of Didymos and Dimorphos, geology of the impact site, revised numerical modelling of DART impact, and Didymos' dynamics based on DART impact); 2. Results from NEO sample return missions, as well as perspectives regarding ongoing and future NEO missions; 3. Legal considerations that would contribute towards the decision to act; and 4. Any other transdisciplinary research that enhances our understanding to make better decisions and increase the likelihood of a successful mitigation of an asteroid or comet impact.

Co-Chairs

Daniel Mazanek
NASA — UNITED STATES

Alissa J. Haddaji
Harvard University — UNITED STATES

Rapporteur

Philipp Maier
Institute of Space Systems, University of Stuttgart — GERMANY

E10.IP

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

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

Coordinators

Alex Karl
Space Applications Services — BELGIUM

Alissa J. Haddaji
Harvard University — UNITED STATES

E11

IAF SYMPOSIUM ON EMERGING SPACE ECOSYSTEMS

The IAF Symposium on Emerging Space Ecosystems is driven by key objectives aligned with the International Astronautical Federation's (IAF) 3G Diversity Agenda.

The IAF Symposium will address the dynamic space landscape. It will serve as a platform for discussions on emerging space ecosystems, with a focus on fostering innovation in space access, entrepreneurship, and engaging emerging countries. The IAF Symposium will explore technology, policies, and strategies for achieving these goals.

Entrepreneurship will be encouraged, fostering collaboration between established companies and startups. Emerging spacefaring nations will have an opportunity to share experiences and form partnerships.

Coordinator

Matias Campos
Astralintu Space Technologies — ECUADOR

E11.1

Connecting Emerging Space ecoSystems

This session will delve into holistic space ecosystem development, emphasizing the interconnectedness of research, education, policy, and industry. Sustainability will be a central theme, promoting responsible space practices and alignment with global sustainability.

Co-Chair:

Matias Campos
Astralintu Space Technologies — ECUADOR

E11.IP

Interactive Presentations - IAF SYMPOSIUM ON EMERGING SPACE ECOSYSTEMS

This session offers a unique opportunity to deliver your key messages in an interactive presentation on Emerging Space Ecosystems addressed in the classic Sessions. The presentation will be displayed on a digital screen in a dedicated location and available for view by all Congress attendees for the entire Congress week. In addition, one afternoon is dedicated exclusively for the attendees to view the Interactive Presentations, and the author will be assigned a specific ten minute slot to personally present the topic and interact with the attendees present. The Interactive Presentation may take advantage of all electronic display capabilities, such as:

PowerPoint charts,
embedded hot links,
pictures,
audio and video clips etc.

An award will also be presented to the author of the best Interactive Presentation in the E Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Coordinator

Matias Campos
Astralintu Space Technologies — ECUADOR

Category G

GTS. GLOBAL TECHNICAL SYMPOSIUM (GTS)

The Global Technical Symposium (GTS) is designed to offer a modern and eclectic platform at the IAC for sharing technical content to an open minded audience on-site but also online! Jointly organized by associated technical committees and the Workforce Development-Young Professional Programme Committee, these sessions are similar to the conventional technical sessions in terms of abstract selection and paper submissions. However, in addition to the on-site presentation of the technical papers, these sessions are also broadcast online. Authors are allowed to present remotely or on-site, and participants are also allowed to listen to the session from the comfort of their homes or at their workplaces in addition to the IAC venue. The IAF hopes that this approach will enable more students and young professionals without the ability to join IAC on-site to contribute to discussion at the IAC.

GTS.1 ENTREPRENEURSHIP AROUND THE WORLD
GTS.2 HUMAN SPACEFLIGHT GLOBAL TECHNICAL SESSION
GTS.3 SPACE COMMUNICATIONS AND NAVIGATION GLOBAL TECHNICAL SESSION
GTS.4 STUDENT TEAM COMPETITION
GTS.5 SMALL SATELLITE MISSIONS GLOBAL TECHNICAL SESSION

Coordinated by Stephanie Wan, *Space Generation Advisory Council (SGAC) — UNITED STATES and* Seyed Ali Nasseri, *Space Generation Advisory Council (SGAC) — CANADA*

GTS.1
E6.5

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 do not. This session welcomes papers and presentations that describe the barriers experienced by real entrepreneurs in their different countries and regions around the world. A summary discussion will identify the commonalities and unique characteristics of nation-specific entrepreneurial barriers as identified by the presenters. This is a technical session co-sponsored by the IAF Entrepreneurship and Investment Committee (EIC) and the IAF Workforce Development/Young Professionals Programme Committee, as part of the Global Technical Sessions – presenters can present in person at the IAC or from their home/work/university location.

