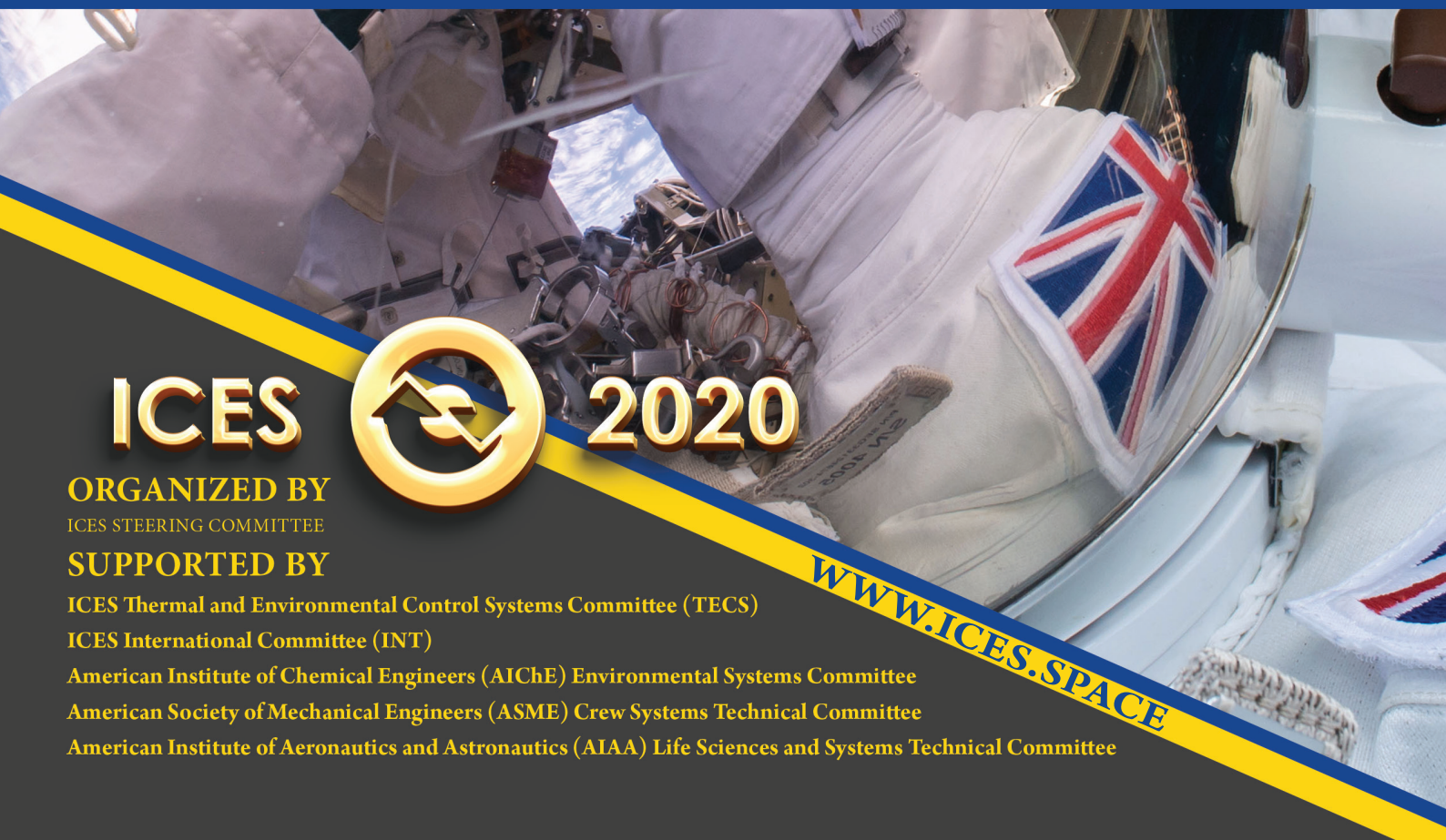
50th INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SYSTEMS

12-16 July
Lisbon, Portugal

ICES 2020 CALL FOR PAPERS

ABSTRACT DEADLINE : 08 NOVEMBER 2019



ICES 2020

ORGANIZED BY

ICES STEERING COMMITTEE

SUPPORTED BY

ICES Thermal and Environmental Control Systems Committee (TECS)
ICES International Committee (INT)
American Institute of Chemical Engineers (AIChE) Environmental Systems Committee
American Society of Mechanical Engineers (ASME) Crew Systems Technical Committee
American Institute of Aeronautics and Astronautics (AIAA) Life Sciences and Systems Technical Committee

