



69TH INTERNATIONAL ASTRONAUTICAL CONGRESS BREMEN 2018

1 - 5 OCTOBER 2018 | GERMANY

CALL
FOR
PAPERS



#INVOLVINGEVERYONE

www.iac2018.org



TEAM
GERMANY



AIRBUS





connecting @ll space people

www.iafastro.org

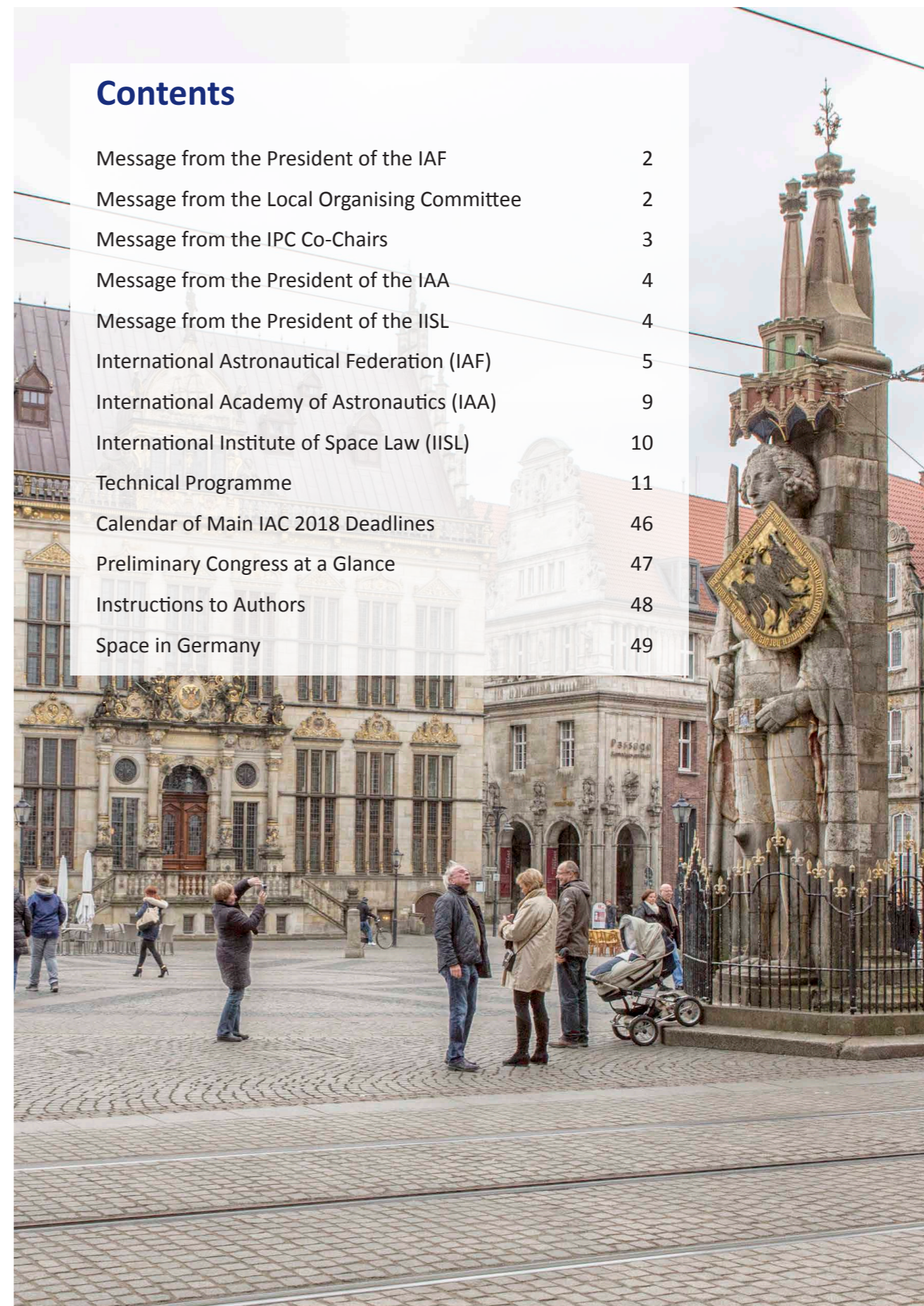


IAF Alliance Programme Partners



Contents

Message from the President of the IAF	2
Message from the Local Organising Committee	2
Message from the IPC Co-Chairs	3
Message from the President of the IAA	4
Message from the President of the IISL	4
International Astronautical Federation (IAF)	5
International Academy of Astronautics (IAA)	9
International Institute of Space Law (IISL)	10
Technical Programme	11
Calendar of Main IAC 2018 Deadlines	46
Preliminary Congress at a Glance	47
Instructions to Authors	48
Space in Germany	49



Message from the President of the IAF

The 69th International Astronautical Congress (IAC) will take place in Bremen, Germany, and I am delighted to invite you all back to this city where already in 2003 the 54th IAC was held with great success.

Bremen is truly the "City of Space" in Germany, with its industry and cutting-edge research. Among the many fields of expertise found here are materials sciences and manufacturing technologies, space systems and research, remote sensing, bionics and robotics. The Galileo satellite navigation system and the upper stages of Ariane are just some of the major projects developed here in Bremen.

Our Local Organizer is ZARM, the Centre of Applied Space Technology and Microgravity, part of the Department of Production Engineering at the University of Bremen. Germany has already hosted several successful IACs; in fact, it is one of the countries that have hosted the most IACs over the years. This will be the sixth IAC organized in Germany since the first International Astronautical Congress in 1952, which was held in Stuttgart..

The theme of IAC 2018, #InvolvingEveryone, aligns with IAF's motto "Connecting @ll space people". We believe it is crucial for the future of the space industry that we learn to successfully work together across borders, challenge norms and embrace diversity. I am confident that with the dedicated efforts of the Local Organizing Committee, supported by the whole of Team Germany and our partner organisations, the IISL and the IAA, the 69th IAC will be an impressive event.

Looking forward to bringing together the worldwide space community in Bremen for yet another outstanding IAC!



Jean-Yves Le Gall
President
International Astronautical Federation (IAF)

Message from the Local Organising Committee

Every year, the International Astronautical Congress brings a wide range of space experts together and has become the most important international forum of the space community. Therefore, the partners from "Team Germany" are delighted to have been given the opportunity to organize the IAC 2018 in the City of Bremen. Moreover, the Local Organizing Team from ZARM is eager to prove that our experienced staff, our committed partners and our beautiful city will surpass the expectations of the IAC participants in many respects.

Why did we choose #InvolvingEveryone as the theme of the IAC 2018 in Bremen? For us this means cross-cultural thinking, passing the frontiers of mind sets and unlocking the potential of the young generation. The success of Germany's space landscape and particularly the landscape in Bremen is based on this idea of diversity.

Different kinds of scientific and cultural mindsets are also the very basis of ZARM. With diverse teams we find interdisciplinary solutions to the intriguing questions within our solar system and beyond. Furthermore, ZARM embraces the societal responsibility expected from today's research organisations by supporting young talents from school kids to university students.

We are convinced that our theme is a necessary and timely one. It goes without saying that ZARM is committed to implement this approach into the IAC 2018, especially because it matches perfectly with IAF's concept of 3G (geography, gender, generation). We also believe that space research will play a decisive role in shaping our future and that cooperation is the very engine for scientific progress. In times of global change and challenges, the community of IAF members - represented by space experts from all parts of the world - has the chance to join its strengths in order to find holistic answers to the pressing questions we are facing today.

The Local Organising Team looks forward to hosting the IAC 2018 and to making it an unforgettable experience for all of you. We hope you support us by making #InvolvingEveryone visible throughout the IAC 2018 while falling in love with our City of Space, the beautiful Hanseatic City of Bremen!



Marc Avila
IAC 2018 Local Organizing Committee
ZARM Executive Director

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

It is with great pleasure that we invite everyone to submit an abstract for the upcoming International Astronautical Congress held in Bremen, Germany. The IAC is the most important international event for all space actors worldwide. Global, interdisciplinary, and covering all space sectors and topics, it offers everyone the latest information from the space community and, above all, new contacts and potential partnerships. It's the key event to meet and discuss with major space agencies worldwide, and the best chance to build international networks. Take this chance and use the IAC technical program as a platform to showcase your latest research. All abstracts will be peer reviewed and a limited number of papers will be selected for publication in Acta Astronautica.

The 21st century has brought many new challenges already and certainly has a few more for us in store. These challenges are affecting everyone around the globe. The environment has to be closely observed and analyzed, the sources and the use of energy reassessed, the continuous growth of population taken into account. At the same time, the requirements concerning efficient communication and mobility are increasing stronger than ever before. These social, political, technical and scientific challenges are directed at our global society, and we need to face them together on an interdisciplinary level. With our theme #InvolvingEveryone we invite experts from every background to get involved for our future.

German space actors are already getting involved in international projects in order to jointly work on sustainable solutions. Earth observation, for example, is an effective tool to deal with some of the most imminent tasks today. Climate change and natural disasters are being monitored by projects of, for example, ESA's Climate Change Initiative, GEO and European Copernicus programs amongst many others. The European Galileo satellites further support our efforts to provide reliable navigation and autonomous mobility. The MASCOT lander of the Hayabusa project and the Orion spacecraft are current examples of how we are expanding our horizons with the help of robotic as well as astronautic exploration.

We truly hope that you will join us in these efforts and share your ideas and research results on space science, engineering, economics, policy, law, education, or history with the IAC community. Submit your abstract, register for the IAC 2018 and meet fellow space colleagues at Bremen space sites like the German Aerospace Center (DLR), OHB, Airbus Defence and Space, ArianeGroup, MT Aerospace and of course your local organizer, the Center of Applied Space Technology and Microgravity (ZARM) in Bremen.

We are convinced that your participation stimulates future projects that you can continue to develop in 2019 when the IAC is held in Washington DC.

We are looking forward to your contributions!



Christiane Schullius
IPC Co-Chair
Friedrich-Schiller-University Jena,
Germany



Michael Lopez-Alegria
IPC Co-Chair
MLA Space, Washington DC,
United States

Message from the President of the International Academy of Astronautics



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

Peter Jankowitsch
President,
International Academy of Astronautics (IAA)



Message from the President of the International Institute of Space Law



On behalf of the International Institute of Space Law, I am pleased to invite you to attend our 61st Colloquium on the Law of Outer Space in Bremen. This Colloquium explores a range of emerging issues including UNISPACE+50 themes, the link between cyber and space activities, the relationship between telecommunications law and space law, privacy issues, and space traffic management. Relevant 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 sessions with the IAF and the IAA, and the 33rd IAA-IISL 'Scientific-Legal Roundtable' will provide an opportunity for lawyers, scientists and engineers to jointly tackle a subject in an interdisciplinary setting. The World Finals of the 27th Manfred Lachs Space Law Moot Court Competition will take place in Bremen, welcoming university students from Africa, the Asia Pacific, Europe and North America, and 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 Bremen!

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



International Astronautical Federation (IAF)

Founded in 1951, the International Astronautical Federation is the world's leading space advocacy body. The IAF has more than 320 members from 67 countries, including all leading space agencies, companies, societies, associations and institutes worldwide.

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

As organiser of the annual International Astronautical Congress (IAC), and other meetings on specific subjects, the IAF actively encourages the development of astronautics for peaceful

purposes and supports the dissemination of scientific and technical information related to space.



International Astronautical Federation
3 Rue Mario Nikis
75015 Paris, France
Tel: +33 1 45 67 42 60
Fax: +33 1 42 73 21 20
Website: www.iafastro.org

Members of IAF Bureau 2017

- | | | |
|---|---|---|
|
PRESIDENT
Jean-Yves Le Gall
<i>President,</i>
<i>Centre National d'Etudes Spatiales (CNES),</i>
France |
GENERAL COUNSEL
Lesley Jane Smith
<i>Solicitor, Weber-Steinhaus & Smith;</i>
<i>Professor, Leuphana University</i>
<i>Lueneburg,</i>
Germany |
HONORARY SECRETARY
Geir Hovmork
<i>Deputy Director General,</i>
<i>Norwegian Space Centre,</i>
Norway |
|
VP: AGENCY, PARLIAMENTARIAN AND MINISTERIAL RELATIONS
Johann-Dietrich Woerner
<i>Director General, European Space Agency (ESA),</i>
Germany |
VP: COMMUNICATIONS, PUBLICATIONS AND GLOBAL CONFERENCES
Pascale Ehrenfreund
<i>Chair of Executive Board, German Aerospace Center (DLR),</i>
Austria |
VP: DEVELOPING COUNTRIES AND EMERGING MEMBERS
Joo-Jin Lee
<i>Senior Research Fellow,</i>
<i>Korea Aerospace Research Institute (KARI),</i>
Republic of Korea |
|
VP: EDUCATION, WORKFORCE DEVELOPMENT
Chris Welch
<i>Professor, International Space University,</i>
France |
VP: FINANCIAL MATTERS AND IAC EVOLUTION
Clayton Mowry
<i>Lead – Sales, Marketing & Customer Experience, Blue Origin,</i>
United States |
VP: GLOBAL MEMBERSHIP DEVELOPMENT AND DIVERSITY INITIATIVES
Mary Snitch
<i>Senior Manager,</i>
<i>Lockheed Martin Corporation,</i>
United States |
|
VP: HONOURS AND AWARDS
V. Koteswara Rao
<i>Scientific Secretary,</i>
<i>India Space Research Organisation (ISRO),</i>
India |
VP: INDUSTRY RELATIONS
Alexander Degyarev
<i>General Designer – General Director,</i>
<i>Yuzhnoye State Design Office,</i>
Ukraine |
VP: INTERNATIONAL RELATIONS AND OUTREACH
Sergey Krikalev
<i>Executive Director for Piloted Spaceflights, ROSCOSMOS,</i>
Russian Federation |
|
VP: SCIENCE AND ACADEMIC RELATIONS
Roberto Battiston
<i>President,</i>
<i>Italian Space Agency (ASI),</i>
Italy |
VP: SOCIETIES AND MUSEUMS
Dengyun Yu
<i>Deputy Director of Scientific and Technological Steering Committee,</i>
<i>China Aerospace Science and Technology Corporation (CASC),</i>
China |
VP: TECHNICAL ACTIVITIES
Otto Koudelka
<i>Head of the Institute of Communication Networks and Satellite Communications, Graz University of Technology,</i>
Austria |
|
PRESIDENT IAA
Peter Jankowitsch
<i>Former Federal Minister for Foreign Affairs, Ambassador of Austria (retired),</i>
Austria |
PRESIDENT IISL
Kai-Uwe Schrogl
<i>Chief Strategy Officer, European Space Agency (ESA),</i>
Germany |
EXECUTIVE DIRECTOR
Christian Feichtinger
<i>International Astronautical Federation (IAF),</i>
France |
|
SPECIAL ADVISOR TO THE IAF PRESIDENT (IAF GLOBAL INNOVATION AGENDA 2016 – 2019)
John Horack
<i>Professor and Neil Armstrong Chair, The Ohio State University College of Engineering,</i>
United States |
SPECIAL ADVISOR TO THE IAF PRESIDENT (NEXT GENERATION)
Victoria Alonsopez
<i>Founder of Chipsafer, IAF 2016 Young Space Leader,</i>
Uruguay | |

IAF Secretariat

Christian Feichtinger, Executive Director
Giulia Maria Berardi, Deputy Executive Director
Myriam Morabet-Moreau, Senior Projects Manager
Valerie Leenhardt, Office Manager
Silvia Antolino, Communications Manager

Isabella Marchisio, Projects Manager
Evelina Hedman, Projects Manager
Abed Aldaas, Projects Manager
Emma Huis, Projects Manager

Wei Yu, Projects Assistant and Special Adviser
(Secondment from CSA)
Elena Feichtinger, Projects Manager (Volunteer)
Michel Arnaud, Advisor to IPC Co-Chairs (Volunteer)