Co-Chairs

Juergen Drescher
Swedish Space Corporation — UNITED STATES

George A. Danos
Cyprus Space Exploration Organisation (CSEO) — CYPRUS

Nancy C. Wolfson
American Institute of Aeronautics and Astronautics (AIAA) — UNITED STATES

Susana Fornies Rodriguez
— FRANCE

GTS.2
B3.9

Human Spaceflight Global Technical Session

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

Co-Chairs

Guillaume Girard
Zero2infinity — SPAIN

Andrea Jaime
Isar Aerospace — GERMANY

GTS.3
B2.8

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. Both Earth's orbital and interplanetary space communications topics can be addressed. This session is co-sponsored by the Space Communications and Navigation Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Joshua Critchley-Marrows
Nottingham Scientific Ltd — UNITED KINGDOM

Kevin Shortt
Airbus Defence & Space — GERMANY

Rapporteur

Eric Wille
ESA — THE NETHERLANDS

GTS.4
E2.3

Student Team Competition

Undergraduate and graduate level student teams present papers on any subject related to space sciences, industry or technology. These papers will represent the work of the authors (three or more students). Students presenting in this session will compete for the Hans von Muldau Team Award. The selection of the oral presentations is solely based on the submitted abstracts. We strongly recommend that you submit an abstract with an extensive description of your topic, including a detailed explanation of your contribution and the novelty of your work. Furthermore, a short description how your team worked together to achieve the project goal should be included. The guidelines for the student competition will be distributed from the session chairs to the authors after abstract acceptance.

Co-Chairs

Emmanuel Zenou
Institut Supérieur de l'Aéronautique et de l'Espace (ISAE) — FRANCE

Andrea Jaime
Isar Aerospace Technologies GmbH — GERMANY

Rapporteur

Kathleen Coderre
Lockheed Martin (Space Systems Company) — UNITED STATES

GTS.5
B4.9

Small Satellite Missions Global Technical Session

The Small Satellite Missions Global Technical Session (GTS) is a collaboration between the International Academy of Astronautics (IAA) Small Satellite Missions Symposium and the International Astronautical Federation (IAF) Workforce Development/Young Professionals Programme Committee. This session is unique in that it allows for sharing of information on a global scale with presenters and audience both at the IAC venue and online at their home/work/university locations. Abstracts are solicited regarding operational missions or mature proposals for small satellite systems and related topics. These must have clear relevance on an international scale or at a business level, and must also provide young professionals a taste of what the space sector has to offer. Where possible, abstracts should have a wide interest in the community and should include transferable knowledge or lessons learned. Abstracts highlighting ingenuity or innovation are preferred. Examples include space missions utilizing small satellites that address specific new societal, scientific or commercial challenges, or novel technologies that have the potential to revolutionize space missions and/or enable their access to space. Papers are to describe the specific need, the small satellite approach that addresses this need, the benefits of this approach and the use of space technology, and demonstrate that other non-space approaches provide inferior solutions. Papers from, or directed at the young professional community are preferred. This session will be accepting submissions for oral presentations only.