WWW.ICES.SPACE

Synopsis

The 50th International Conference on Environmental Systems (ICES) will cover all topics related to humans living and working in extreme environments with applications inside or outside of terrestrial or outer space habitats or vehicles, including aerospace human factors; environmental control and life-support system technology; environmental monitoring and controls; planetary protection; EVA system technology; life sciences; planetary habitats and systems; and thermal control systems technology for both manned and unmanned vehicles. The conference is open to participants from any nation, from academic, government, or industry organizations. There will be four days of technical presentations, with approximately 40 sessions. The conference is organized by the ICES Steering Committee and supported by ICES Thermal and Environmental Control Systems (TECS) Committee, ICES International Committee (INT), American Institute of Chemical Engineers (AIChE) Environmental Systems Committee, American Society of Mechanical Engineers (ASME) Crew Systems Technical Committee, American Institute of Aeronautics and Astronautics Life Sciences and Systems (AIAA-LS&S) Technical Committee.

LOCATION AND ACCOMMODATIONS

ICES has made accommodations for a block of rooms at the Corinthia Hotel Lisbon. The Corinthia Hotel Lisbon is the ideal base from which to explore this noble yet thoroughly contemporary European capital. It combines elegance and modernity with breathtaking views over the 18th Century Aqueduct and the beautiful Monsanto Natural Park. The Corinthia Hotel Lisbon is a short distance away from Lisbon International Airport, just 7 km away. Set in the city centre, Corinthia Hotel Lisbon is easily accessible by Lisbon's metro and train station which are within walking distance of the hotel.

***CORINTHIA HOTEL LISBON** - Av. Columbano Bordalo Pinheiro 105, 1099-031 Lisboa, Portugal*

- **BOOK ONLINE: Corinthia Hotel Lisbon ICES Room Block for dates 11 July – 16 July**
- **€150.00 single / €170.00 double (€ = Euros)**
- **(inclusive of breakfast and VAT per room, per day)**
- **City tax not included in above rates: €2 per person/ per night, up to a maximum of 7 nights, is to be charged.**
- **Pre and post nights available at group rate based upon availability**
- **Group rate available until June 03, 2020 or until room block is full**
- **Cancellation policy : 6pm one day before arrival**
- **First night will be charged in the event of a late cancellation or no-show**

ORGANIZING COMMITTEE

Conference Chair
Stéphane Lapensée
European Space Agency

Conference Vice-Chair
Tom Leimkuehler
Jacobs

STEERING COMMITTEE

Art Avila
(TECS Program Chair)
Jet Propulsion Laboratory

Matthias Holzwarth
(INT Program Chair)
ArianeGroup

Morgan Abney
(AIChE Program Chair)
NASA Marshall Space Flight Center

Shawn Macleod
(ASME Program Chair)
Collins Aerospace

Kevin R. Duda
(AIAA LS&S Program Chair)
Draper Laboratory

Tim Nalette
(Past Conference Chair 2019)
UTC Aerospace Systems (retired)

Grant Anderson
(Past Conference Chair 2018)
Paragon Space Development Corporation

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For more information about becoming an official sponsor of the 50th ICES in Lisbon go to the Sponsorship Page on www.ices.space

Abstract Submittal Guidelines and Procedures

ICES 2020
WWW.ICES.SPACE

Authors who wish to contribute a paper to the conference must submit a 300-word maximum abstract electronically to the ICES submission site. Papers should present technical developments and progress in any of the fields of environmental systems listed in this Call for Papers and should make a new and original contribution to the state of the art, or be a constructive review of the technical field. Authors do not need to be affiliated with any of the co-sponsoring societies. Papers proposed will be evaluated solely on the basis of their suitability for inclusion in the program. Please note that only electronically submitted abstracts will be accepted.