IAF Member Organisations

A9C Capital	Bahrain	Central Research Institute for Machine Building (FGUP TSNIIMASH)	Russian Federation
Access e.V.	Germany	Centre for Mechanical and Aerospace Science and Technologies (C-MAST)	Portugal
Advanced Instrumentation and Technology Centre (AITC)	Australia	Centre National de la Cartographie et de la Teledetection (CNCT)	Tunisia
Aeromet Rocketdyne	United States	Centre National d'Etudes Spatiales (CNES)	France
Aerospace Research Institute	Iran	Centre Royal de Teledetection Spatiale	Morocco
Aexa Aerospace LLC	United States	Centro de Investigacion y Difusion Aeronautico Espacial (CIDA-E)	Uruguay
Agence Spatiale Algérienne (ASAL)	Algeria	China Head Aerospace Technology Co.	China
Agencia Espacial Mexicana (AEM)	Mexico	Chinese Society of Astronautics (CSA)	China
Agrupacion Astronautica Espanola	Spain	CIRA Italian Aerospace Research Centre	Italy
Airbus Defence and Space Ltd	United Kingdom	Comision Nacional de Actividades Espaciales (CONAE)	Argentina
Airbus Defence and Space Netherlands B.V.	The Netherlands	Commission d'Astronautique de l'Academie Roumaine	Romania
Airbus Defence and Space SA	Spain	Cosmoexport Aerospace Research Agency	Russian Federation
Airbus Defence and Space SAS	France	Croatian Astronautical and Rocket Federation (HARS)	Croatia
Airbus DS GmbH	Germany	CSIRO Astronomy & Space Science	Australia
American Astronautical Society (AAS)	United States	CSL (Centre Spatial de Liège)	Belgium
American Institute of Aeronautics and Astronautics (AIAA)	United States	Curtin University	Australia
Andøya Space Center	Norway	CVA (Community of Ariane Cities)	France
Arianespace	France	Cyprus Astronautical Society	Cyprus
Asher Space Research Institute (ASRI)	Israel	Cyprus Space Exploration Organisation (CSEO)	Cyprus
Association Aéronautique & Astronautique de France (3AF)	France	Czech Space Alliance	Czech Republic
Association Dedicated to Development in Astronautics (A.D.D.A)	Romania	Czech Space Office	Czech Republic
Association of Arab Remote Sensing Centers (AARSC)	Libya	Danish Aerospace Company ApS	Denmark
Association of Space Explorers (ASE)	United States	Danish Astronautical Society	Denmark
Associazione Italiana di Aeronautica e Astronautica (AIDAA)	Italy	Dassault Aviation	France
Astronautic Technology SDN BHD	Malaysia	Deimos Space S.L.	Spain
Astronautical Society of India	India	Delft University of Technology	The Netherlands
Astrosat Limited	United Kingdom	Denel Spaceteq	South Africa
ASTROSCALE Pte. LTD.	Singapore, Republic of	Department of Space Studies, University of North Dakota	United States
ATUCOM - Tunisian Association for Communication and Space Sciences	Tunisia	Desà Engineering srl	Italy
Auspace Pty Ltd.	Australia	Deutsche Gesellschaft für Luft- und Raumfahrt, Lilienthal-Oberth e.V. (DGLR)	Germany
Austrian Research Promotion Agency	Austria	Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)	Germany
Austrospace	Austria	Dnipropetrovsk National University	Ukraine
Bauman Moscow State Technical University	Russian Federation	Dniprotekhservice, SPF, LLC	Ukraine
Beihang University	China	DTU Space	Denmark
Beijing Sunwise Space Technology Ltd.	China	EADS Sodern	France
Belgian Federal Science Policy Office (BELSPO)	Belgium	Ecole Polytechnique Fédérale de Lausanne (EPFL)	Switzerland
Blue Origin LLC	United States	Ecuadorian Civilian Space Agency (EXA)	Ecuador
Brazilian Space Agency (AEB)	Brazil	Embry-Riddle Aeronautical University	United States
Bryce Space and Technology	United States	EMXYS (Embedded Instruments and Systems S.L)	Spain
Bulgarian Aerospace Agency	Bulgaria	Engineers Australia	Australia
California Polytechnic State University	United States	Enterprise Estonia	Estonia
Canadian Aeronautics & Space Institute (CASI)	Canada	Eumetsat	Germany
Canadian Space Agency	Canada	EURISY	France
Canadian Space Commerce Association (CSCA)	Canada	Euro Space Center	Belgium
Canadian Space Society	Canada	Euroknot Launch Services GmbH	Germany
Center for Planetary Science and Exploration, Western University	Canada	Euroconsult	France
Center of Space Exploration, Ministry of Education (COSE)	China	European Conference for Aero-Space Sciences (EUCASS)	Germany
Central American Association for Aeronautics and Space (ACAE)	Costa Rica	European Space Agency (ESA)	France
		European Space Policy Institute (ESPI)	Austria

European Test Services (ETS) B.V.	The Netherlands	Joanneum Research	Austria
Eurospace	France	JSC Glavcosmos	Russian Federation
Faculty of Aviation and Space Sciences, Necmettin Erbakan University	Turkey	JSC NPO Energomash	Russian Federation
Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST)	United States	JSC SRC Progress	Russian Federation
Finnish Astronautical Society	Finland	KBRWyle	United States
Flinders University	Australia	Kenya National Space Secretariat	Kenya
Friedrich-Schiller-Universität Jena	Germany	Khrunichev State Research & Production Space Center	Russian Federation
Future Space Leaders Foundation	United States	King Abdulaziz City for Science & Technology (KACST)	Saudi Arabia
G.A.U.S.S. Srl	Italy	Kongsberg Satellite Services AS	Norway
General Organization of Remote Sensing (GORS)	Syria	Korea Aerospace Industries	Korea, Republic of
Geo-Informatics and Space Technology Development Agency (GISTDA)	Thailand	Korea Aerospace Research Institute (KARI)	Korea, Republic of
Georgia Institute of Technology, School of Aerospace Engineering	United States	Korea Association for Space Technology Promotion (KASP)	Korea, Republic of
German Aerospace Industries Association (BDLI)	Germany	Korea Astronomy and Space Science Institute	Korea, Republic of
GIFAS	France	Kyiv Politechnic Institute (NTUU "KPI")	Ukraine
GKN Aerospace Engine Systems	Sweden	Kyushu Institute of Technology	Japan
Global Student Commercial Space Society (GSCSS)	United States	Lavochkin Science and Production Association	Russian Federation
GMV Aerospace & Defence SAU	Spain	Law Offices of Sterns and Tennen	United States
GMV INSYEN	Germany	Lithuanian Space Association (LSA)	Lithuania
GomSpace Aps	Denmark	Lockheed Martin Corporation	United States
Graz University of Technology (TU Graz)	Austria	Max-Planck-Institute for Ornithology	Germany
Gumush Aerospace & Defense	Turkey	Mc Gill Institute for Aerospace Engineering (MIAE)	Canada
HE Space	The Netherlands	MDA Corporation	Canada
Hermann-Oberth-Raumfahrt Museum e.V.	Germany	Microcosm, Inc.	United States
Hungarian Astronautical Society (MANT)	Hungary	Mitsubishi Electric Corporation	Japan
IABG Industrieanlagen - Betriebsgesellschaft mbH	Germany	Mitsubishi Heavy Industries, Ltd.	Japan
ICARE-CNRS	France	Mohammed Bin Rashid Space Centre (MBRSC)	United Arab Emirates
IHI Aerospace Co, Ltd.	Japan	Moscow Aviation Institute	Russian Federation
Indian Space Research Organization (ISRO)	India	MT Aerospace AG	Germany
Indonesian National Institute of Aeronautics and Space (LAPAN)	Indonesia	MXSpace A.C	Mexico
Institut d'Estudis Espacials de Catalunya - IEEC	Spain	National Aeronautics and Space Administration (NASA)	United States
Institut Français d'Histoire de l'Espace	France	National Aerospace Agency (NASA) of Azerbaijan Republic	Azerbaijan
Institut Supérieur de l'Aéronautique et de l'Espace (ISAE)	France	National Aerospace Educational Centre of Youth	Ukraine
Institute of Space Technology (IST)	Pakistan	National Aerospace Laboratory (NLR)	The Netherlands
Instituto de Aeronáutica e Espaço (IAE)	Brazil	National Institute of Information and Communications Technology (NICT)	Japan
Instituto de Geofísica, Universidad Nacional Autónoma de México	Mexico	National Oceanic and Atmospheric Administration (NOAA)	United States
Instituto Geográfico Agustín Codazzi (IGAC)	Colombia	National Space Agency of Malaysia (ANGKASA)	Malaysia
Instituto Nacional de Pesquisas Espaciais (INPE)	Brazil	National Space Centre	Ireland
Instituto Nacional de Técnica Aeroespacial (INTA)	Spain	National Space Research and Development Agency (NASRDA)	Nigeria
Intelligent Materials and Systems Lab, University of Tartu	Estonia	NEC Corporation	Japan
International Association for the Advancement of Space Safety	The Netherlands	Neptec Design Group	Canada
International Institute of Space Commerce	Isle of Man	Netherlands Space Office (NSO)	The Netherlands
International Lunar Observatory Association	United States	Netherlands Space Society (NVR)	The Netherlands
International Space Center - Space Park Israel Ashdod	Israel	NGC Aerospace Ltd.	Canada
International Space University (ISU)	France	Nigerian Meteorological Agency	Nigeria
Internationaler Förderkreis für Raumfahrt – Hermann Oberth – Wernher von Braun e.V.	Germany	Norsk Astronautisk Forening	Norway
Intersputnik International Organization of Space Communications	Russian Federation	Norwegian Space Centre	Norway
Invap S.E.	Argentina	Novespace	France
Iranian Space Agency	Iran	Office National d'Etudes et de Recherches Aérospatiales (ONERA)	France
Israel Aerospace Industries. Ltd.	Israel	OHB Italia SpA	Italy
Israel Space Agency	Israel	OHB System AG - Munich	Germany
Istanbul Technical University	Turkey	OHB System AG-Bremen	Germany
Italian Space Agency (ASI)	Italy	Orbital Access Ltd	United Kingdom
Japan Aerospace Exploration Agency (JAXA)	Japan	Pakistan Space and Upper Atmosphere Research Commission	Pakistan
Japan Manned Space Systems Corporation (JAMSS)	Japan	Peoples' Friendship University of Russia	Russian Federation
Japan Society for Aeronautics and Space Sciences (JSASS)	Japan	PJSC "Elmiz"	Ukraine
Japanese Rocket Society	Japan	Polish Academy of Sciences	Poland
		Polish Astronautical Society	Poland
		Politecnico di Milano	Italy

Politecnico di Torino
Proespaço-The Portuguese Association of Space Industries
Project Management Institute
Purple Mountain Observatory (PMO)
QinetiQ Space nv
Rafael Advanced Defense Systems Ltd.
Ramirez de Arellano y Abogados, S.C. Law Firm
RHEATECH LTD
RMIT University, Australia
Rocket Research Institute, Inc.
Romanian Space Agency (ROSA)
ROSCOSMOS
Rovsing A/S
RUAG Space
Russian Academy of Sciences
S.A.B.C.A
S.P. Korolev Rocket and Space Corporation Energia
Safran Aircraft Engines
Samara State Aerospace University (SSAU)
Sapienza University of Rome
Satrec Initiative
Secure World Foundation
SEMECCEL Cité de l'Espace
SENER Ingenieria y Sistemas, S.A.
Sergio Arboleda University
SES
Shaanxi Engineering Laboratory for Microsatellites
Shamakhy Astrophysical Observatory
SHOAL
Sierra Nevada Corporation
Simeon Technologies
Sirius XM Radio
Sital Spa
Solar MEMS Technologies S.L.
Soletop Co., Ltd
South African National Space Agency (SANSA)
South African Space Association (SASA)
Space Canada Corporation
Space Center Houston
Space Commercial Services Holdings (Pty) Ltd
Space Coordination Office, Department of Industry & Science
Space Florida
Space Foundation
Space Generation Advisory Council (SGAC)
Space Industry Association of Australia
Space Policy Institute, George Washington University
Space Systems/Loral
Space Trust
SpaceLand Africa
SpaceNed
SpaceX
SSC
Starsem
State Enterprise Production Association Kyivpyrlad
State Space Agency of Ukraine (SSAU)
Stellenbosch University
STM (Savunma Teknolojileri Muhendislik ve Ticaret A.S.)
Surrey Satellite Technology Ltd (SSTL)
Swedish Society for Aeronautics and Astronautics

Italy
Portugal
United States
China
Belgium
Israel
Mexico
United Kingdom
Australia
United States
Romania
Russian Federation
Denmark
Switzerland
Russian Federation
Belgium
Russian Federation
France
Russian Federation
Italy
Korea, Republic of
United States
France
Spain
Colombia
Luxemburg
China
Azerbaijan
Australia
United States
France
United States
Italy
Spain
Korea, Republic of
South Africa
South Africa
Canada
United States
South Africa
Australia
United States
United States
Austria
Australia
United States
United States
United Kingdom
Mauritius
The Netherlands
United States
Sweden
France
Ukraine
Ukraine
South Africa
Turkey
United Kingdom
Sweden

SwissSpace Association
Tallinn University of Technology
TAMSAT - The Society of Amateur Satellite Technologies of Turkey
Tartu Observatory
Techno System Developments S.R.L.
Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences
Teledyne Brown Engineering
Telespazio S.p.A.
Telespazio VEGA UK LTD
Tesat-Spacecom GmbH & Co. KG
Thales Alenia Space France
Thales Alenia Space Italia
The Aerospace Corporation
The Boeing Company
The British Interplanetary Society
The Chinese Aeronautical and Astronautical Society located in Taipei
The Federal University of Technology, Akure (FUTA)
The Fisher Institute for Air and Space Strategic Studies
The Johns Hopkins University Applied Physics Laboratory
The Korean Society for Aeronautical and Space Sciences
The Ohio State University College of Engineering
The Planetary Society
The Sergei Korolev Space Museum
TNO
TÜBITAK
Turkish Aerospace Industries
U.S. Geological Survey
UAE Space Agency
UK Space Agency
United Rocket and Space Corporation
Universiti Teknologi Mara (UITM)
University of Adelaide
University of Alabama in Huntsville
University of Colorado, Colorado Center for Astrodynamics Research
University of Naples "Federico II"
University of South Australia
University of the Western Cape
University of Vigo
University POLITEHNICA of Bucharest - Research Center for Aeronautics and Space
University Wuerzburg
UNSW Australia
Victorian Space Science Education Centre
Vieira de Almeida & Associados
Vietnam National Satellite Center (VNSC)
Virgin Galactic L.L.C
Vishay Precision Group
VITO nv
von Karman Institute for Fluid Dynamics
WFB - Wirtschaftsförderung Bremen
Wildcard Mavericks Ltd
Women in Aerospace Europe (WIA-E)
World Space Week Association
Xovian Research & Technologies Pvt. Ltd
Youth Network for Reform, Inc (YONER - LIBERIA)
Yuzhnoye State Design Office
ZARM Fab GmbH
Zero2infinity

Switzerland
Estonia
Turkey
Estonia
Italy
China
United States
Italy
United Kingdom
Germany
France
Italy
United States
United States
United Kingdom
China
Nigeria
Israel
United States
Korea, Republic of
United States
United States
Ukraine
The Netherlands
Turkey
Turkey
United States
United Arab Emirates
United Kingdom
Russian Federation
Malaysia
Adelaide
United States
United States
Italy
Australia
South Africa
Spain
Romania
Germany
Australia
Australia
Portugal
Vietnam
United States
United States
Belgium
Germany
Germany
United Kingdom
The Netherlands
United States
India
Liberia
Ukraine
Germany
Spain

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 1200 elected members and corresponding members from 87 nations, it works closely with space agencies, industry, the academic community and the national science and engineering academies to determine needs and objectives and to help shape policy and forge cooperation by means of studies, position papers, conferences and publications. The IAA has published nearly 60 studies to date and is engaged in the preparation of 40 others. The Academy also publishes the journal Acta Astronautica containing refereed papers.

The Academy now organizes 20 conferences per year and regional meetings focused on the development and promotion of new

initiatives. 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 by organizing and co-sponsoring symposia as well as in the International Society for Photogrammetry and Remote Sensing (ISPRS) congress this year in Prague. 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.



Address: 6 rue Galilée, 75016 Paris
Mailing address: P.O. Box 1268-16 – 75766 Paris Cedex 16 – France
Phone: 33 (0)1 47 23 82 15
Fax: 33 (0) 1 47 23 82 16
Email: sgeneral@iaaemail.org
Website: www.iaaweb.org
IAA Shop: shop.iaaweb.org



PRESIDENT
Peter Jankowitsch
Austria



SECRETARY GENERAL
Jean-Michel Contant
France

IAA Board of Trustees 2017 - 2019

PRESIDENT
Peter Jankowitsch (Austria)

VICE-PRESIDENT SCIENTIFIC ACTIVITIES
Anatoly Perminov (Russian Federation)

VICE-PRESIDENT PUBLICATIONS & COMMUNICATION
Liu Jiyuan (China)

VICE-PRESIDENT AWARDS & MEMBERSHIP
Francisco Mendieta-Jimenez (Mexico)

VICE-PRESIDENT FINANCE
Hiroki Matsuo (Japan)

PAST-PRESIDENT
Madhavan Nair (India)

SECRETARY GENERAL
Jean-Michel Contant (France)

LEGAL COUNSEL
Leslie Tennen (USA)

Trustees Section 1, Basic Sciences

Ralph McNutt Jr. (USA, Chairman)
Athena Coustenis (France)

Filippo Graziani (Italy)
Rumi Nakamura (Japan)

Antonio Viviani (Italy)
Wang Jinnian (China)

Lev Zelenyi (Russian Federation)

Trustees Section 2, Engineering Sciences

John Schumacher (USA, Chairman)
Weimin Bao (China)

Simonetta Di Pippo (Italy)
Scott Fouse (USA)

Junichiro Kawaguchi (Japan)
Shigeki Kinai (Japan)

Vladimir Solntsev (Russian Federation)

Trustees Section 3, Life Sciences

Chrysoula Kourtidou-Papadeli
(Greece, Chairman)

Jeffrey Davis (USA)
Du Jichen (China)

Gerd Gruppe (Germany)
Chiaki Mukai (Japan)

Dumitru-Dorin Prunariu (Romania)
Zhuang Fengyuan (China)

Trustees Section 4, Social Sciences

Marius-Ioan Piso (Romania, Chairman)
John Elbon (USA)

Efim Malitkov (Russian Federation)
Seidu Oneilo Mohammed (Nigeria)

Olle Norberg (Sweden)
Yuriy Urlichich (Russian Federation)

Wu Meirong (China)

International Institute of Space Law (IISL)

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

Since 1992, the IISL has organised 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 organisation'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 organises an annual space law symposium for the delegates and staff attending the sessions of the UNCOPUOS Legal Subcommittee. In addition the Institute organises a variety of conferences on space law throughout the year in locations all over the world. It publishes an annual volume of IISL Proceedings with papers and reports of all these activities during the year.