Co-Chairs

Matthias Hetscher
DLR (German Aerospace Center) — GERMANY

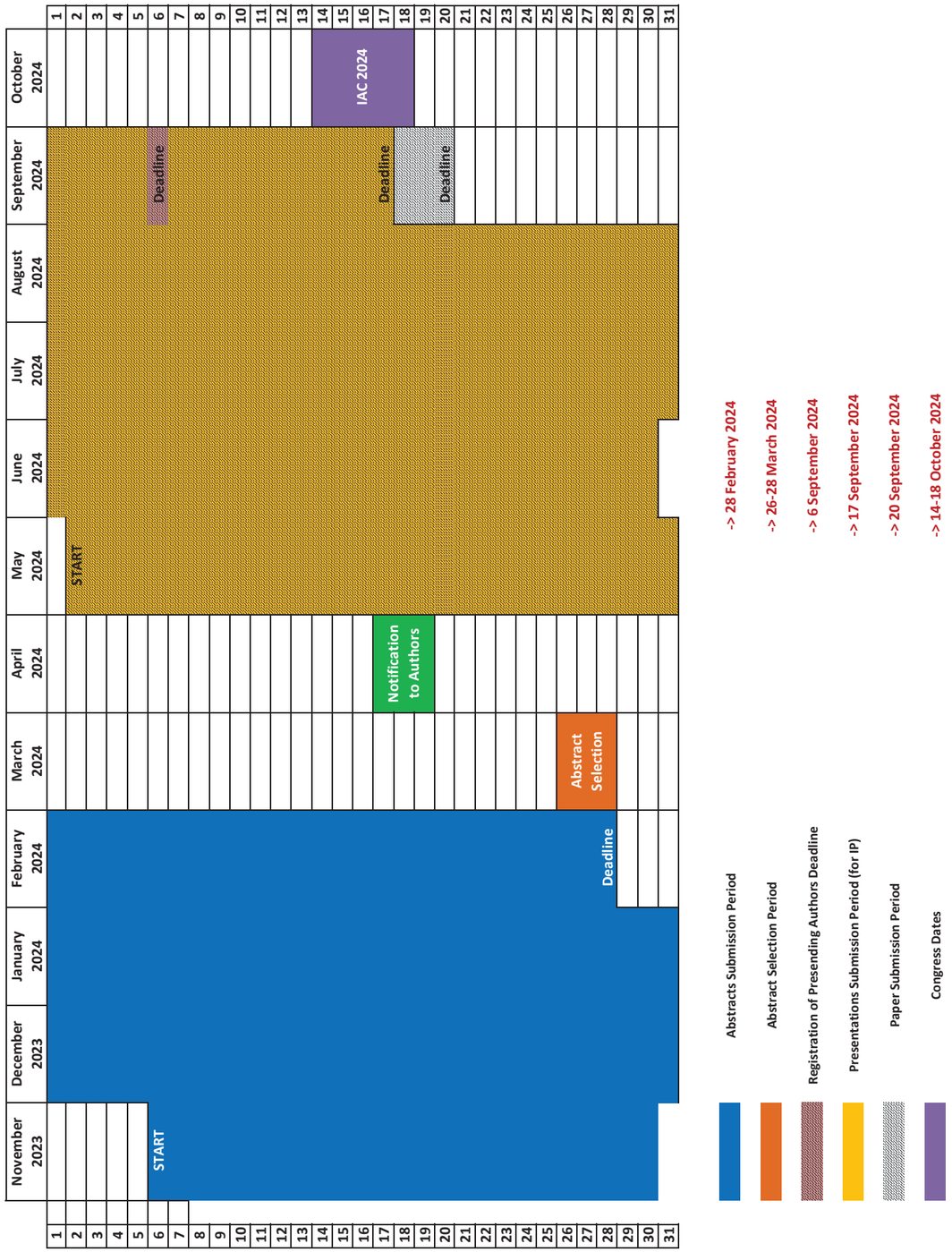
Norbert M.K. Lemke
OHB System AG - Oberpfaffenhofen — GERMANY