The electronic submission process is as follows:

1. Access Easy Chair for ICES 2020 (https://easychair.org/conferences/?conf=ices2020)
2. Log in or create an account.
3. Click on "Submissions" in top menu
4. Click on "Add a submission" in upper right corner.
5. Select a "Track" (Session Topic) relevant to your submission (See pages 4-11 for detailed descriptions of each of these topics)
6. If unsure which Session Topic your submission falls under, please submit to ICES600: Other

The deadline for receipt of abstracts via electronic submittal is
Friday, 08 November 2019 by midnight Eastern Standard Time.

Authors having trouble submitting abstracts electronically should send an email to info@ices.space

Questions pertaining to the abstract or technical topics, or general inquiries concerning the program format or policies of the conference, should be referred to the corresponding Program Chair:

TECS (Sessions 101-109)
Art Avila, Jet Propulsion Laboratory
arturo.avila@jpl.nasa.gov

INT (Sessions 201-207)
Matthias Holzwarth, ArianeGroup
Matthias.holzwarth@ariane.group

AIChE (Sessions 300-308)
Morgan Abney, NASA Marshall Space Flight Center
morgan.b.abney@nasa.gov

ASME (Sessions 400-406)
Shawn Macleod, Collins Aerospace
shawn.macleod@collins.com

AIAA LS&S (Sessions 500-513)
Kevin R. Duda, Draper Laboratory
kduda@draper.com

Authors will be notified of abstract acceptance or rejection on or about 09 December 2019. An Author's Kit, containing detailed instructions and guidelines for submitting papers to ICES, will be made available to authors of accepted abstracts on www.ices.space. Authors of accepted abstracts must provide a draft manuscript by Friday, 06 March 2020. Based on a peer review of this draft manuscript the author and session organizer will collaborate toward revision and acceptance of the draft manuscript. Authors must then submit the accepted final manuscript to ICES by Friday, 01 May 2020 for inclusion in the conference proceedings and the right to present at the conference. It is the responsibility of those authors whose papers are accepted to ensure that a representative attends the conference to present the paper, otherwise it will be withdrawn from the conference proceedings. Sponsor and/or employer approval of each paper is the responsibility of the author(s). Government review, if required, is the responsibility of the author(s).

Technical Topics

ICES101: TECS
Spacecraft and Instrument Thermal Systems
This session presents thermal design, testing, and on-orbit performance of near-earth and interplanetary uncrewed/robotic spacecraft, instruments, and payloads, and the application of key new technologies.

Jose Rodriguez, NASA Jet Propulsion Laboratory, jose.i.rodriguez@jpl.nasa.gov
Joe Gasbarre, NASA Langley Research Center
Wes Ousley, Lentech, Inc.

ICES102: TECS
Thermal Control for Planetary and Small Body Surface Missions
This session focuses on active and passive thermal control for planetary and small body surface missions utilizing vehicles such as rovers, landers, probes, and rendezvous systems. Also covered is the characterization and modeling of the environment in support of such missions.

Eric Sunada, NASA Jet Propulsion Laboratory, Eric.T.Sunada@jpl.nasa.gov
Jennifer Miller, NASA Jet Propulsion Laboratory
Gaj Birur, NASA Jet Propulsion Laboratory

ICES103: TECS/INT
Thermal and Environmental Control of Exploration Vehicles and Habitats
This session covers environmental control, thermal control (passive and active), and thermal protection topics for vehicles used to transport crew and cargo to/from cislunar space, the Moon, Mars, and asteroids, including landers, habitats, and crew transport vehicle systems. Papers on related systems within international and U.S. programs, including Gateway and Landers, are welcome. Potential topics include encountered space environment, base heat rejection, dust mitigation, thermal and environmental control and life support requirements, design, analysis, verification, and testing.

Jose Roman, NASA Marshall Space Flight Center, jose.roman@nasa.gov
Sean Tuttle, Nova Systems / Sigma Space Systems, sean.tuttle@novasystems.com
Rubik Sheth, NASA Johnson Space Center
Andrea Ferrero, Thales Alenia Space
Tom Leimkuehler, Jacobs

ICES104: TECS/INT
Advances in Thermal Control Technology
This session addresses novel or advanced technologies and development activities pertaining to heat acquisition, transport, rejection, and storage, as well as cryogenic cooling and thermal protection systems not specific to any existing or future scientific instruments, spacecraft, or planetary systems.