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

IISL Board of Directors 2017-2018



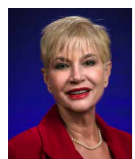
PRESIDENT
Kai-Uwe Schrogl
Germany



VICE PRESIDENT
K.R. Sridhara Murthi
India



VICE PRESIDENT
Setsuko Aoki
Japan



EXECUTIVE SECRETARY
Diane Howard
United States



TREASURER
Dennis J. Burnett
United States

Members of the Board

P.J. Blount (United States)
Frans G. von der Dunk (The Netherlands)
Marco Ferrazzani (Italy)
Steven Freeland (Australia)
Joanne Irene Gabrynowicz (United States)
Stephan Hobe (Germany)
Mahulena Hofmann (Czech Republic)
Corinne Jorgenson (France/United States)

Sergio Marchisio (Italy)
Martha Mejia-Kaiser (Mexico/Germany)
Lesley Jane Smith (United Kingdom)
Milton 'Skip' Smith (United States)
Maureen Williams (Argentina)
Zhenjun Zhang (China)

Introduction to the Technical Programme

The IAC Technical Programme is the core of the International Astronautical Congress, and evolves continually in response to the changing nature of space science, technology and its societal aspects. The programme for IAC 2018 in Bremen is of no exception.

The symposia are grouped into our usual five Categories: A. **Science and Exploration**; B. **Applications and Operations**; C. **Technology**; D. **Infrastructure**; and E. **Space and Society**. The IAF Technical Committees, IAA Commissions and IISL Programme Committee plan the coverage of the symposia and the International Programme Committee selects the abstracts that will be presented.

Topics can be presented either as an oral presentation or in the interactive section. The latter is a recent format which has proven to be very successful. Greater focus is put on creating an interesting presentation which is shown on screens in the congress venue. It has the ability to more easily embed media, discuss with the authors, and receive near-real-time feedback about the paper. The technical programme for the 2018 Congress is shown on the following pages. I encourage you to submit abstracts for consideration within the sessions which you are interested in making a contribution to.



Otto Koudelka
IAF Vice-President, Technical Activities

Technical Programme



SCIENCE AND EXPLORATION

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

- A1 SPACE LIFE SCIENCES SYMPOSIUM
- A2 MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM
- A3 IAA SPACE EXPLORATION SYMPOSIUM
- A4 47TH IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) - THE NEXT STEPS
- A5 21ST IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM
- A6 16TH IAA SYMPOSIUM ON SPACE DEBRIS
- A7 SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS

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

A1

SPACE LIFE SCIENCES SYMPOSIUM

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

Coordinators

Oleg Orlov
SSC RF-Institute of Biomedical Problems RAS — RUSSIAN FEDERATION

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

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 — UNITED STATES

Peter Suedfeld
University of British Columbia — CANADA

Rapporteur

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

Inessa Kozlovskaya
State Scientific Center of the Russian Federation, Institute of Biomedical Problems of the Russian Academy of Sciences — RUSSIAN FEDERATION

Jens Jordan
Institute of Aerospace Medicine (DLR) — GERMANY

Rapporteur

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

A1.3 Medical Care for Humans in Space

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

Co-Chairs

Oleg Orlov
SSC RF-Institute of Biomedical Problems RAS —
RUSSIAN FEDERATION

Satoshi Iwase
Aichi Medical University — JAPAN

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 Arctic 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

Hanns-Christian Gunga
Charité - University Medicine Berlin — GERMANY

Oleg Orlov
SSC RF-Institute of Biomedical Problems RAS — RUSSIAN
FEDERATION

Rapporteur

Christian Rogon
DLR (German Aerospace Center) — GERMANY

A1.5 Radiation Fields, Effects and Risks in Human Space Missions

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

Co-Chairs

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

Lawrence Pinsky
University of Houston — UNITED STATES

Rapporteur

Premkumar Saganti
Prairie View A&M University — UNITED STATES

A1.6 Astrobiology and Exploration

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

Co-Chairs

Nicolas Walter
European Science Foundation — FRANCE

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

Rapporteur

Brent Sherwood
Caltech/JPL — UNITED STATES

A1.7 Life Support, habitats and EVA Systems

This session will address strategies, solutions and technologies in providing Life Support for finally human requirements during future deep space and planetary/lunar surface exploration as well as extreme environments in general. An important task of Life Support is the use of in situ resources. This research and technology development is of utmost interest also for Earth application.

Co-Chairs

Klaus Slenzka
OHB System AG-Bremen — GERMANY

Liu Hong
Xi'an Aerospace Propulsion Institute — CHINA

Rapporteurs

Chiaki Mukai
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Michael Becker
DLR (German Aerospace Center) — 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

Fengyuan Zhuang
Beihang University — CHINA

Markus Braun
DLR (German Aerospace Center) — GERMANY

Rapporteurs

Cora Thiel
University of Zurich — SWITZERLAND

Nicole Buckley
University of Zurich — SWITZERLAND

A1.IP Interactive Presentations

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

Cora Thiel
University of Zurich — SWITZERLAND

Klaus Slenzka
OHB System AG-Bremen — GERMANY

A2 MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM

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

Coordinator

Nickolay N. Smirnov
Moscow Lomonosov State University — RUSSIAN
FEDERATION

Secretary

Anastassia Nikonova
Russian Academy of Sciences — RUSSIAN FEDERATION

Vice-Coordinator

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

A2.1 Gravity and Fundamental Physics

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

Co-Chairs

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

Hanns Selig
ZARM - University of Bremen — GERMANY

Rapporteur

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

A2.2 Fluid and Materials Sciences

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

Co-Chairs

Nickolay N. Smirnov
Moscow Lomonosov State University — RUSSIAN
FEDERATION

Satoshi Matsumoto
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteur

Thomas Driebe
DLR (German Aerospace Center) — Germany

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

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

Co-Chairs

Raffaele Savino
— ITALY

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

Rapporteur

Peter Hofmann
OHB System AG - Munich — GERMANY

A2.4 Science Results from Ground Based Research

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

Co-Chairs

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

Valentina Shevtsova
Université Libre de Bruxelles — BELGIUM

Rapporteur

Nickolay N. Smirnov
Moscow Lomonosov 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 (telescope, robotics, hardware & software).

Co-Chairs

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

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

Rapporteur

Satoshi Matsumoto
Japan Aerospace Exploration Agency (JAXA) — JAPAN

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

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

Co-Chairs

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

Peter Hofmann
OHB System AG - Munich — GERMANY

Rapporteur

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

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

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

Co-Chairs

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

Cora S. Thiel
University of Zurich — SWITZERLAND

Rapporteurs

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

Satoshi Matsumoto
Japan Aerospace Exploration Agency (JAXA) — JAPAN

A2.IP Interactive Presentations

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 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

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

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

A3 SPACE EXPLORATION SYMPOSIUM

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

Coordinators

Bernard Foing
ESA/ESTEC, ILEWIG & VU Amsterdam — THE
NETHERLANDS

Christian Sallaberger
Canadensys Aerospace Corporation — CANADA

A3.1 Space Exploration Overview
This Session covers Space Exploration strategies and architectures, as well as technology roadmaps. Papers of both national and international perspectives are invited, as are papers dealing with the emerging area of commercial space exploration activities.

Co-Chairs

Christian Sallaberger <i>Canadensys Aerospace Corporation — CANADA</i>	Kathy Laurini <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>
--	---

Rapporteurs

Keyur Patel <i>National Aeronautics and Space Administration (NASA)/ Jet Propulsion Laboratory — UNITED STATES</i>	Norbert Frischauf <i>— AUSTRIA</i>
--	--

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 <i>ESA/ESTEC, ILEWVG & VU Amsterdam — THE NETHERLANDS</i>	David Korsmeyer <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>
---	---

Rapporteur

Nadeem Ghafoor <i>Canadensys Aerospace Corporation — CANADA</i>	Sylvie Espinasse <i>European Space Agency (ESA) — THE NETHERLANDS</i>
---	---

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 <i>ESA/ESTEC, ILEWVG & VU Amsterdam — THE NETHERLANDS</i>	David Korsmeyer <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>
---	---

Rapporteurs

Nadeem Ghafoor <i>Canadensys Aerospace Corporation — CANADA</i>	Sylvie Espinasse <i>European Space Agency (ESA) — THE NETHERLANDS</i>
---	---

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 <i>ESA/ESTEC, ILEWVG & VU Amsterdam — THE NETHERLANDS</i>	David Korsmeyer <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>
---	---

Rapporteurs

Nadeem Ghafoor <i>Canadensys Aerospace Corporation — CANADA</i>	Sylvie Espinasse <i>European Space Agency (ESA) — THE NETHERLANDS</i>
---	---

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

Pierre W. Bousquet <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Vincenzo Giorgio <i>Thales Alenia Space Italia — ITALY</i>
--	--

Rapporteurs

Amalia Ercoli Finzi <i>Politecnico di Milano — ITALY</i>	Cheryl Reed <i>The Johns Hopkins University Applied Physics Laboratory — UNITED STATES</i>
--	--

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

Pierre W. Bousquet <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Vincenzo Giorgio <i>Thales Alenia Space Italia — ITALY</i>
--	--

Rapporteurs

Amalia Ercoli Finzi <i>Politecnico di Milano — ITALY</i>	Cheryl Reed <i>The Johns Hopkins University Applied Physics Laboratory — UNITED STATES</i>
--	--

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

Stephan Ulamec <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i>	Susan McKenna-Lawlor <i>Space Technology (Ireland) Ltd. — IRELAND</i>
--	---

Rapporteurs

Marc D. Rayman <i>Jet Propulsion Laboratory - California Institute of Technology — UNITED STATES</i>	Norbert Frischauf <i>— AUSTRIA</i>
--	--

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.

A3.5 Solar System Exploration
This session covers robotic missions for Solar System exploration (inner and outer planets and their satellites, and space plasma physics) except the Earth, Moon, Mars, and small bodies covered in other sessions of this symposium. Papers covering both new mission concepts as well as the associated specific technologies are invited.

Co-Chairs

Junichiro Kawaguchi <i>Japan Aerospace Exploration Agency (JAXA) — JAPAN</i>	Mariella Graziano <i>GMV Aerospace & Defence SAU — SPAIN</i>
--	--

Rapporteurs

Alain Ouellet <i>Canadian Space Agency — CANADA</i>	Charles E. Cockrell Jr <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>
---	--

A3.IP Interactive Presentations
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 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

Bernard Foing <i>ESA/ESTEC, ILEWVG & VU Amsterdam — THE NETHERLANDS</i>	Christian Sallaberger <i>Canadensys Aerospace Corporation — CANADA</i>
---	--

A4 47th IAA SYMPOSIUM ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) – THE NEXT STEPS
This symposium organised by the International Academy of Astronautics (IAA) deals with the scientific, technical and interdisciplinary aspects of the search for extra-terrestrial intelligence (SETI) including a discussion of all kinds of contacts. The technical side is not limited to the microwave window, but includes also optical and any kinds of radiation. The interdisciplinary aspects include all societal implications, risk communication and philosophical considerations of any kind of discovery or contact.

Coordinator

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

A4.1 SETI 1: SETI Science and Technology
All technical aspects involved in the search for extraterrestrial intelligence, including current and future search strategies.

Co-Chairs

Ian Morrison <i>Swinburne University of Technology — AUSTRALIA</i>	Michael Albert Garrett <i>University of Manchester — UNITED KINGDOM</i>
--	---

Rapporteur

Andrew Siemion
University of California / ASTRON / Radboud University — UNITED STATES

A4.2 SETI 2: SETI and Society
All aspects concerning the societal implications of extraterrestrial intelligence are considered, including public reaction to a discovery, risk communication and the possible.

Co-Chairs

Carol Oliver <i>University of New South Wales — AUSTRALIA</i>	Morris Jones <i>Independent Space Analyst — AUSTRALIA</i>	Paul Davies <i>Arizona State University — UNITED STATES</i>
---	---	---

A4.IP Interactive Presentations
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 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-Chair

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

A5 21st IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM
This Symposium, organised 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 <i>Canadensys Aerospace Corporation — CANADA</i>	Maria Antonietta Perino <i>Thales Alenia Space Italia — ITALY</i>
--	---

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

Michael Raftery <i>Boeing Defense Space & Security — UNITED STATES</i>	Nadeem Ghafoor <i>Canadensys Aerospace Corporation — CANADA</i>
--	---

Rapporteur

Marc Haese
DLR, German Aerospace Center — GERMANY

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

Co-Chairs
Kathy Laurini
National Aeronautics and Space Administration (NASA) — UNITED STATES

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

Rapporteur
Norbert Frischauf
— AUSTRIA

A5.3 B3.6 Human and Robotic Partnerships in Exploration – Joint session of the Human Spaceflight and 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
Christian Sallaberger
Canadensys Aerospace Corporation — CANADA

Rapporteur
M. Hempell
Hempell Astronautics Limited — UNITED KINGDOM

A5.4 D2.8 Joint-session: Space Transportation Solutions for Deep Space Missions
This joint session will explore space transportation capabilities, existing or under study, for human space exploration missions, new science, programme architectures, technology demonstrations as well as the issues of scientific and political motivations and international cooperation. The session will also deal with worldwide needs, requirements and potential missions enabled by deep space transportation system.

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

Ernst Messerschmid
University of Stuttgart — GERMANY

K. Bruce Morris
RUAG Space — SWEDEN

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

Rapporteur
Gerhard Schwehm
European Space Agency (ESA) — THE NETHERLANDS

A5.1P Interactive Presentations
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 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-Chair
Christian Sallaberger
Canadensys Aerospace Corporation — CANADA

Maria Antonietta Perino
Thales Alenia Space Italia — ITALY

A6 16th IAA SYMPOSIUM ON SPACE DEBRIS
This symposium organised by the Interantional Academy of Astronautics (IAA) will address the complete spectrum of technical issues of space debris: measurements, modelling, risk assessment in space and on the ground, reentry, hypervelocity impacts and protection, mitigation and standards, and Space Surveillance.

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

J.-C. Liou
National Aeronautics and Space Administration (NASA) — UNITED STATES

A6.1 Space Debris Detection, Tracking and Characterization
This session will address advanced ground and space-based measurement techniques, relating processing methods, and results of space debris characterization.

Co-Chairs
Frank Di Pentino
Integrity Applications Incorporated (IAI) — UNITED STATES

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

Rapporteur
Vladimir Agapov
Russian Academy of Sciences — RUSSIAN FEDERATION

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 assessments. The in-orbit analysis will cover collision risk estimates based on statistical population models and deterministic catalogues, and active avoidance.

Co-Chairs
Daniel Oltrogge
Analytical Graphics, Inc. — UNITED STATES

Luciano Anselmo
ISTI-CNR — ITALY

Rapporteur
Marlon Sorge
The Aerospace Corporation — UNITED STATES

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, and component failures up to mission loss. 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
Frank Schaefer
Fraunhofer - Institut für Kurzeitdynamik, Ernst-Mach-Institut (EMI) — GERMANY

Norman Fitz-Coy
University of Florida — UNITED STATES

Rapporteur
Darren McKnight
Integrity Applications Incorporated (IAI) — UNITED STATES

A6.4 Mitigation and Standards
This session will focus on the definition and implementation of debris prevention and reduction measures and vehicle passive protection. The session will also address space debris mitigation guidelines and standards that exist already or are in preparation at the national or international level.

Co-Chairs
Holger Krag
European Space Agency (ESA) — GERMANY

Pierre Omaly
CNES — France

Rapporteur
David Finkleman
International Academy of Astronautics — UNITED STATES

A6.5 Post Mission Disposal and Space Debris Removal (1)
This session will address post-mission disposal and active removal techniques “ground and space based”, review potential solutions and identify implementation difficulties.