Rapporteurs

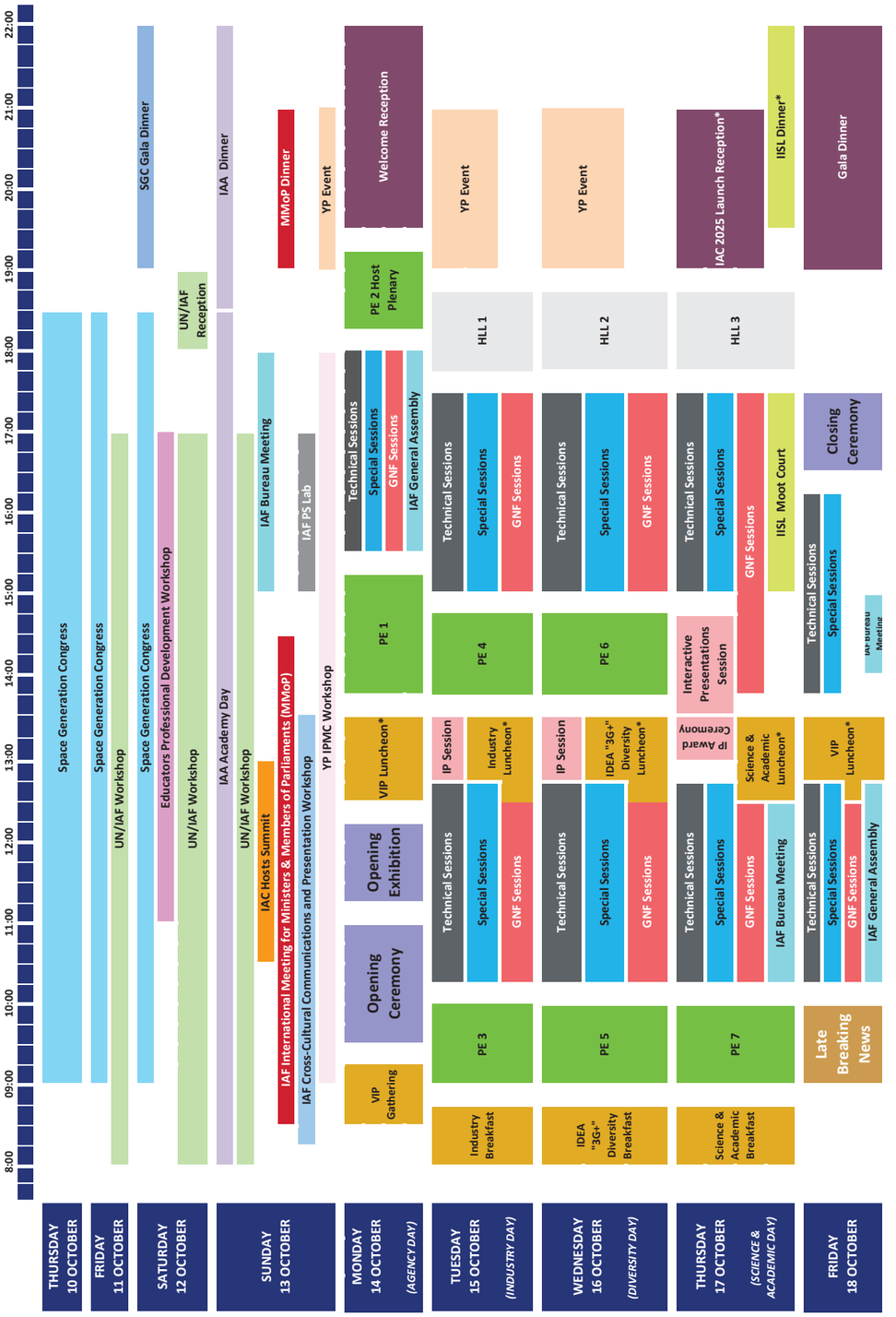
Alex da Silva Curiel
Surrey Satellite Technology Ltd (SSTL) — UNITED KINGDOM

Victoria Barabash
Luleå University of Technology — SWEDEN

11. IAC 2024 Call for Papers Deadlines



12. Preliminary IAC 2024 at a Glance



Please Note:

*By invitation only; Pre-Congress events as well as the IISL Moot Court are dedicated to the respective participants

13. Instructions for Authors

Abstract Preparation

Format

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

Content

- Tables or drawings are not allowed in the abstract.
- Formulas can be included using the LaTeX box provided on the abstract submission 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 https://iafastro.directory/iac/account/login/
- If you are submitting an abstract on our website for the first time, you will need to register.
- In case you have forgotten your password, please use the password recovery utility.

Submission

- Go to the new abstract submission page.
- Browse the technical programme and choose the symposium and technical session for which you want to submit your abstract.
- Type the title and content of your abstract into the related fields.
- Choose you presentation preference: oral presentation only, 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 2024 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 IAF Digital Library is available on the IAF website: *https://dl.iafastro.directory/*

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

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

DEADLINES

Abstract Submission	**28 February 2024**
Interactive Presentation Submission	**17 September 2024**
Paper Submission	**20 September 2024**
Oral Presentation Submission	**22 September 2024**

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: ipsupport@iafastro.org

14. Space in Italy: from Galileo to Lunar Gateway

Italy's legacy in space endeavors is a testament to its rich heritage and vibrant ecosystem. From Galileo's pioneering observations to contemporary exploits like the Lunar Gateway, Italy's involvement spans centuries and encompasses a multitude of dimensions. This journey is guided by a dynamic collaboration between enterprises, research centers, universities, associations, and institutes, collectively propelling advancements in human spaceflight, exploration missions, critical satellite systems and space education.

Italy's space landscape involves an expansive value chain, incorporating large system integrators, over 200 SMEs, and innovative startups. Ranked as the fourth-largest space industry in Europe and third country in terms of contribution in the ESA, the sector generates a €13 billion in revenues while providing employment to over 64,000 skilled individuals. This inclusive ecosystem positions Italy at the forefront of space technology and innovation.