Jeff Farmer, NASA Marshall Space Flight Center, jeffery.t.farmer@nasa.gov
Matthias Holzwarth, ArianeGroup, matthias.holzwarth@ariane.group
Olivier Pin, European Space Agency
Joël Gayraud, CNES
Angel Alvarez-Hernandez, NASA Johnson Space Center
Brian O'Connor, NASA Marshall Space Flight Center

ICES105: TECS
Thermal Standards and Design/Development Practices
This session focuses on current and future efforts and needs for development of spacecraft thermal control standards and reference documents dealing with such areas as design, analysis, testing, equipment, specifications, and processes. These standards might be dedicated to a specific company or applicable to programs, space centers, or agencies. Also included are lessons learned in developing or applying these standards.

Eric Grob, NASA Goddard Space Flight Center, eric.w.grob@nasa.gov
Art Avila, NASA Jet Propulsion Laboratory
Joe Gasbarre, NASA Langley Research Center

ICES106: TECS/INT
Thermal Control for Space Launch Vehicles, Propulsion, and Nuclear Power Systems
This session features papers on thermal control design, analysis, testing, and flight performance. Three aspects are addressed in this session: (1) Launch vehicles, both commercial and government, including NASA's Space Launch System (SLS); (2) Propulsion systems for rockets, spacecraft, orbiting platforms, space vehicles, and landers, including advanced propulsion techniques; (3) Nuclear power systems for spacecraft, orbiting platforms, space vehicles, landers, and rovers, including systems for power generation, propulsion, and heating.

Jose Roman, NASA Marshall Space Flight Center, jose.roman@nasa.gov
Matthias Holzwarth, ArianeGroup, matthias.holzwarth@ariane.group

Technical Topics

ICES107: TECS/INT

Thermal Design of Cubesats, Nanosats, and Other Small Satellites

Satellites that are smaller than smallsats run into issues with limited radiative surface area and increased power density that make their thermal environment in some ways more challenging than larger satellites. This session presents and discusses the unique thermal concerns pertaining to very small satellites (nanosatellites, cubesats, microsats, etc.). Potential topics include the thermal design, analysis, testing, and on-orbit performance of very small satellites, and the application of relevant key new technologies.

Stephanie Mauro, NASA Marshall Space Flight Center, stephanie.l.mauro@nasa.gov
Robert Coker, Johns Hopkins University Applied Physics Laboratory, robert.coker@jhuapl.edu
Brian Briggs, NASA Jet Propulsion Laboratory
Hosei Nagano, Nagoya University

ICES108: TECS/INT

Thermal Control of Cryogenic Instruments and Optical Systems

This session covers cryogenic thermal control as applied in instruments, focal plane assemblies, detectors, and optical systems. This includes relevant passive and active cooling technologies, as well as cryogenic testing facilities, test processes, and lessons learned.

Wes Ousley, Lentech, Inc., wes.ousley@nasa.gov
Martin Altenburg, Airbus
Jose Rodriguez, NASA Jet Propulsion Laboratory

ICES109: TECS

Thermal Control of High Altitude Balloon Systems

This session addresses topics related to thermal control of high altitude balloons including their systems and payloads. Applications can include terrestrial-based balloon systems, balloons in other planetary atmospheres, or terrestrial-based simulations of other planetary atmospheres. Topics can include design, analysis, testing, mission performance, and new technologies.

Robert Coker, Johns Hopkins Applied Physics Laboratory, Robert.Coker@jhuapl.edu

ICES201: INT

Two-Phase Thermal Control Technology

This session presents the latest developments and innovations of two-phase heat transport systems, modeling techniques, and on-orbit performances for space applications. It covers all variants of heat pipe technologies, capillary and mechanically pumped loops, and loop heat pipes.

Frank Bodendieck, OHB System AG, frank.bodendieck@ohb.de
Stéphane Lapensée, European Space Agency
Guanghan Wang, Canadian Space Agency
Alejandro Torres, IberEspacio S.A.
Alain Chaix, Thales Alenia Space

ICES202: INT

Satellite, Payload, and Instrument Thermal Control

This session covers the development and design of thermal control systems for satellites, payloads, and instruments.