Co-Chairs
Benjamin Bastida Virgili
European Space Agency (ESA) — GERMANY

Fabrizio Piergentili
University of Rome “La Sapienza” — ITALY

Rapporteur
Fabio Santoni
University of Rome “La Sapienza” — ITALY

A6.6 Post Mission Disposal and Space Debris Removal (2)
This session 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 University — INDIA

Nicolas Bérend
ONERA - The French Aerospace Lab — FRANCE

Rapporteur
Luca Rossetini
D-ORBIT — ITALY

A6.7 Operations in Space Debris Environment, Situational Awareness
This session will address the multiple aspects associated to safe operations in Space dealing with Space Debris, including operational observations, orbit determination, catalogue build-up and maintenance, data aggregation from different sources, relevant data exchanges standards and conjunctions analyses.

Co-Chairs
Carsten Wiedemann
TU Braunschweig, Institute of Space Systems — GERMANY

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

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

A6.8 Policy, Legal, Institutional and Economic Aspects of Space Debris Detection, Mitigation and Removal (joint session with Space Security Committee)
This session will deal with the non-technical aspects of space debris detection, mitigation and removal. Policy, legal and institutional aspects includes role of IADC and UNCOPOUS and other multilateral bodies. Economic issues including insurance, financial incentives and funding for space debris mitigation and removal. The role of international cooperation in addressing these issues will be considered.

Co-Chairs
Alexander Soucek
ESA/ESRIN — ITALY

David B. Spencer
The Pennsylvania State University — UNITED STATES

Serge Plattard
European Space Policy Institute (ESPI) — AUSTRIA

Rapporteur
A. Anilkumar
Vanderbilt University — UNITED STATES

A6.9 Orbit Dtermination and Propagation
This session will address aspects of space debris orbit determination related to assessment of raw and derived data accuracy, optical measurements processing and modelling and risk analysis of space debris.

Co-Chairs
Hugh G. Lewis
University of Southampton — UNITED KINGDOM

Rapporteur
Heiner Klinkrad
European Space Agency (ESA) — GERMANY

A6.10 B4.10 Joint Small Satellite/Space Debris Session to promote the long-term sustainability of space
This session facilitates bilateral discussions between Small Satellite and Space Debris communities for shared understanding of the challenges/issues and to promote practical small satellite solutions for the long-term sustainability of space. It will include topics such as: - Orbital debris mitigation solutions for small satellites and mega constellations - Small satellite orbital debris mitigation lessons learned, best practices and expected norms of behaviour (including minimization of post-mission orbit lifetime, trackability) - Orbital debris mitigation compliance statistics and monitoring methods (for both small and large satellites) - Stakeholder education (bilateral) - Collision and warning risk assessment techniques and resulting estimates - Mitigation of risks to other operational spacecraft (ISS, etc.) - Small satellite propulsive requirements, methods and technology - Small satellite orbit regulation concepts - Small satellite deorbit technologies and lessons learned - Small satellite mission assurance, reliability and lessons learned - Small satellite deployment best practices and lessons learned - Tracking organization and small satellite operator interplay - Orbit, maneuver, and scenario data exchange. This session will be accepting submissions for oral presentations only.

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

Daniel Oltrogge
Analytical Graphics, Inc. — UNITED STATES

Norman Fitz-Coy
University of Florida — UNITED STATES

Co-Chair
Rene Laufer
Baylor University / University of Cape Town — UNITED STATES

Rapporteur
Christian Cazaux
Centre National d'Etudes Spatiales (CNES) — FRANCE

A6.11 C1.10 Joint Astrodynamics/Space Debris Session: "Orbital Safety and Optimal Operations in an Increasingly Congested Environment"
This joint session will concern itself with the technical challenges driven by salient problems in space debris and space traffic that can be well informed by contributions from the field of astrodynamics (the science that studies the motion of objects in space). Specific issues regarding long-term population assessments and predictions, safely operating NextGen (large) Constellations, determining the data and modelling requirements to uniquely identify and predict the motion of objects in space (e.g. class specific), discovering and developing improved methods of debris mitigation and remediation founded upon forces and torques, development of semi-analytical theories relevant to specific classes and types of orbital debris, etc. are of relevance to this joint session.

Co-Chair
Moriba Jah
University of Arizona — UNITED STATES

Rapporteur
Thomas Schildknecht
Astronomical Institute University of Bern (AIUB) / SwissSpace Association — SWITZERLAND

A6.1P Interactive Presentations
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 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
Christophe Bonnal
Centre National d'Etudes Spatiales (CNES) — FRANCE

Darren McKnight
Integrity Applications Incorporated (IAI) — UNITED STATES

Tetsuo Yasaka
QPS Institute — JAPAN

- A7 SYMPOSIUM ON FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS**
The Symposium invites leaders from the science, space industry, and space-agencies community to share information, insights, and planning for 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.
- Coordinator**
Jakob van Zyl
National Aeronautics and Space Administration (NASA)
— UNITED STATES
- A7.1 Space Agency Strategies and Plans**
The first session includes invited talks by international space-agency division directors about their long-term views, priorities, and plans to implement developments and missions for the five fields (exoplanets, space astronomy, space physics, fundamental physics, and outer solar system planetary science). The mission scope ranges from flagship-class, large-class, medium-class, and small-class to smallsat platforms. The program scope includes status updates on current programs, near-term investment priorities, and long-range directions, including the relationship to community and guiding research panels
- Co-Chairs**
Jakob van Zyl
National Aeronautics and Space Administration (NASA)
— UNITED STATES
- Pietro Ubertini**
INAF — ITALY
- Rapporteur**
Brent Sherwood
Caltech/JPL — UNITED STATES
- A7.2 Science Goals and Drivers for Future Exoplanet, Space Astronomy, Physics, and Outer Solar System Science Missions**
The second session includes invited and contributed talks about scientific motivations, goals, opportunities, and needs in the five fields (exoplanets, space astronomy, space physics, fundamental physics, and outer solar system planetary science). 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**
Brent Sherwood
Caltech/JPL — UNITED STATES
- Pietro Ubertini**
INAF — ITALY
- Rapporteur**
Eric Wille
ESA — THE NETHERLANDS
- A7.3 Technology Needs for Future Missions, Systems, and Instruments**
The third 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; fundamental physics including relativity; and outer solar system planetary science including gas giants, ice giants, complex planetary systems, primordial body populations, and ocean worlds. 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
- Jakob van Zyl**
National Aeronautics and Space Administration (NASA)
— UNITED STATES
- Rapporteur**
Brent Sherwood
Caltech/JPL — UNITED STATES
- A7.IP Interactive Presentations**
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 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-Chair**
Jakob van Zyl
National Aeronautics and Space Administration (NASA)
— UNITED STATES

Category B

APPLICATIONS AND OPERATIONS

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

- B1 EARTH OBSERVATION SYMPOSIUM**
- B2 SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM**
- B3 HUMAN SPACEFLIGHT SYMPOSIUM**
- B4 25TH IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS**
- B5 SYMPOSIUM ON INTEGRATED APPLICATIONS**
- B6 SPACE OPERATIONS SYMPOSIUM**

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

- B1 EARTH OBSERVATION SYMPOSIUM**
The Earth Observation Committee covers all aspects of Earth observations from space, especially observations related to the Earth's environment and including mission planning, microwave and optical sensors and technologies, systems for land, oceanographic, and atmospheric applications, ground data-processing.
- Coordinators**
Andrew Court
TNO — THE NETHERLANDS
- Gunter Schreier**
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
- B1.1 International Cooperation in Earth Observation Missions**
Focus is on efforts being made by governments, agencies and society to achieve coordination, cooperation and compatibility in the development of space-based Earth observation systems. Presentations are encouraged which involve cooperative efforts with developing countries. Papers on current and ongoing missions involving coordination among commercial, government and other entities are especially encouraged.
- Co-Chairs**
John Hussey
Consultant — UNITED STATES
- K.R. Sridhara Murthi**
NIAS — India
- Rapporteur**
Brent Smith
National Oceanic and Atmospheric Administration (NOAA)
— UNITED STATES
- B1.2 Future Earth Observation Systems**
Emphasis is on technical descriptions of planned and new space systems and missions for experimental and operational Earth observation. Descriptions of new concepts and innovative Earth observation systems are encouraged.
- Co-Chairs**
Alain Gleyzes
Centre National d'Etudes Spatiales (CNES) — FRANCE
- Timo Stuffer**
OHB System AG - Munich — GERMANY
- Rapporteur**
Gunter Schreier
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
- B1.3 Earth Observation Sensors and Technology**
Focus is on sensors now being developed or tested for all aspects of Earth observation. Particular emphasis is on new sensors, technologies, instruments or techniques that can provide either new measurements or improved data for science, operational or commercial applications.
- Co-Chairs**
Andrew Court
TNO — THE NETHERLANDS
- Ralph Girard**
Canadian Space Agency — CANADA
- Rapporteur**
Yean Joo Chong
National University of Singapore — SINGAPORE, REPUBLIC OF
- B1.4 Earth Observation Data Management Systems**
Focus is on Earth Observation related data systems. Emphasis is on the challenges of new IT and web technologies (e.g. Big Data, Cloud, crowd sourcing) for acquisition, communication, processing, dissemination and archiving systems and concepts needed to address large data volumes. The session also covers innovative methods for the extraction of information from these large data systems and methods for making the results available to decision makers. Presentation of International coordination and programmes - on Earth Observation data -related systems - is also encouraged.
- Co-Chairs**
Gunter Schreier
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY
- James E. Graf**
National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratory — UNITED STATES
- Rapporteur**
Na Yao
China Academy of Space Technology (CAST) — CHINA
- B1.5 Earth Observation Applications, Societal Challenges and Economic Benefits**
Focus is on using Earth Observation data to generate value-added products and services, for meeting societal challenges or addressing new commercial approaches. Presentation of algorithms, processing chains and services (specifically based on web technologies) for science and governmental users, as well as for commercial users including consideration of specific investments and commercial benefits in a "New Space" framework are encouraged.
- Co-Chairs**
Luigi Bussolino
Bussolino and Associates — ITALY
- Paul Kamoun**
Thales Alenia Space France — FRANCE
- Rapporteur**
Yean Joo Chong
National University of Singapore — SINGAPORE, REPUBLIC OF
- B1.6 Citizen Science in Global Earth Observation Systems**
This joint session follows an Adelaide IAC Global Networking Forum initial identification of this topic in the kickoff of a continuing partnership involving the IAF Subcommittee on Global Earth Observation System of Systems and IAF's Workforce Development and Young Professional Programme (WD/YPP) Committee. Papers selected for B1.6. will be presented together with presentations from virtual participants in a WD/YPP Global Forum organized in collaboration with the Bremen IAC Local Organizing Committee. This combined Technical Session/Global Forum will focus on the role of citizen science and crowd sourcing in Earth observation. It will address different concepts for involving citizen scientists through different media venues and describe benefits derived from the activity. It will cover crowd sourcing methodology, experience from past and present projects, and how to best involve people from around the globe in Earth observation.
- Co-Chairs**
Harry A. Cikanek
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES
- Rapporteur**
Brent Smith
National Oceanic and Atmospheric Administration (NOAA) — UNITED STATES



Rapporteurs

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

Marco D'Errico
Seconda Universita' di Napoli — 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
National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratory — UNITED STATES

Rene Laufer
Baylor University / University of Cape Town — UNITED STATES

B4.9

GTS.5

Small Satellite Missions Global Technical Session

The Small Satellite Missions Global Technical Session (GTS) is 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

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

Rhoda Shaller Hornstein
— UNITED STATES

B4.10

A6.10

Joint Small Satellite/Space Debris Session to promote the long-term sustainability of space

This session facilitates bilateral discussions between Small Satellite and Space Debris communities for shared understanding of the challenges/issues and to promote practical small satellite solutions for the long-term sustainability of space. It will include topics such as: - Orbital debris mitigation solutions for small satellites and mega constellations - Small satellite orbital debris mitigation lessons learned, best practices and expected norms of behavior (including minimization of post-mission orbit lifetime, trackability) - Orbital debris mitigation compliance statistics and monitoring methods (for both small and large satellites) - Stakeholder education (bilateral) - Collision and warning risk assessment techniques and resulting estimates - Mitigation of risks to other operational spacecraft (ISS, etc.) - Small satellite propulsive requirements, methods and technology - Small satellite orbit regulation concepts - Small satellite deorbit technologies and lessons learned - Small satellite mission assurance, reliability and lessons learned - Small satellite deployment best practices and lessons learned - Tracking organization and small satellite operator interplay - Orbit, maneuver, and scenario data exchange This session will be accepting submissions for oral presentation only.

Co-Chairs

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

Daniel Oltrogge
Analytical Graphics, Inc. — UNITED STATES

Norman Fitz-Coy
University of Florida — UNITED STATES

Co-Chairs

Rene Laufer
Baylor University / University of Cape Town — UNITED STATES

Christian Cazaux
Centre National d'Etudes Spatiales (CNES) — FRANCE

B5

SYMPOSIUM ON INTEGRATED APPLICATIONS

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

Coordinators

Larry Paxton
The John Hopkins University Applied Physics Laboratory — 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 and address the various issues associated with the design of space and ground systems, the kind of data they collect, how they collect data, and how the data are integrated and distributed to address key user needs. Possible topics include: ground-truthing of space data; innovative, low-cost tools for space data distribution and access; new ways of distributing integrated data products; data fusion and visualisation tools especially those using COTS systems; managing integrated applications programmes; education and outreach for integrated programmes, etc...

Co-Chairs

Boris Penne
OHB System AG — GERMANY

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

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

Rapporteur

Beatrice Barresi
ESA — UNITED KINGDOM

B5.2

Integrated Applications End-to-End Solutions

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

Co-Chairs

Boris Penne
OHB System AG — GERMANY

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

Rapporteurs

Beatrice Barresi
ESA — UNITED KINGDOM

Yuval Brodsky
Newton VR Ltd. — ISRAEL

B6

SPACE OPERATIONS SYMPOSIUM

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

Coordinators

John Auburn
RHEATECH Ltd — UNITED KINGDOM

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

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

Mario Cardano
Thales Alenia Space France — ITALY

Michael McKay
European Space Agency (ESA) — GERMANY

Rapporteur
Hegyí Akos
Airbus D&S — France

B6.2

New Space Operations Concepts and Advanced Systems

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

Co-Chairs

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

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

Rapporteur
Keiichiro Sakagami
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.

Co-Chairs

Paolo Ferri
European Space Agency (ESA) — GERMANY

Zeina Mounzer
Telespazio VEGA Deutschland GmbH — GERMANY

Rapporteur
Borre Pedersen
Kongsberg Satellite Services AS — NORWAY

B6.4

GTS.1

Spaceflight Operations Global Technical Session

This session addresses hands-on space flight operations personnel from multiple international organisations with objectives of sharing best practices, lessons learned, and issues. Your paper can be presented on site at the IAC or through a virtual forum broadcast live on the internet. It is co-sponsored by the Space Operations Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Adnan Al Rais
Mohammed Bin Rashid Space Centre (MBRSC) — UNITED ARAB EMIRATES

Andrea Boyd
European Space Agency (ESA) — AUSTRIA

Rapporteur
Ahmed Farid
Telespazio VEGA Deutschland GmbH — Germany

B6.5

B3.4

Flight & Ground Operations of HSF Systems – Joint Session of the Human Spaceflight and Space Operations Symposia

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

Co-Chairs

Annamaria Piras
Thales Alenia Space Italia — ITALY

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

Rapporteur
Thomas A.E. Andersen
Danish Aerospace Company ApS — DENMARK

B6.IP

Interactive Presentations

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 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 B Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Coordinators

John Auburn
RHEATECH Ltd — UNITED KINGDOM

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



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

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

Category coordinated by *Li Ming, China Academy of Space Technology (CAST), China*

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

Coordinators

Alfred Ng <i>Canadian Space Agency — CANADA</i>	Anna Guerman <i>Centre for Mechanical and Aerospace Science and Technologies (C-MAST) — PORTUGAL</i>
---	--

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		Rapporteur
James O'Donnell <i>National Aeronautics and Space Administration (NASA)/Goddard Space Flight Center — UNITED STATES</i>	Shinji Hokamoto <i>Kyushu University — JAPAN</i>	Gianmarco Radice <i>University of Glasgow — UNITED KINGDOM</i>

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		Rapporteur
Michael Yu Ovchinnikov <i>Keldysh Institute of Applied Mathematics, RAS — RUSSIAN FEDERATION</i>	Paolo Teofilatto <i>University of Rome "La Sapienza" — ITALY</i>	Hao-Chi Chang <i>tiSPACE Inc. — UNKNOWN</i>

C1.3 Guidance, Navigation & Control (1)
The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth-orbiting and interplanetary spacecraft and rockets, including formation flying, rendezvous and docking.

Co-Chairs		Rapporteur
Stephan Theil <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i>	Yong Chun Xie <i>Beijing Institute of Control Engineering — CHINA</i>	Fuyuto Terui <i>Japan Aerospace Exploration Agency (JAXA) — JAPAN</i>

C1.4 Guidance, Navigation & Control (2)
The emphasis of this theme is on the studies and application related to the guidance, navigation and control of Earth-orbiting and interplanetary spacecraft and rockets, including formation flying, rendezvous and docking.