Italian scientists and researchers have contributed significantly to space missions, participating in projects such as Cassini-Huygens, Rosetta, and ExoMars, advancing our understanding of celestial bodies. The Italian space industry excels in satellite development and Earth observation. The COSMO-SkyMed constellation, as an example, provides high-resolution radar imaging for disaster monitoring and environmental management. Other notable achievements include contributions to Copernicus, Galileo, MRO, JUNO, Solar Orbiter, and more, underscoring Italy's prominence in the field.

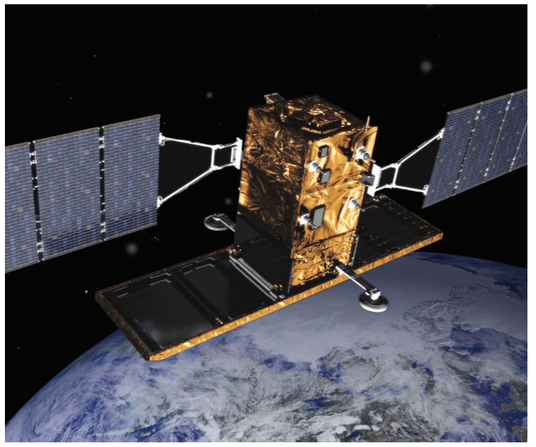
The strategic pursuits of the Italian Space Industry include important European missions such as the European Large Logistics Lander (EL3) project and the Moonlight Initiative. The former seeks to enable autonomous lunar landings for Europe, while the latter aims to establish the first off-planet commercial telecoms and satellite navigation provider, deploying lunar satellites for a comprehensive constellation. Italy's contributions also extend to other vital ESA missions like JUICE, investigating Jupiter and its icy moons, and Euclid, charting a 3D-map of the Universe.

As a pivotal player in the international space community, Italy's involvement goes well beyond the European borders. The Italian Space Agency (ASI) is an active participant in the Artemis Accords, signifying its commitment to partnering with NASA in groundbreaking missions. Among the ambitious projects, Italy intends to contribute to the Space Launch System's inaugural mission, as well as the Lunar Gateway endeavor, thus driving the European I-HAB program.

Italy's vision involves more than its space activities, serving as a facilitator for emerging economies' integration into the space domain. The nation's space machine also emphasizes its pivotal role in forging connections between the space sector and traditional industries on a global scale, promoting innovation and mutual growth.

Counting today more than 10 thousand students only in aerospace engineering, the future of the Italian space ecosystem is secured by the work of international renowned Universities and Polytechnic Schools all over the country. Alongside with AIDAA, founding member of IAF and host of IAC 2024 together with the co-hosts ASI and Leonardo, they embrace the important mission of growing the next space generation through highest level education and outreach initiatives.

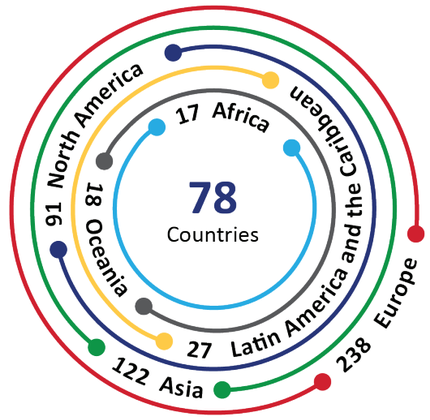
As Italy eagerly prepares to host IAC 2024 in Milan, accompanied by a series of events under the Aerospace Italy 2024 initiative (www.aidaa.it/aerospaceitaly2024), the nation's dedication to space exploration and technological advancements becomes evident. With a focus on strategic collaboration, innovation, education, and international cooperation, Italy's engagement in the field of space continues to leave an indelible mark on humanity's journey into the cosmos.



Notes

Notes

Join the IAF, the world's leading and most diverse space advocacy body



Become an IAF Member

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

Join Us

1 Download the **Application Form** on our website (www.iafastro.org) or request it to the Secretariat.

2 Complete the Application Form and attach the **requested documents.**

3 Send everything to our Secretariat. (info@iafastro.org)

4 We will review your application and ask in case of missing information.

5 Once reviewed, your application will be recommended by the **IAF General Counsel**.

6 **Final approval** by the General Assembly during the IAC.

Connecting @ll Space People
for a sustainable future

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