Patrick Hugonnot, Thales Alenia Space, patrick.hugonnot@thalesaleniaspace.com
Marco Molina, SITAEL
Hiroyuki Ogawa, Japan Institute of Space and Astronautical Science
Johannes van Es, NLR

ICES203: INT

Thermal Testing

The thermal testing session focuses on all aspects of thermal tests, test methods, test correlation, and test facilities. Tests for all kinds of spacecraft, instruments, equipment, and materials are of interest. Special attention is given to sharing lessons learned from thermal test and test analysis and correlation activities, and also to innovative test methods, set-ups, and approaches to testing and verification of the hardware and of the analysis.

Gerd Jahn, Airbus, gerd.jahn@airbus.com
Luke Tamkin, Airbus
Hiroyasu Mizuno, JAXA
Andrea Ferrero, Thales Alenia Space

ICES204: INT/AIAA LS&S

Bioregenerative Life Support

This session focuses on the design, development and operations of ground-based facilities, flight hardware and experiments associated with integrated systems which incorporate biological, physical, and chemical processors for the production, management and regeneration of Life Support resources.

Cesare Lobascio, Thales Alenia Space, cesare.lobascio@thalesaleniaspace.com
Masato Sakurai, JAXA
Miriam Sargusingh, NASA Johnson Space Center

ICES205: INT/AIChE

Advanced Life Support Sensor and Control Technology

This session includes papers describing approaches to monitoring water and air in enclosed habitats, thermal control of habitats, chemical sensors and sensing devices for detection of chemical constituents in water and air, and systems and system concepts for environmental monitoring and control.

Abhijit V. Shevade, NASA Jet Propulsion Laboratory, abhijit.v.shevade@jpl.nasa.gov
Darrell L. Jan, NASA Ames Research Center
Timo Stuffler, OHB System AG

ICES206: INT/TECS

Manned Orbiting Infrastructures, Habitats, Space Station and Payload Thermal Control

This session addresses thermal control on board the current Space Station and future long term, manned (or man-tended) orbiting habitats, platforms, or laboratories including their payloads and on-board experimental test prototypes. Topics range from system and component issues with the Space Station, Orbiting Infrastructures and Habitats thermal control systems to thermal aspects of payloads and experiments that utilize the Space Station or other Orbiting Infrastructures and Habitats as a science platform or as a test bed for future exploration applications including advanced thermal control solutions/techniques.

Patrick Oger, Airbus, patrick.oger@airbus.com
Zoltan Szigetvari, Airbus
Matteo Lamantea, Thales Alenia Space
Diego Mugurusa, Collins Aerospace
Dale Winton, Honeywell International

ICES207: INT/TECS

Thermal and Environmental Control Engineering Analysis and Software

This session addresses thermal and environmental control engineering analysis and software. This may include novel user experiences with existing tools, new tool and utility developments, improvements in existing commercial tools, cross-discipline tool integration and data exchanges, as well as any other software or analysis related topics.

Henri Brouquet, ITP Aero, henri.brouquet@itp-engines.co.uk
Brian Briggs, NASA Jet Propulsion Laboratory
Matthew Vaughan, European Space Agency
Hume Peabody, NASA Goddard Space Flight Center

ICES300: AIChE

ECLSS Modeling and Test Correlations

This session reports on applications and advances in modeling physiochemical and biochemical life support processes, as well as in numerical modeling of atmospheric pressure, cabin ventilation, and composition distributions in closed space habitats, such as the International Space Station, exploration spacecraft, the habitats, and commercial crewed and cargo space transport vehicles.

Chang Hyun Son, The Boeing Company, chang.h.son@boeing.com
Kevin Braman, The Boeing Company, kevin.m.braman@boeing.com
Nikolay Ivanov, Peter the Great Saint Petersburg Polytechnic University, Russia

ICES301: AIChE

Advanced Life Support Systems Control

This session reports on advanced life support system control topics, such as controller technology; control theory and application; autonomous control; integrated system control; control software; and modeling, simulation, and emulation for control development.

Chang Hyun Son, The Boeing Company, chang.h.son@boeing.com
Cliff Martin, The Boeing Company, cliff.martin@boeing.com
Cynthia Reuland, Aerodyne
Nikolay Ivanov, Peter the Great Saint Petersburg Polytechnic University, Russia

ICES302: AIChE/ASME/INT

Pysico-Chemical Life Support- Air Revitalization Systems -Technology and Process Development

This session addresses research, development, and enhancement of physico-chemical technologies and systems associated with Air Revitalization Systems (ARS). Integration of these systems in closed loop life support applications such as space vehicles and habitats, recent findings and performance of on-orbit systems, cross-cutting applications of ARS technologies, and approaches to reducing mission costs and improving overall mission logistics associated with ARS technologies are also presented.