Co-Chairs		Rapporteur
Anton de Ruiter <i>Ryerson University — CANADA</i>	Bernard Lübke-Ossenbeck <i>OHB System AG-Bremen — GERMANY</i>	Igor V. Belokonov <i>Samara State Aerospace University — RUSSIAN FEDERATION</i>

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 and rockets, including formation flying, rendezvous and docking.

Co-Chairs		Rapporteur
Arun Misra <i>Mc Gill Institute for Aerospace Engineering (MIAE) — CANADA</i>	Moriba Jah <i>University of Arizona — UNITED STATES</i>	Shoji Yoshikawa <i>Mitsubishi Electric Corporation — JAPAN</i>

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		Rapporteur
Michèle Lavagna <i>Politecnico di Milano — ITALY</i>	Stéphanie Lizy-Destrez <i>SUPAERO- Ecole Nationale Supérieure de l'Aéronautique et de l'Espace — FRANCE</i>	
Rapporteurs		
Johannes Schoenmaekers <i>European Space Operations Centre — GERMANY</i>	Vincent Martinot <i>Thales Alenia Space France — FRANCE</i>	

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		Rapporteur
Kathleen Howell <i>Purdue University — UNITED STATES</i>	Massimiliano Vasile <i>University of Strathclyde — UNITED KINGDOM</i>	
Rapporteurs		
Richard Epenoy <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Xiao Qian Chen <i>National University of Defense Technology — CHINA</i>	

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		Rapporteur
Laureano Cangahuala <i>Jet Propulsion Laboratory — UNITED STATES</i>	Simei Ji <i>Beijing Institute of Technology — CHINA</i>	
Rapporteurs		
Filippo Graziani <i>G.A.U.S.S. Srl — ITALY</i>	Josep J. Masdemont <i>Universitat Politècnica de Catalunya (UPC) — SPAIN</i>	

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		Rapporteur
Daniel Scheeres <i>University of Colorado, Colorado Center for Astrodynamics Research — UNITED STATES</i>	Gerard Gomez <i>University of Barcelona — SPAIN</i>	Antonio Prado <i>National Institute for Space Research - INPE — BRAZIL</i>

C1.10 A6.11 Joint Astrodynamics/Space Debris Session: "Orbital Safety and Optimal Operations in an Increasingly Congested Environment"
This joint session will concern itself with the technical challenges driven by salient problems in space debris and space traffic that can be well informed by contributions from the field of astrodynamics (the science that studies the motion of objects in space). Specific issues regarding long-term population assessments and predictions, safely operating NextGen (large) Constellations, determining the data and modeling requirements to uniquely identify and predict the motion of objects in space (e.g. class specific), discovering and developing improved methods of debris mitigation and remediation founded upon forces and torques, development of semi-analytical theories relevant to specific classes and types of orbital debris, etc. are of relevance to this joint session.

Co-Chairs		Rapporteur
Moriba Jah <i>University of Arizona — UNITED STATES</i>	Thomas Schildknecht <i>Astronomical Institute University of Bern (AIUB) / SwissSpace Association — SWITZERLAND</i>	

C1.IP Interactive Presentations
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 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 C Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair		Rapporteur
Alfred Ng <i>Canadian Space Agency — CANADA</i>	Anna Guerman <i>Centre for Mechanical and Aerospace Science and Technologies (C-MAST) — PORTUGAL</i>	

C2 MATERIALS AND STRUCTURES SYMPOSIUM
This symposium provides an international forum for recent advancements in assessment of the latest technology achievements in space structures, structural dynamics and materials. The Symposium addresses the design and development of space vehicle structures and mechanical/thermal/fluidic systems. Future advances in a number of space systems applications for space power, space transportation, astrodynamics, space exploration, space propulsion and space station will depend increasingly on the successful application of innovative materials and the development of structural concepts - particularly those relating to very large deployable (and assembled) space structures. For these applications to occur, increased interaction between these technology communities, and collaboration among technologists and mission planners needs to be pursued. Substantial improvements are essential in a wide range of current technologies, including nanotechnologies, to reduce projected costs and increase potential scientific returns from respective mission system applications. Papers in this symposium will review the projected advances in materials and space structures in this domain for advanced space systems applications.

Coordinator		Rapporteur
Andreas Rittweger <i>DLR (German Aerospace Center) — GERMANY</i>	Paolo Gasbarri <i>Università di Roma "La Sapienza" — ITALY</i>	

C2.1 Space Structures I - Development and Verification (Space Vehicles and Components)
The topics to be addressed include evaluation of analysis versus test results, spacecraft and launch vehicles system and subsystems, e.g. pressurised structures, tanks, loads introduction, primary structures, fluidic equipment, control surfaces; examination of both on-ground and in-orbit testing, launch dynamic environment as related to structural design, space vehicle development and launch verification such as sine, random and acoustic vibration testing, and lessons learned.

Co-Chairs		Rapporteur
Alwin Eisenmann <i>IABG Industrieanlagen - Betriebsgesellschaft mbH — GERMANY</i>	Andreas Rittweger <i>DLR (German Aerospace Center) — GERMANY</i>	Jochen Albus <i>Airbus DS GmbH — GERMANY</i>

C2.2 Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures)
The topics to be addressed include evaluation of analysis versus test results for deployable and dimensionally stable structures, e.g. reflectors, telescopes, antennas; examination of both on-ground and in-orbit testing, thermal distortion and shape control, structural design, development and verification; lessons learned.

Co-Chairs		Rapporteur
Oliver Kunz <i>RUAG SPACE — SWITZERLAND</i>	Paolo Gasbarri <i>Università di Roma "La Sapienza" — ITALY</i>	Pierre Rochus <i>CSL (Centre Spatial de Liège) — BELGIUM</i>

C2.3 Space Structures - Dynamics and Microdynamics
The topics to be addressed include dynamics analysis and testing, modal identification, landing and impact dynamics, pyroshock, test facilities, vibration suppression techniques, damping, micro-dynamics, in-orbit dynamic environment, wave structural propagation, excitation sources and in-orbit dynamic testing.

Co-Chairs		Rapporteur
Harijono Djojodihardjo <i>— INDONESIA</i>	Ijar M. Da Fonseca <i>ITA-DCTA — BRAZIL</i>	Luigi Scatteia <i>PricewaterhouseCoopers Advisory — FRANCE</i>



C4.1	<p>Propulsion System (1) This session is dedicated to all aspects of Liquid Rocket Engines.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Christophe Bonhomme <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i></td> <td>Patrick Danous <i>Snecma — FRANCE</i></td> </tr> </table> <p>Rapporteurs</p> <table border="0"> <tr> <td>Akira Ogawara <i>Mitsubishi Heavy Industries, Ltd. — JAPAN</i></td> <td>Ozan Kara <i>Koc University — TURKEY</i></td> </tr> </table>	Christophe Bonhomme <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Patrick Danous <i>Snecma — FRANCE</i>	Akira Ogawara <i>Mitsubishi Heavy Industries, Ltd. — JAPAN</i>	Ozan Kara <i>Koc University — TURKEY</i>	
Christophe Bonhomme <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Patrick Danous <i>Snecma — FRANCE</i>					
Akira Ogawara <i>Mitsubishi Heavy Industries, Ltd. — JAPAN</i>	Ozan Kara <i>Koc University — TURKEY</i>					
C4.2	<p>Propulsion System (2) This session is dedicated to all aspects of Solid and Hybrid Propulsion.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Stéphane Henry <i>ArianeGroup — FRANCE</i></td> <td>Toru Shimada <i>Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN</i></td> <td>Rapporteur Yen-Sen Chen <i>American Institute of Aeronautics and Astronautics (AIAA) — TAIWAN, CHINA</i></td> </tr> </table>	Stéphane Henry <i>ArianeGroup — FRANCE</i>	Toru Shimada <i>Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN</i>	Rapporteur Yen-Sen Chen <i>American Institute of Aeronautics and Astronautics (AIAA) — TAIWAN, CHINA</i>		
Stéphane Henry <i>ArianeGroup — FRANCE</i>	Toru Shimada <i>Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency — JAPAN</i>	Rapporteur Yen-Sen Chen <i>American Institute of Aeronautics and Astronautics (AIAA) — TAIWAN, CHINA</i>				
C4.3	<p>Propulsion Technology (1) This session includes all science and technologies supporting all aspects of space propulsion. The emphasis in this session is placed in particular on components for propulsion.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Angelo Cervone <i>Delft University of Technology (TU Delft) — THE NETHERLANDS</i></td> <td>Didier Boury <i>Herakles (Safran group) — FRANCE</i></td> </tr> </table> <p>Rapporteurs</p> <table border="0"> <tr> <td>Changjin Lee <i>Konkuk University — KOREA, REPUBLIC OF</i></td> <td>John Harlow <i>Aerojet Rocketdyne — UNITED KINGDOM</i></td> </tr> </table>	Angelo Cervone <i>Delft University of Technology (TU Delft) — THE NETHERLANDS</i>	Didier Boury <i>Herakles (Safran group) — FRANCE</i>	Changjin Lee <i>Konkuk University — KOREA, REPUBLIC OF</i>	John Harlow <i>Aerojet Rocketdyne — UNITED KINGDOM</i>	
Angelo Cervone <i>Delft University of Technology (TU Delft) — THE NETHERLANDS</i>	Didier Boury <i>Herakles (Safran group) — FRANCE</i>					
Changjin Lee <i>Konkuk University — KOREA, REPUBLIC OF</i>	John Harlow <i>Aerojet Rocketdyne — UNITED KINGDOM</i>					
C4.4	<p>Electric Propulsion This session is dedicated to all aspects of electric propulsion technologies, systems and applications.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Garrí A. Popov <i>Research Institute of Applied Mechanics and Electrodynamics — RUSSIA</i></td> <td>Norbert Puettmann <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i></td> </tr> </table> <p>Rapporteurs</p> <table border="0"> <tr> <td>Nicoletta Wagner <i>Airbus DS GmbH — GERMANY</i></td> <td>Vanessa Vial <i>Safran Aircraft Engines — FRANCE</i></td> </tr> </table>	Garrí A. Popov <i>Research Institute of Applied Mechanics and Electrodynamics — RUSSIA</i>	Norbert Puettmann <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i>	Nicoletta Wagner <i>Airbus DS GmbH — GERMANY</i>	Vanessa Vial <i>Safran Aircraft Engines — FRANCE</i>	
Garrí A. Popov <i>Research Institute of Applied Mechanics and Electrodynamics — RUSSIA</i>	Norbert Puettmann <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i>					
Nicoletta Wagner <i>Airbus DS GmbH — GERMANY</i>	Vanessa Vial <i>Safran Aircraft Engines — FRANCE</i>					
C4.5	<p>Propulsion Technology (2) This session includes all science and technologies supporting all aspects of space propulsion. An objective is to attract papers from students and young professionals with a more technical rather than programmatic or organisational focus.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Jacques Gigou <i>European Space Agency (ESA) — FRANCE</i></td> <td>Walter Zinner <i>Airbus Safran Launchers — GERMANY</i></td> <td>Rapporteur Max Calabro <i>The Inner Arch — FRANCE</i></td> </tr> </table>	Jacques Gigou <i>European Space Agency (ESA) — FRANCE</i>	Walter Zinner <i>Airbus Safran Launchers — GERMANY</i>	Rapporteur Max Calabro <i>The Inner Arch — FRANCE</i>		
Jacques Gigou <i>European Space Agency (ESA) — FRANCE</i>	Walter Zinner <i>Airbus Safran Launchers — GERMANY</i>	Rapporteur Max Calabro <i>The Inner Arch — FRANCE</i>				
C4.6	<p>New Missions Enabled by New Propulsion Technology and Systems The session will explore concepts for new missions that can be enabled by specific advancements in propulsion and/or integration of various propulsion technologies and systems.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Giorgio Saccoccia <i>SSC Keldysh Research Centre — RUSSIAN FEDERATION</i></td> <td>Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i></td> </tr> </table> <p>Rapporteurs</p> <table border="0"> <tr> <td>Alexander Lovtsov <i>Space Generation Advisory Council (SGAC) — ITALY</i></td> <td>Elena Toson <i>Space Generation Advisory Council (SGAC) — ITALY</i></td> </tr> </table>	Giorgio Saccoccia <i>SSC Keldysh Research Centre — RUSSIAN FEDERATION</i>	Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i>	Alexander Lovtsov <i>Space Generation Advisory Council (SGAC) — ITALY</i>	Elena Toson <i>Space Generation Advisory Council (SGAC) — ITALY</i>	
Giorgio Saccoccia <i>SSC Keldysh Research Centre — RUSSIAN FEDERATION</i>	Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i>					
Alexander Lovtsov <i>Space Generation Advisory Council (SGAC) — ITALY</i>	Elena Toson <i>Space Generation Advisory Council (SGAC) — ITALY</i>					
C4.7	<p>Joint Session on Advanced and Nuclear Power and Propulsion Systems This session, organised jointly between the Space Power and the Space Propulsion Symposiums, includes papers addressing all aspects related to advanced and nuclear power and propulsion systems for space applications.</p> <p>Co-Chair</p> <table border="0"> <tr> <td>Jerome Breteau <i>European Space Agency (ESA) — FRANCE</i></td> <td>Leopold Summerer <i>European Space Agency (ESA) — THE NETHERLANDS</i></td> </tr> </table> <p>Rapporteurs</p> <table border="0"> <tr> <td>Changjin Lee <i>Konkuk University — KOREA, REPUBLIC OF</i></td> <td>Constance Syring <i>ArianeGroup — GERMANY</i></td> <td>Vito Salvatore <i>CIRA Italian Aerospace Research Center, Capua — ITALY</i></td> </tr> </table>	Jerome Breteau <i>European Space Agency (ESA) — FRANCE</i>	Leopold Summerer <i>European Space Agency (ESA) — THE NETHERLANDS</i>	Changjin Lee <i>Konkuk University — KOREA, REPUBLIC OF</i>	Constance Syring <i>ArianeGroup — GERMANY</i>	Vito Salvatore <i>CIRA Italian Aerospace Research Center, Capua — ITALY</i>
Jerome Breteau <i>European Space Agency (ESA) — FRANCE</i>	Leopold Summerer <i>European Space Agency (ESA) — THE NETHERLANDS</i>					
Changjin Lee <i>Konkuk University — KOREA, REPUBLIC OF</i>	Constance Syring <i>ArianeGroup — GERMANY</i>	Vito Salvatore <i>CIRA Italian Aerospace Research Center, Capua — ITALY</i>				
C4.8 B4.5A	<p>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 focus on other propulsion systems and technologies, refer to other C4 sessions.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Arnaud Pons Lorente <i>Space Generation Advisory Council (SGAC) — SPAIN</i></td> <td>Jeffery Emdee <i>The Aerospace Corporation — UNITED STATES</i></td> </tr> </table> <p>Rapporteurs</p> <table border="0"> <tr> <td>Elena Toson <i>Space Generation Advisory Council (SGAC) — ITALY</i></td> <td>Elizabeth Jens <i>NASA Jet Propulsion Laboratory — UNITED STATES</i></td> </tr> </table>	Arnaud Pons Lorente <i>Space Generation Advisory Council (SGAC) — SPAIN</i>	Jeffery Emdee <i>The Aerospace Corporation — UNITED STATES</i>	Elena Toson <i>Space Generation Advisory Council (SGAC) — ITALY</i>	Elizabeth Jens <i>NASA Jet Propulsion Laboratory — UNITED STATES</i>	
Arnaud Pons Lorente <i>Space Generation Advisory Council (SGAC) — SPAIN</i>	Jeffery Emdee <i>The Aerospace Corporation — UNITED STATES</i>					
Elena Toson <i>Space Generation Advisory Council (SGAC) — ITALY</i>	Elizabeth Jens <i>NASA Jet Propulsion Laboratory — UNITED STATES</i>					



C4.9	<p>Hypersonic Air-breathing and Combined Cycle Propulsion 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, denotation 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.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Helen Webber <i>Reaction Engines Ltd. — UNITED KINGDOM</i></td> <td>Riheng Zheng <i>China Aerospace Science & Industry Corporation (CASIC) — CHINA</i></td> <td>Rapporteur Salvatore Borrelli <i>CIRA Italian Aerospace Research Centre — ITALY</i></td> </tr> </table>	Helen Webber <i>Reaction Engines Ltd. — UNITED KINGDOM</i>	Riheng Zheng <i>China Aerospace Science & Industry Corporation (CASIC) — CHINA</i>	Rapporteur Salvatore Borrelli <i>CIRA Italian Aerospace Research Centre — ITALY</i>	
Helen Webber <i>Reaction Engines Ltd. — UNITED KINGDOM</i>	Riheng Zheng <i>China Aerospace Science & Industry Corporation (CASIC) — CHINA</i>	Rapporteur Salvatore Borrelli <i>CIRA Italian Aerospace Research Centre — ITALY</i>			
C4.10	<p>Propulsion Technology (3) This session included all science and technologies supporting all aspects of space propulsion.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Norbert Puettmann <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i></td> <td>Riheng Zheng <i>China Aerospace Science & Industry Corporation (CASIC) — CHINA</i></td> </tr> </table> <p>Rapporteurs</p> <table border="0"> <tr> <td>Angelo Cervone <i>Delft University of Technology (TU Delft) — THE NETHERLANDS</i></td> <td>Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i></td> </tr> </table>	Norbert Puettmann <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i>	Riheng Zheng <i>China Aerospace Science & Industry Corporation (CASIC) — CHINA</i>	Angelo Cervone <i>Delft University of Technology (TU Delft) — THE NETHERLANDS</i>	Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i>
Norbert Puettmann <i>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) — GERMANY</i>	Riheng Zheng <i>China Aerospace Science & Industry Corporation (CASIC) — CHINA</i>				
Angelo Cervone <i>Delft University of Technology (TU Delft) — THE NETHERLANDS</i>	Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i>				
C4.IP	<p>Interactive Presentations 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 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 C Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.</p> <p>Coordinators</p> <table border="0"> <tr> <td>Christophe Bonhomme <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i></td> <td>Elizabeth Jens <i>Jet Propulsion Laboratory - California Institute of Technology — UNITED STATES</i></td> <td>Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i></td> </tr> </table> <p>Yen-Sen Chen <i>American Institute of Aeronautics and Astronautics (AIAA) — TAIWAN, CHINA</i></p>	Christophe Bonhomme <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Elizabeth Jens <i>Jet Propulsion Laboratory - California Institute of Technology — UNITED STATES</i>	Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i>	
Christophe Bonhomme <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Elizabeth Jens <i>Jet Propulsion Laboratory - California Institute of Technology — UNITED STATES</i>	Jerrold Littles <i>Aerojet Rocketdyne — UNITED STATES</i>			

INFRASTRUCTURE

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

- D1 SPACE SYSTEMS SYMPOSIUM
- D2 SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM
- D3 16TH IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT
- D4 16TH IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE
- D5 51ST IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES
- D6 SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES

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

D1	<p>SPACE SYSTEMS SYMPOSIUM The Space Systems Symposium addresses the present and future development of space systems, architectures, and technologies, with sessions on System Engineering Methods, Processes, and Tools; Enabling Technologies for Space Systems; Significant Achievements in space systems with implications for Lessons Learned and future Training and Practice; Advanced System Architectures; Cooperative Space Systems, and Innovative and Visionary Space Systems of the future</p> <p>Coordinators</p> <table border="0"> <tr> <td>Jill Prince <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i></td> <td>Reinhold Bertrand <i>European Space Agency (ESA) — GERMANY</i></td> </tr> </table>	Jill Prince <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>	Reinhold Bertrand <i>European Space Agency (ESA) — GERMANY</i>	
Jill Prince <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>	Reinhold Bertrand <i>European Space Agency (ESA) — GERMANY</i>			
D1.1	<p>Innovative and Visionary Space Systems Concepts This session will explore innovative concepts, and services for space applications in future scenarios. The session objective is to broaden the opportunities for innovation in order to foster the involvement of people, from researchers and subject matter experts to other appropriate stakeholders, in building and advancing the future vision of novel and transformational space systems and relevant applications. In this perspective, the dreams of yesterday are the hope of today and the reality of tomorrow. By proposing novel concepts of space systems, and applications, we can broaden today's paradigm towards preferable outcomes beyond incremental advancements.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Peter Dieleman <i>National Aerospace Laboratory (NLR) — THE NETHERLANDS</i></td> <td>Tibor Balint <i>Royal College of Art — UNITED KINGDOM</i></td> <td>Rapporteur Camillo Richiello <i>CIRA Italian Aerospace Research Centre — ITALY</i></td> </tr> </table>	Peter Dieleman <i>National Aerospace Laboratory (NLR) — THE NETHERLANDS</i>	Tibor Balint <i>Royal College of Art — UNITED KINGDOM</i>	Rapporteur Camillo Richiello <i>CIRA Italian Aerospace Research Centre — ITALY</i>
Peter Dieleman <i>National Aerospace Laboratory (NLR) — THE NETHERLANDS</i>	Tibor Balint <i>Royal College of Art — UNITED KINGDOM</i>	Rapporteur Camillo Richiello <i>CIRA Italian Aerospace Research Centre — ITALY</i>		
D1.2	<p>Space Systems Architectures This session will explore innovative concepts, and services for space applications in future scenarios. The session objective is to broaden the opportunities for innovation in order to foster the involvement of people, from researchers and subject matter experts to other appropriate stakeholders, in building and advancing the future vision of novel and transformational space systems and relevant applications. In this perspective, the dreams of yesterday are the hope of today and the reality of tomorrow. By proposing novel concepts of space systems, and applications, we can broaden today's paradigm towards preferable outcomes beyond incremental advancements.</p> <p>Co-Chairs</p> <table border="0"> <tr> <td>Franck Durand-Carrier <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i></td> <td>Peter Dieleman <i>National Aerospace Laboratory (NLR) — THE NETHERLANDS</i></td> <td>Rapporteur Jill Prince <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i></td> </tr> </table>	Franck Durand-Carrier <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Peter Dieleman <i>National Aerospace Laboratory (NLR) — THE NETHERLANDS</i>	Rapporteur Jill Prince <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>
Franck Durand-Carrier <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Peter Dieleman <i>National Aerospace Laboratory (NLR) — THE NETHERLANDS</i>	Rapporteur Jill Prince <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>		

D2.IP

Interactive Presentations

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 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 D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair		Rapporteur
Christophe Bonnal <i>Centre National d'Etudes Spatiales (CNES) — FRANCE</i>	Daniel L. Dumbacher <i>Purdue University — UNITED STATES</i>	Carina Dorbath <i>MT Aerospace AG — GERMANY</i>

D3

16th 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	
Alain Pradier <i>European Space Agency (ESA) — THE NETHERLANDS</i>	John C. Mankins <i>ARTEMIS Innovation Management Solutions, LLC — UNITED STATES</i>

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		Rapporteur
John C. Mankins <i>ARTEMIS Innovation Management Solutions, LLC — UNITED STATES</i>	Maria Antonietta Perino <i>Thales Alenia Space Italia — ITALY</i>	Anouck Girard <i>University of Michigan — UNITED STATES</i>

D3.2

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

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

Co-Chairs		Rapporteur
Paivi Jukola <i>Aalto University — FINLAND</i>	Scott Hovland <i>European Space Agency (ESA) — THE NETHERLANDS</i>	William H. Siegfried <i>The Boeing Company — UNITED STATES</i>

D3.3

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

In order to realise future, sustainable programmes of space exploration, utilisation and commercial development, a focused suite of transformational new concepts and supporting technologies must be advanced during the coming years. The technical objectives to be pursued should be drawn from a broad, forward looking view of the technologies and systems needed, but must be sufficiently well focused to allow tangible progression—and dramatic improvements over current capabilities—to be realised in the foreseeable future. This session will address cross cutting research topics and/or technologies to enable future building blocks in Space Exploration and Development. Papers are solicited in these and related areas.

Co-Chairs		
Alain Pradier <i>European Space Agency (ESA) — THE NETHERLANDS</i>	Christopher Moore <i>National Aeronautics and Space Administration (NASA) — UNITED STATES</i>	
Rapporteurs		
Alain Dupas <i>European Bank for Reconstruction and Development — FRANCE</i>	Junjiro Onoda <i>Japan Society for Aeronautics and Space Sciences (JSASS) — JAPAN</i>	

D3.4

Space Technology and System Management Practices and Tools

The effective management of space technology and systems development is critical to future success in space exploration, development and discovery. This session is the next in an ongoing series at the International Astronautical Congress that provides a unique international forum to further the development of a family of ‘best practices and tools’ in this important field. Specific areas of potential interest include: (1) Technology Management Methodologies and Best Practices; (2) R&D Management Software Tools and Databases; and (3) Systems Analysis Methods and Tools. The full range of R&D activities are appropriate for discussion, ranging from technology development long-term planning, through technology R&D programmes, to system development projects, with special emphasis on the transition of new technologies from one stage to the next. Particular topics could include: Technology Readiness Levels (TRLs) and Technology Readiness Assessments, Technology R&D Risk Assessments and Management, Advanced Concepts 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		Rapporteur
John C. Mankins <i>ARTEMIS Innovation Management Solutions, LLC — UNITED STATES</i>	Paivi Jukola <i>Aalto University — FINLAND</i>	Maria Antonietta Perino <i>Thales Alenia Space Italia — ITALY</i>

D3.IP

Interactive Presentations

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 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 D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair	
Alain Pradier <i>European Space Agency (ESA) — THE NETHERLANDS</i>	John C. Mankins <i>ARTEMIS Innovation Management Solutions, LLC — UNITED STATES</i>

D4

16th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE

This 16th 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 Space activities can contribute to the resolution of World Societal Changes as well as to increasing the countries engaged in space activities.

Coordinator	
Giuseppe Reibaldi <i>International Academy of Astronautics (IAA) — FRANCE</i>	Yu Lu <i>China Academy of Launch Vehicle Technology, China — CHINA</i>

D4.1

Innovative Concepts and Technologies

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

Co-Chairs		Rapporteur
Giorgio Saccoccia <i>European Space Agency (ESA) — THE NETHERLANDS</i>	Roger X. Lenard <i>LPS — UNITED STATES</i>	Wang Xiaowei <i>China Academy of Launch Vehicle Technology — CHINA</i>

D4.2

Contribution of Space Activities to Solving Global Societal Issues

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

Co-Chairs		Rapporteur
Giuseppe Reibaldi <i>International Academy of Astronautics (IAA) — FRANCE</i>	Yu Lu <i>China Academy of Launch Vehicle Technology, China — CHINA</i>	Paivi Jukola <i>Aalto University — FINLAND</i>

D4.3

Conceptualizing Space Elevators and Tethered Satellites

The development of a system concept for space elevators [and tethered stallites] requires systems engineering and architecture approaches. IAA study (3-24) entitled "Road to Space Elevator Era" is pulling together initial steps for a new look at space elevators. This study will show how to approach mega-projects with engineering discipline leading to the initial phase of a program - Concept Development. The members of the study are all focusing on the early engineering and operational steps towards an operational capability, such as defining the missions and laying out the top-level requirements. This session will suggest strategies to illustrate the space elevator development leading to a phenomenal low cost to space infrastructure. In addition, the session can accept the strategies to leverage space tethers as a viable tool for space systems.

Co-Chairs		Rapporteur
Akira Tsuchida <i>Earth-Track Corporation — JAPAN</i>	Peter Swan <i>International Space Elevator Consortium — UNITED STATES</i>	Robert E Penny <i>Cholla Space Systems — UNITED STATES</i>

D4.4

Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond

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

Co-Chairs		Rapporteur
Giancarlo Genta <i>Politecnico di Torino — ITALY</i>	Mae Jemison <i>100 Year Starship — UNITED STATES</i>	Louis Friedman <i>The Planetary Society — UNITED STATES</i>

D4.5

Space Mineral Resources, Asteroid Mining and Lunar/Mars insitu

Exploitation of space mineral resources is becoming a commercial space endeavour for the benefit of humanity and profit. In 2012, the IAA approved a broad study of the technology, economics, legal and policy aspects of identifying, obtaining, and using these resources. The question on the table is not “how” to leverage space minerals resources, but “how best” to leverage them. The purpose of this session is to provide the current state of the art of the technology, economics, law & policy related to Space Mineral Resource (SMR) opportunities. Our objective will be to put a developmental roadmap anchored in realities of engineering, economics and legal/policy. . In addition, the IAA has initiated a second study on the topic entitled: Space Mineral Resources II, Considerations and Recommendations on National Legislation Relevant to Extraterrestrial Resource Utilization and Benefication.

Co-Chairs		Rapporteur
Peter Swan <i>International Space Elevator Consortium — UNITED STATES</i>	Roger X. Lenard <i>LPS — UNITED STATES</i>	Susan McKenna-Lawlor <i>Space Technology (Ireland) Ltd. — IRELAND</i>

D4.IP

Interactive Presentations

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 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 D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Co-Chair

Giuseppe Reibaldi
International Academy of Astronautics (IAA) — FRANCE

D5

51ST IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES

Quality, safety, security... These domains reflect a same concern: how a complex space system can be developed and be operated in order to give its best with the proper robustness. In that environment, where radiations are not the least stress and possible ill-intentioned actions may occur, decreasing the level of failures in space activities is a must. Knowledge management, meaning proper capturing, capitalising, protecting and sharing the knowledge, and application of lessons learned and experience, are key factors. This Symposium organized by the International Academy of Astronautics aims at arousing the discussion between professionals, and raising the awareness of the new generation on the various approaches to obtain and run reliable, and safe space systems: design solutions, validation and tests, software development, validation and security, methods, management approaches, regulations to improve the quality, efficiency, and collaborative ability of space programs and space operations. All aspects are considered: risk management, complexity of systems and operations, knowledge and information management, human factors, economical constraints, international cooperation, norms, and standards.

Coordinator

Jeanne Holm
University of California — UNITED STATES

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

D5.1

Quality and Safety, a challenge for Traditional and New Space

Great or small, ambitious or recurrent, every space program is undertaken with great hopes! But we are far from 100 % success even if “Faster, better, cheaper” is 20 years old. Now that the span of the actors of space has enlarged, including lots of newcomers, what are the practices to cope with the risks of failure and the results achieved? This session deals with the methods, tests, lessons learned, standards for analysis and mitigation of such risks to maintain the desired quality. It provides an opportunity for exchanges on all aspects of the life cycle (including design, development and production philosophy, operations) and associated risk management approach. It addresses every kind of space missions: transportation systems, orbital systems, exploration vehicles.

Co-Chairs

Alexander S. Filatyev
Central Aero-HydroDynamic Institute — RUSSIAN FEDERATION

Manola Romero
3AF — FRANCE

Rapporteur

Pierre Molette
— FRANCE

D5.2

Knowledge Management for Space Activities in The Digital Era

In the today's digital era, also space businesses should rethink on the KM approaches to generate a community of shared and useful information and knowledge. More advanced technologies give digital workers the opportunity to communicate and collaborate on a regular basis, in addition the proliferation of mobile devices and social media allows content to be more rapidly shared. This new environment pushes towards understanding what critical knowledge is, how it can help drive down costs and seeing solutions. Key themes addressed during the session are: managing the sharing of the knowledge to develop new projects, what solutions are in place to work securely across corporate and international boundaries, how is knowledge captured, shared, and used to drive innovation and create value to the organization, collaboration and culture, the financial value of KM to the business, processes and technologies that organisations are using to sustain, energise and invigorate their ability to learn, innovate, and share knowledge. Examples of case studies of particular interest include successful projects and innovations in the application of knowledge management, grounded research in knowledge and risk management, methods that allow data, information or knowledge exchange within or amongst organisations in support of actual programmes.

Co-Chairs

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

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

Rapporteurs

Jeanne Holm
University of California — UNITED STATES

Patrick Hambloch
University of Alabama in Huntsville — UNITED STATES

D5.3

Prediction, Testing, Measurement and Effects of space environment on space missions

Space environment characterized by various factors such as radiation, plasma, atomic oxygen, planetary dusts, extreme temperature, vacuum, micro-gravity, micrometeoroid and debris, etc. and its fluctuations strongly affects quality of space missions. Environmental conditions yield constraints at design phase, and important risks in the course of the mission. The evaluation of the average and worst case conditions to be met, and of their impact on missions and sub-systems are thus of prime importance. This session will encompass the following topics: Space Weather, Plasma, Spacecraft Charging, Radiation, Atomic Oxygen, Planetary Dusts, Combined Environments - flight measurements; - physical processes; - prediction of average or worst case condition; - ground testing; - flight experiments and lessons learnt; - modelling and prediction.

Co-Chairs

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

Mengu Cho
Kyushu Institute of Technology — JAPAN

Rapporteur

Carlos Soares
NASA Jet Propulsion Laboratory — UNITED STATES

D5.4

Cyber-security threats to space missions and countermeasures to address them

The global network connectivity offered by the Internet introduces whole new families of cyber-security threats that can target space missions. To send commands to a spacecraft nowadays one would not need to build a ground station, but just penetrate from home or office the existing ground infrastructures, challenging and bypassing their protection measures. These questions will be addressed in the session: - 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 develop new missions? - What solutions are in place to work securely across corporate and international boundaries? - How is knowledge about security threats captured, shared among the constituency, and used to counteract the evolution of cyber threats? - Which ones of these specific threats are to be expected to target space missions, from the ground and up into space? - What is particularly to be expected from the cyber-space to target outer space? Case studies will focus on cryptography, processes, operational security, supply chain, and other aspects of space missions that are all constituting the technical and organizational measures necessary to make a mission “cyber secure”.

Co-Chair

Stefano Zatti
ESA — ITALY

Rapporteur

Luca del Monte
European Space Agency (ESA) — FRANCE

D5.IP

Interactive Presentations

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Safety, Quality and Knowledge Management in Space Activities 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 D Category at a special ceremony. An Abstract that follows the standard format must be submitted by the deadline for standard IAC abstracts.