Morgan Abney, NASA Marshall Space Flight Center, morgan.b.abney@nasa.gov
Jim Knox, Dynetics Technical Solutions, jim.knox@nasa.gov
Carsten Matthias, Airbus Defence and Space
Darrell Jan, NASA Ames Research Center

ICES303: AIChE/INT

Physico-Chemical Life Support- Water Recovery & Management Systems - Technology and Process Development

This session addresses research, development, and improvement of physico-chemical technologies and systems associated with Water Re¬covery & Management (WRM) Systems to include water quality management. Integration of these systems in closed-loop life support applications such as in-transit space vehicles and planetary missions on the Lunar or Mars surface are discussed. Advanced technologies (e.g. regenerative systems and fluid mechanics) that aim to reduce mission costs and improve overall mission logistics associated with wa¬ter recovery system technologies are also presented.

Justine Richardson, NASA Ames Research Center, tra-my.j.richardson@nasa.gov
Cesare Lobascio, Thales Alenia Space
Mike Flynn, NASA Ames Research Center
Andrew Jackson, Texas Tech University

ICES304: AIChE/INT

Physico-Chemical Life Support- Waste Management Systems- Technology and Process Development

This session addresses research, development, and enhancement of physico-chemical technologies and systems associated with Solid Waste Management Systems (SWM). Integration of these systems in closed loop life support applications such as space vehicles and habitats, recent findings and performance of on orbit systems, cross cutting applications of SWM technologies is discussed. In addition, approaches to reducing mission costs and improving overall mission logistics associated with SWM technologies are also presented.

Justine Richardson, NASA Ames Research Center, tra-my.j.richardson@nasa.gov
Jeffrey Lee, NASA Ames Research Center
Mike Flynn, NASA Ames Research Center
Matteo Lamantea, Thales Alenia Space

ICES305: AIChE/ASME/TECS/AAIA LS&S

Environmental and Thermal Control of Commercial and Exploration Spacecraft

This session seeks papers that describe the design, operation, and performance of reliable and cost-efficient thermal and environmental control systems and subsystems for crew and cargo transport, space stations, deep space habitats, other space vehicles, and exploration spacecraft.

Barry W. Finger, Paragon Space Development Corporation, bfinger@paragonsdc.com
Chang Hyun Son, The Boeing Company
David Williams, NASA Johnson Space Center
Tom Leimkuehler, Jacobs

Technical Topics

ICES307: AIChE

Collaboration, Educational Outreach, and Public Engagement

This session features papers that link human activities in space with human activities on earth. It includes innovative collaborations and networks among industry, academia, government, and the public to address global and local challenges on Earth and beyond. We invite papers in which educators and students, contractors, researchers, and other innovators present new approaches for linking students, vendors, and the general public to STEAM topics (Science, Technology, Engineering, Arts and Math) and the human exploration of space.

Jean Hunter, Cornell University, jbh5@cornell.edu
Dean Muirhead, Barrios Technology,
dean.muirhead-1@nasa.gov
Jochen Keppler, University of Stuttgart,
keppler@irs.uni-stuttgart.de

ICES308: AIChE

Advanced Technologies for In-Situ Resource Utilization

This session seeks papers that address analyses, research, development, and operation of In Situ Resource Utilization (ISRU) technologies and systems that relate to similar Environmental Control and Life Support capabilities and needs for missions sustainability, including water, carbon dioxide, and trash/waste collection and processing for mission consumables, resources management, propellants, and plastic production, as well as product contaminant removal and quality assurance for crew consumption.

Christian Junaedi, Precision Combustion, Inc.,
cjunaedi@precision-combustion.com
Brittany Brown, NASA Marshall Space Flight Center, Brittany.
brown@nasa.gov
Gerald Sanders, NASA Johnson Space Center

ICES400: ASME

Extravehicular Activity: Space Suits

This session covers topics related to space suit pressure garments. It includes advanced development work for the spectrum of missions including micro-gravity EVA operations in low-Earth orbit, cis-lunar space, and deep space Mars transit; long-duration surface campaigns; and launch/entry/abort pressure garments for multiple vehicles, as well as sustaining engineering and lessons learned on the ISS Extravehicular Mobility Unit (EMU) space suit assembly (SSA).