Coordinator

Jeanne Holm
University of California — UNITED STATES

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

D6

SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES

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

Coordinator

Christophe Chavagnac
Airbus Defence and Space SAS — FRANCE

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

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, re-entry 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

Christophe Chavagnac
Airbus Defence and Space SAS — FRANCE

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

Rapporteur

Gennaro Russo
Associazione Italiana di Aeronautica e Astronautica (AIDAA) — ITALY

D6.2

D2.9

Joint-Session Creating Safe Transportation Systems for Sustainable Commercial Human Spaceflight

Commercial human space transportation systems must account for technical, economic and policy factors in order to be sustainable. This session will explore both this technical design solutions for reliability and safety, as well as the related economics, policy and regulatory issues involved in producing a human space transportation ecosystem that is sustainable. The discussion can include both suborbital and orbital transportation systems, as well as spaceports and infrastructure.

Co-Chairs

Aline Decadi
HE Space Operations — FRANCE

Rapporteur

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

D6.3

Enabling safe commercial spaceflight: vehicles and spaceports

This session is 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

Christophe Chavagnac
Airbus Defence and Space SAS — FRANCE

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

Rapporteur

Francesco Santoro
Altec S.p.A. — ITALY

Category

E

SPACE AND SOCIETY

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

- E1 SPACE EDUCATION AND OUTREACH SYMPOSIUM
- E2 46TH STUDENT CONFERENCE
- E3 31ST IAA SYMPOSIUM ON SPACE POLICY, REGULATIONS AND ECONOMICS
- E4 52ND IAA HISTORY OF ASTRONAUTICS SYMPOSIUM
- E5 29TH IAA SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY
- E6 BUSINESS INNOVATION SYMPOSIUM
- E7 61ST IISL COLLOQUIUM ON THE LAW OF OUTER SPACE
- E8 IAA MULTILINGUAL ASTRONAUTICAL TERMINOLOGY SYMPOSIUM

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

E1

SPACE EDUCATION AND OUTREACH SYMPOSIUM

This symposium explores best practice and innovative approaches to space education at all levels. It also considers activities, methods and techniques for informal education, outreach to the general public and workforce development. Each year the symposium will commence with a key note address by the winner of the IAF Frank J. Malina Astronautics Medal. This award recognizes the outstanding contribution to space education by an educator who promotes the study of astronautics and space science. When submitting abstracts for consideration, please note that:

- Papers should have clear education or outreach content.
- Emphasis should be placed on evaluating the learning outcomes of a project, and how these learning outcomes were achieved and evaluated.
- Authors are encouraged to clearly identify target groups, benefits, lessons-learned, good practice and include measures of critical assessment
- Technical details of projects, even if carried out in an educational context, will not usually qualify.
- Papers reporting on programmes/activities that have already taken place will 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

Lisa Antoniadis <i>— SWITZERLAND</i>	Naomi Mathers <i>Advanced Instrumentation and Technology Centre (AITC) — AUSTRALIA</i>
--	--

E1.1

Ignition - Primary Space Education

This session will explore innovative programs for students up to the age of 11 conducted within the formal education system. Emphasis will be placed on programs that effectively engage primary school students in STEM, develop key skills, and foster a long-term passion for space. This session will also consider programs and activities that develop effective and inspirational primary school teachers.

Co-Chairs

Carol Carnett <i>International Space University (ISU) — UNITED STATES</i>	Kaori Sasaki <i>Japan Aerospace Exploration Agency (JAXA) — JAPAN</i>
---	---

Rapporteurs

Christopher Vasko <i>European Space Agency (ESA) — FRANCE</i>	Gulnara T. Omarova <i>Astrophysical Institute — KAZAKHSTAN</i>
---	--

E1.2

Lift Off - Secondary Space Education

This session will explore innovative programs for students aged 11 to 18, conducted within the formal education system. Emphasis will be placed on programs that effectively engage secondary school students in STEM, develop key skills, and foster a long-term passion for space. This session will also consider programs and activities that develop effective and inspirational secondary school teachers.

Co-Chairs

Andrea Jaime <i>OHB System AG - Munich — GERMANY</i>	Seyed Ali Nasserli <i>Space Generation Advisory Council (SGAC) — CANADA</i>
--	---

Rapporteurs

Carlos Duarte <i>Agencia Espacial Mexicana (AEM) — MEXICO</i>	Christopher Vasko <i>European Space Agency (ESA) — FRANCE</i>
---	---

E1.3

On Track - Undergraduate Space Education

This session will explore innovative programs 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 program is structured for maximum impact, how the impact is measured and how the lessons learned are being applied to other courses.

Co-Chairs

Camille Alleyne
NASA — UNITED STATES

Hubert Diez
CNES — FRANCE

Rapporteur

Michal Kunes
Czech Space Office — CZECH REPUBLIC

E1.4

In Orbit - Postgraduate Space Education

This session will explore innovative programs 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 program is structured for maximum impact, how the impact is measured and how the lessons learned are being applied to other courses.

Co-Chairs

Camille Alleyne
NASA — UNITED STATES

David B. Spencer
The Pennsylvania State University — UNITED STATES

Rapporteurs

Remco Timmermans
— THE NETHERLANDS

Thierry Dana-Picard
Jerusalem College of Technology (JCT) — ISRAEL

E1.5

Enabling the Future - Developing the Space Workforce

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

Co-Chairs

Amalio Monzon
Airbus Defence and Space — SPAIN

Olga Zhdanovich
European Space Agency (ESA) — THE NETHERLANDS

Rapporteur

Bettina Boehm
European Space Agency (ESA) — FRANCE

E1.6

Calling Planet Earth - Space Outreach to the General Public

This session will focus on activities, programs and strategies for engaging the general public. This session does not include programs that are conducted within the formal education system.

Co-Chairs

Jessica Culler
The Planetary Society — UNITED STATES

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

Rapporteurs

Frank Friedlaender
Lockheed Martin Space Systems Company — UNITED STATES

Thierry Dana-Picard
Jerusalem College of Technology (JCT) — ISRAEL

E1.7

New Worlds - Non-Traditional Space Education and Outreach

This session will focus on novel and non-standard methods of space education and outreach in non-traditional areas and to non-traditional target groups. This session does not include programs that are conducted within the formal education system.

Co-Chairs

Olga Zhdanovich
European Space Agency (ESA) — THE NETHERLANDS

Vera Mayorova
Bauman Moscow State Technical University — RUSSIAN FEDERATION

Rapporteur

Carol Christian
STScl — UNITED STATES

E1.8

Hands-on Space Education and Outreach

Hands-on can be a powerful way to introduce and teach STEM concepts, especially with diverse learners of many backgrounds. This session will demonstrate and share effective hands-on activities and experiments to explore, teach and reinforce space-related concepts. During the session, presenters will actually demonstrate the activity. Full details are available at <http://www.iafastro.org/committees/space-education-and-outreach-committee-seoc/>.

Co-Chairs

Lyn Wigbels
University Corporation for Atmospheric Research — UNITED STATES

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

Rapporteurs

Andrea Jaime
OHB System AG - Munich — GERMANY

Remco Timmermans
— The Netherlands

E1.9

Space Culture –Public Engagement in Space through Culture

This Session is co-sponsored by the IAF Technical Committee on the Cultural Utilization of Space (ITACCUS) and will focus the activities of institutions such as museums, space agencies and non-profit organizations involving space that engage the cultural sector. This session does not include programs that are conducted within the formal education system.

Co-Chairs

Lisa Antoniadis
EASL — SWITZERLAND

Nelly Ben Hayoun
Royal Holloway, University of London — UNITED KINGDOM

Rapporteurs

Carol Carnett
International Space University (ISU) — UNITED STATES

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

E1.1P

Interactive Presentations

This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Education and Outreach 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 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

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

Lisa Antoniadis
EASL — SWITZERLAND

Rapporteurs

Carlos Duarte
Agencia Espacial Mexicana (AEM) — MEXICO

Gulnara T. Omarova
Astrophysical Institute — KAZAKHSTAN

E2

46TH STUDENT CONFERENCE

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

Coordinators

Marco Schmidt
Bochum University of Applied Sciences — GERMANY

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

E2.1

Student Conference – Part 1

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

Co-Chairs

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

Franco Bernelli-Zazera
Politecnico di Milano — ITALY



Rapporteurs

Hannes Mayer
Karl Franzens Universität Graz — AUSTRIA

Vera Pinto Gomes
European Commission — BELGIUM

E5 29TH IAA SYMPOSIUM ON SPACE AND SOCIETY

This 29th symposium, organised by the International Academy of Astronautics (IAA), will review the impact and benefits of space activities on the quality of life on Earth, including arts and culture, society's expectations from space, life in space, as well as technology and knowledge transfer.

Coordinators

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

Olga Bannova
University of Houston — UNITED STATES

E5.1 Architecture for humans in space: design, engineering, concepts and mission planning

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

Co-Chairs

Brent Sherwood
Caltech/JPL — UNITED STATES

Olga Bannova
University of Houston — UNITED STATES

Rapporteur

Anna Barbara Imhof
Liquifier Systems Group (LSG) — AUSTRIA

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

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

Co-Chairs

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

Olga Bannova
University of Houston — UNITED STATES

Rapporteur

Anna Barbara Imhof
Liquifier Systems Group (LSG) — AUSTRIA

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 practice is branching into a several directions, ranging from performance, installation, video, or conceptual work situated in the space or space analogous environments themselves, to commercial gallery contexts, and the realm of participation and public engagement with science. This session addresses the practice of contemporary artists who have developed new ways to appropriate space for their work, the conceptual and practical foundations of their engagement, and the implications of this emerging aesthetic paradigm for both the fields of space and art. Submissions are welcome from artists and art historians; representatives from space industry, space agencies and the cultural sector facilitating or programming related projects crossing over the increasingly blurred boundaries of creative practice.

Co-Chairs

Nahum Romero
Equilibrio. Medio ambiente y responsabilidad social — UNITED KINGDOM

Richard Clar
Art Technologies — UNITED STATES

Rapporteur

Ioannis Michaloudis
Charles Darwin University — AUSTRALIA

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 Space Societies, Professional Associations and Museums

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 organisations and other organisations 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. This symposium offers a podium for ideas and proposals to enhance the interaction between the organisations, 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-Chair

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

Scott Hatton
The British Interplanetary Society — UNITED KINGDOM

Rapporteur

Minoo Rathnasabapathy
Space Generation Advisory Council (SGAC) — AUSTRIA

E5.IP Interactive Presentations

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 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 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

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

Olga Bannova
University of Houston — UNITED STATES

E6

BUSINESS INNOVATION SYMPOSIUM

The Business Innovation Symposium is designed to offer papers that observe, study, analyse, describe, and/or propose any topic related to space activities that have commercial objectives, whether from an academic and/or practitioner perspective.

Coordinator

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

E6.1

New Space Individuals, Projects, Programs, or Business Units: Innovation, Entrepreneurship & Investment at The Microscopic Level of Analysis

Included in this session are topics of innovation, entrepreneurship, and investment at the microscopic level of analysis and conducted by any sector (e.g., public or private, government or industry, etc.). Subjects of interest can include analyses, narrative descriptions, or current practices regarding individual projects, programs, business units (within a firm, regardless of the firm size). Example topics may include specific business plan ideas, descriptions of particular fund raising techniques, performance of a specific division within a company, etc.

Co-Chairs

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

David Bearden
Aerospace Corp. — UNITED STATES

Rapporteur

Ian Christensen
Secure World Foundation — UNITED STATES

E6.2

New Space Industry Segments, Firms, Actor Groups, and Multiple Programs: Innovation, Entrepreneurship, & Investment at The Mesoscopic Level of Analysis

Included in this session are topics of innovation, entrepreneurship, and investment at the mesoscopic level of analysis, (between the microscopic and macroscopic levels of analysis) and conducted by any sector (e.g., public or private, government or industry, etc.). Subjects of interest can include analyses, narrative descriptions, or current practice of entire firms (regardless of firm size), groups of actors (e.g., the government sector, the financial sector, etc.), and systems of programs. Example subjects may include industry-segment analyses or descriptions (within a specific country), perspectives of investment community of the industry, descriptions of public-private partnership arrangements, etc. It should be noted that the boundary definitions between the mesoscopic level and the micro- and macro-level perspectives are not particularly clear.

Co-Chairs

AC Charania
Blue Origin — UNITED STATES

John Culton
US DoS — UNITED STATES

Rapporteur

Luigi Scatteia
&Strategy — FRANCE

E6.3

New Space at The National, International, and Overall Industry Levels: Innovation, Entrepreneurship, & Investment at The Macroscopic Level of Analysis

Topics of innovation, entrepreneurship and investment from the macroscopic perspective may include theory-based analyses or narrative descriptions of current practice or programs at the national, regional, and/or international levels of analysis. Examples could include descriptions of public-private partnership arrangements, industry-specific structure or change analyses (across multiple countries), etc.

Co-Chairs

Tom Olson
Exodus — UNITED STATES

Misuzu Onuki
Consultant — JAPAN

Rapporteur

Joerg Kreisl
JKIC — GERMANY

E6.IP

Interactive Presentations

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

E7

61ST IISL COLLOQUIUM ON THE LAW OF OUTER SPACE

This year's Colloquium places a special focus on the fiftieth anniversary of the Outer Space Treaty, and discusses its main principles in the context of each individual dedicated IISL panel session

Coordinators

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

Diane Howard
International Institute of Space Law (IISL) — UNITED STATES

Lesley Jane Smith
— GERMANY

Publication officers

PJ Blount
University of Mississippi School of Law — UNITED STATES

Rafael Moro-Aguilar
Orbspace — AUSTRIA

E7.1

10th Nandasiri Jasentuliyana Keynote Lecture on Space Law and Young Scholars Session

Title: "Space law and international organisations" Marco Ferrazzani, ESA

Co-Chairs

Kai-Uwe Schrogl
European Space Agency (ESA) — FRANCE

Lesley Jane Smith
— GERMANY

Rapporteur

Christopher Johnson
Secure World Foundation — UNITED STATES

E7.2

Financing space: Procurement, competition and regulatory approach

This session invites papers with a focus on the subject of competition in the space sector from both the perspective of access and structure of financing space activities, as well as space-related procurement rules. With the increasing number of start-ups, and the growing interest in the micro-satellite sector, the session looks to identify whether and how these three key elements of finance, procurement and competition combine to frame the degree of competition in the space sector at national and/or regional level. Papers may also deliver observations in these sectors relating to developments in the downstream sectors.

Co-Chairs

Audrey Powers
Blue Origin LLC — UNITED STATES

Ingo Baumann
— GERMANY

Rapporteur

Gina Petrovici
ECSL — GERMANY

E7.3 Integrated space applications: Earth observation, Telecommunications and navigation
This session looks at the increasing reliance of society on all space-based services from the perspective of legal rules, national and international. It invites authors to address the legal issues relating to their use and deployment, from ownership and licensing of intellectual property to availability, integrity and interoperability. Authors are particularly encouraged to examine the access and use of space data in the various fields where it is relied on, highlighting the relation between the law of outer space and the accompanying fields such as intellectual property law or communications law.

Co-Chairs

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

Setsuko Aoki
Keio University — JAPAN

E7.4 Space law at Unispace III+ 50: consequences and future perspectives
This session takes UNISPACE I as its starting point and invites authors to examine the development and contribution of the UNISPACE dialogue, particularly UNISPACE III, from the perspective of its achievements to date, the spectrum and type of legal rules agreed on over the years, and its agenda for the future.

Co-Chairs

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

Yun Zhao
The University of Hong Kong — HONG KONG

E7.5 The relationship between space law and cyberlaw, and other recent developments in space law
This session invites submissions on a range of topics focusing on the policy and legal interactions between telecommunications law and outer space law. Papers addressing the following issues will be of particular interest to the IISL's Cyberspace Law Working Group: technical architecture of cyber space; existence of a (self-contained) specific legal regime for cyber space; entities responsible to regulate cyber space; applicability of space applicable to cyber activities in outer space; legal aspects of cyber security for space assets.

Co-Chairs

Larry Martínez
International Institute of Space Law (IISL) — UNITED STATES

Stephan Hobe
University of Cologne — GERMANY

Rapporteur

Simona Spassova
University of Luxembourg — LUXEMBURG

E7.6 Joint IAA/IISL round table; Global cooperation in planetary defense
Invited speakers only.
This session looks at the technology and law relating to planetary defense at a time where its exposure to natural and physical threats is of paramount concern. Speakers are invited from various communities across the space sector, from developers, to regulators and users. The session addresses the dependencies between legal and technical rules in a field whose vulnerability has increased together with society's dependency on its availability and the benefits it brings.

Co-Chairs

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

Masami Onoda
Japan Aerospace Exploration Agency (JAXA) — JAPAN

Rapporteurs

Marc Haese
DLR, German Aerospace Center — GERMANY

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

E7.7 Joint IAF/IISL session Legal framework for collaborative space activities - New ways of launching (micro-launching and large constellation microsats)
B3.8
This session includes both invited and submitted papers on the challenges currently faced by existing systems for licensing space activities in the light of the necessity to ensure their sustainability, and efficient management of scarce frequency resources. It looks at the way in which dialogue is mapped out between governments and the various actors in the space community, and pays particular attention to the latest developments arising from low cost transportation systems and technology. The papers are particularly invited to address the question as to how these challenges can be met, and how to best approach these at national and international level.

Co-Chairs

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

Kamlesh Brocard
Swiss Space Office (SSO) — SWITZERLAND

Rapporteur

Kamlesh Brocard
Swiss Space Office (SSO) — SWITZERLAND

E7.1P Interactive Presentations
This session offers a unique opportunity to deliver your key messages in an interactive presentation on any of the subjects of Space Law 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 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

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

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

E8 IAA MULTILINGUAL ASTRONAUTICAL TERMINOLOGY SYMPOSIUM
This symposium, organised by the International Academy of Astronautics (IAA), will review the progress made in multilingual space terminology and its impact on international cooperation in space. Terminology is a key issue for a better understanding among people using various languages and dialects. Consecutive or simultaneous translation does not remove the risk of ambiguity during technical meetings and accuracy in terminology is essential during all phases of cooperation. The session will address issues such as standardisation of definitions in space science and technology. The specific character of emerging space countries will also be discussed.

Coordinators

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

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

E8.1 Multilingual Astronautical Terminology
This symposium, organised by the International Academy of Astronautics (IAA), will review the progress made in multilingual space terminology and its impact on international cooperation in space. Terminology is a key issue for a better understanding among people using various languages and dialects. Consecutive or simultaneous translation does not remove the risk of ambiguity during technical meetings and accuracy in terminology is essential during all phases of cooperation. The session will address issues such as standardisation of definitions in space science and technology. The specific character of emerging space countries will also be discussed.

Co-Chairs

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

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

Rapporteur

Fabrice Dennemont
International Academy of Astronautics (IAA) — FRANCE



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! Oriented towards young and talented space professionals, 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. The Global Technical Sessions are similar to the conventional technical sessions with abstract selection and paper submissions. They are jointly organized by associated technical committees and co-chaired by seasoned experts and young professionals in order to stimulate the interaction with the authors. The Global Technical Sessions are the IAC cradle for future talents and a modern session to speak with a larger audience thanks to the real-time broadcast online. It can also allow the authors who can't come to IAC to present their paper to the onsite audience at the IAC and is recorded for further use and personal branding by the presenter.

- GTS.1 SPACEFLIGHT OPERATIONS GLOBAL TECHNICAL SESSION
- GTS.2 HUMAN SPACE FLIGHT 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 Guillaume Girard, Zero2infinity — SPAIN and Kathleen Coderre, Lockheed Martin Corporation — UNITED STATES

GTS.1 B6.4

Spaceflight Operations Global Technical Session

This session addresses hands-on space flight operations personnel from multiple international organisations with objectives of sharing best practices, lessons learned, and issues. Your paper can be presented on site at the IAC or through a virtual forum broadcast live on the internet. It is co-sponsored by the Space Operations Committee and the Workforce Development/Young Professionals Programme Committee.

Co-Chairs

Adnan Al Rais
Mohammed Bin Rashid Space Centre (MBRSC) — UNITED ARAB EMIRATES

Andrea Boyd
European Space Agency (ESA) — AUSTRIA

Rapporteur

Ahmed Farid
Telespazio VEGA Deutschland GmbH — GERMANY

GTS.2 B3.9

Human Space Flight Global Technical Session

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

Co-Chairs

Andrea Jaime
OHB System AG - Munich — GERMANY

Guillaume Girard
Zero2infinity — SPAIN

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

Co-Chairs

Edward W. Ashford
Graz University of Technology — AUSTRIA

Kevin Shortt
— GERMANY

Rapporteur

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

GTS.4 E2.3

Student Team Competition

Undergraduate and graduate level students teams present papers on any subject related to space sciences, industry or technology. These papers will represent the work of the authors (three or more students). Students presenting in this session will compete for the Hans von Muldau Team Award. The guidelines for the student competition will be distributed from the session chairs to the authors after abstract acceptance.

Co-Chairs

Andrea Jaime
OHB System AG - Munich — GERMANY

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

Rapporteur

Michelle Mendes
World Space Week Association — UNITED STATES

GTS.5 B4.9

Small Satellite Missions Global Technical Session

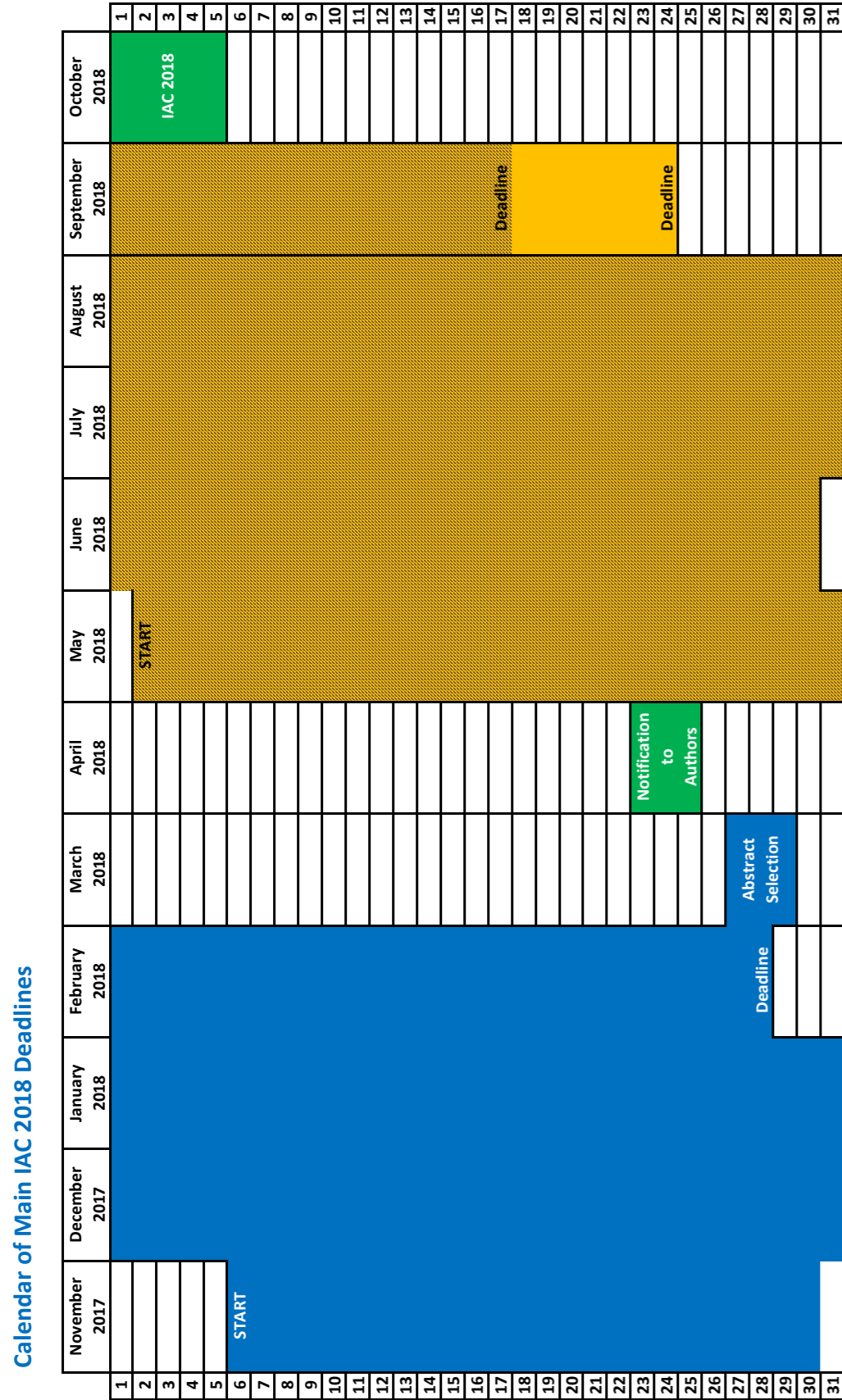
The Small Satellite Missions Global Technical Session (GTS) is collaboration between the International Academy of Astronautics (IAA) Small Satellite Missions Symposium and the International Astronautical Federation (IAF) Workforce Development/Young Professionals Programme Committee. This session is unique 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

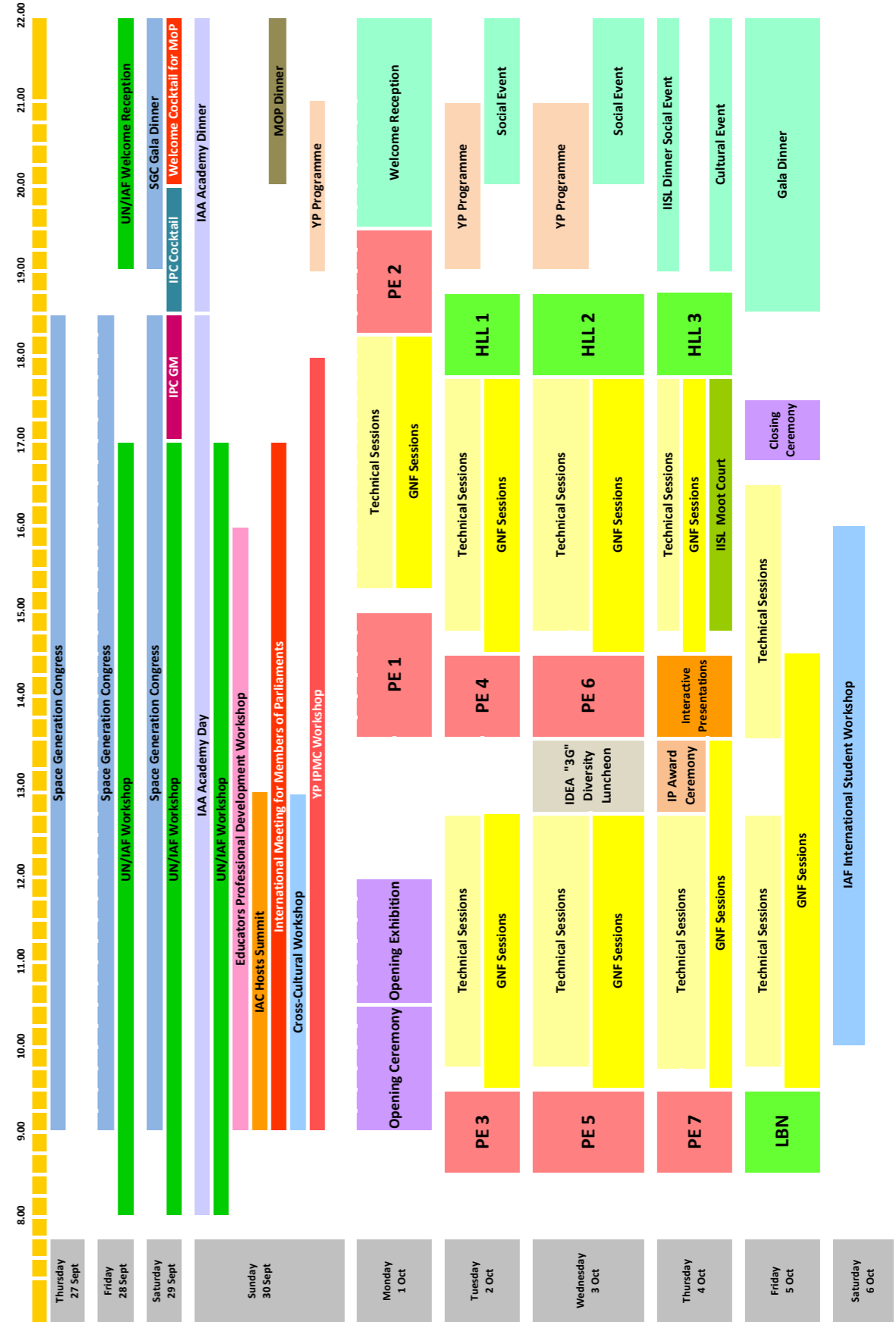
Alex da Silva Curiel
Surrey Satellite Technology Ltd (SSTL) — UNITED KINGDOM

Rhoda Shaller Hornstein
— UNITED STATES

Calendar of Main IAC 2018 Deadlines



Preliminary Congress at a Glance Chart



Instructions to Authors

Abstract Preparation

Format

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

Content

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

Co-authors

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

Abstract Submission

Signing in

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

Submission

- Go to the new abstract submission page.
- Browse the technical programme and choose the symposium and technical session for which you want to submit your abstract.
- Type the title and content of your abstract into the related fields.
- Choose your presentation preference: oral presentation only, poster presentation only, oral or poster.
- Confirm that the material is new and original and that it has not been presented at a previous meeting.
- Confirm that your attendance at IAC 2018 to deliver and present the paper is assured.

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

Abstract Selection

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

Paper and Presentation Submission

- Details on how to prepare and submit your final paper as well as your presentation material will be available on www.iafastro.org by mid-April.
- Authors with 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 5 to 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 plasma screens. Authors will be assigned to interactive sessions in which they must be near the plasma screens to engage in interactive discussions with other congress attendees.

International Astronautical Federation (IAF)

Preliminary versions of the IAC proceedings will be available to participants at the congress electronically. More information about the IAC paper archive is available on www.iafastro.org

International Academy of Astronautics (IAA)

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

International Institute of Space Law (IISL)

Authors should follow the above instructions for the submission of their abstracts. In addition to the IAC Proceedings, 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 2018
Paper Submission	17 September 2018
Presentation Submission	24 September 2018

Please make sure to check the IAF website (www.iafastro.org) regularly to get the latest updates on the Technical Programme!

If questions contact: support@iafastro.org

JOIN THE BREMEN EXPERIENCE

The City of Space

As a result of the extraordinary accumulation of space-related research and industry Bremen has developed into a major space center in Europe. Bremen hosts a broad range of experts who work in fundamental research, computational modelling, technology development, system qualification, and the production of space components. All of these space actors see the IAC as a unique chance to further improve Bremen's visibility within the space community. The IAC delegates will benefit from this commitment and will be able to gain new insights into Bremen's scientific and industrial space landscape. No other city in Germany would be able to offer a greater variety of visits to space locations. Part of our concept is to create a new type of technical visits especially tailored for young professionals, allowing them to meet their peers and gather first-hand information on career opportunities.

2018 will be an especially exciting space year for Bremen: The European Service Module of ORION will be delivered by the Bremen site of Airbus Defence and Space, the touchdown of the MASCOT lander of the DLR Institute for Space Systems is scheduled for October next year. OHB SE will continue their assembly of GALILEO satellites and Ariane Group and MT Aerospace are busy with the production of main parts of the ARIANE launchers. Moreover, the City of Bremen will be organizing the "Bremen Space Year 2018" with lectures, exhibitions, and other events for the general public.

The Comfortable Conference City

Travelling to Bremen could not be easier. The City Airport Bremen offers flight connections to 50 international destinations and is located conveniently close to the city center: You can reach the conference center within a 15-minute tram ride. Additional comfort is guaranteed by the fact that there are 3,200 hotel beds in walking distance from the conference venue. The Fair and Exhibition Center Bremen is equipped with state-of-the-art conference and IT technology and offers ideal conditions for participants to find all required services. Especially the location and concept of the IAC 2018 space exhibition guarantees a busy and lively atmosphere all through the day. Also the visa application for IAC delegates is unproblematic as we support non-European participants with individual invitation letters.

The City with Hanseatic Flair

Bremen is a cosmopolitan and attractive city, in which the IAC delegates will feel safe and comfortable and find a large variety of things to do. Visitors love the historic architecture with UNESCO world heritage sites like the Bremen Town Hall, the Roland Statue and the market place as well as the relaxed maritime flair of the Hanseatic League. The IAC 2018 venue is close to Bremen's cultural highlights, famous historic sites, and vibrant city quarters. Due to this proximity IAC attendees can do their sightseeing as it fits their schedule, either on their way to the venue, during breaks or at the end of the conference day. In addition to its touristic attractions, Bremen stands out as a green city. IAC guests can enjoy the riverside promenades or the 200 hectares of the Bürgerpark right next to the conference center for a short escape from a busy conference day.





International Astronautical Federation

3 Rue Mario Nikis
75015 Paris, France

Tel: +33 1 45 67 42 60

Fax : +33 1 42 73 21 20

E-mail: info@iafastro.org

www.iafastro.org



ZARM - Center of Applied Space Technology and Microgravity

Am Fallturm
28359 Bremen, Germany

Tel: + 49 421 218 57755

E-mail: office(at)iac2018.org

www.zarm.uni-bremen.de



Connecting @ll Space People



<https://www.facebook.com/iafastro/>



<https://twitter.com/iafastro>



<https://www.flickr.com/photos/iafastro>



<https://instagram.com/iafastro/>



<https://www.youtube.com/user/iafastro>



<https://www.linkedin.com/groups/79867>