Shane McFarland, Wyle Laboratories,
shane.m.mcfarland@nasa.gov
Jinny Ferl, ILC Dover, ferlj@ilcdover.com
Brad Holschuh, University of Minnesota

ICES401: ASME/AIAA LS&S

Extravehicular Activity: Systems

This session includes topics describing aspects of EVA systems, technologies, and studies that envision the space suit as a system. Concepts and testing of advanced space suit systems are also included.

Keith Splawn, ILC Dover, splawk@ILCDover.com
Brian Alpert, NASA Johnson Space Center,
brian.k.alpert@nasa.gov
Robert Trevino, NASA Johnson Space Center,
robert.c.trevino@nasa.gov

ICES402: ASME

Extravehicular Activity: PLSS Systems

This session covers topics describing design studies and new technology development or significant experience and lessons learned with existing systems in the area of portable life support systems and associated support hardware. Also, this session will deal with emerging technology and concepts for use in and from Orion or other exploration platforms.

Gregory Quinn, Collins Aerospace, gregory.quinn@utas.utc.com
Bruce Conger, Jacobs Technology, bruce.conger@jacobs.com

ICES403: ASME

Extravehicular Activity: Operations

This session addresses EVA operational activities and EVA simulations associated with the International Space Station (ISS), analog or field studies, and other future EVA missions. This may also include, but is not limited to, lessons learned during EVA preparations, such as logistics, maintenance, training, and flight controlling.

Cinda Chullen, NASA Johnson Space Center,
cinda.chullen-1@nasa.gov
Christie Sauers, NASA Johnson Space Center

ICES404: ASME

International Space Station ECLS: Systems

This session addresses ECLS System issues and lessons learned from the International Space Station.

Steven Balistreri, The Boeing Company,
steven.balistreri@boeing.com
John Cover, NASA Johnson Space Center,
john.m.cover@nasa.gov

ICES405: ASME

Human/Robotics System Integration

This session addresses the research, design, development and testing of human-automation and human-robotic integration for space exploration. Specific topics could include wearable robotics, human-robotic teaming, and human-automation interaction and task allocation. Papers including operations to experimental and modeling approaches, both in the laboratory and in spaceflight analog locations are of interest

Amy Ross, NASA Johnson Space Center,
amy.j.ross@nasa.gov
Dr. David Akin, University of Maryland,
dakin@ssl.umd.edu

ICES406: ASME/AIChE

Spacecraft Water/Air Quality: Maintenance and Monitoring

This session focuses on recent results from flight-and ground-based chemical analyses of spacecraft water and air samples along with recent developments in spacecraft water and air quality monitoring technology.

David Zuniga, Jacobs, david.zuniga@nasa.gov
Darrel Jan, NASA Ames Research Center

ICES500: AIAA LS&S / AIChE

Life Science/Life Support Research Technologies

This session emphasizes research technologies to support space biology, habitation, and life support system design. Life sciences related hardware developments, experiment designs, and flight experiment results for manned spaceflight, unmanned systems such as free flying platforms and planetary spacecraft, and terrestrial analogs are of interest. Other specific topics of interest include the integration of defined cultures of algae and other micro-organisms -- production, processing, refining, utilization and disposition of algal and microbial biomass including GMOs; novel algal and microbial products and applications; and engineering and control of bioprocess systems for space flight and long-term planetary systems.

Bob Morrow, Sierra Nevada Corporation (SNC),
robert.morrow@sncorp.com
John Wetzel, Sierra Nevada Corporation (SNC),
john.wetzel@sncorp.com
Jean Hunter, Cornell University, jbh5@cornell.edu

ICES501: AIAA LS&S

Life Support Systems Engineering and Analysis

This session addresses all aspects of the systems engineering, analysis, and development of space life support. It includes identifying alternatives, conducting trade studies, and optimizing the mission scenario, management approach, systems architecture, technology selection, detailed design, integration, testing, and operations. The overall objective of systems engineering and analysis is to guide the creation of effective systems that meet the performance, risk, cost, and schedule objectives.

Harry Jones, NASA Ames Research Center,
harry.jones@nasa.gov
John Hogan, NASA Ames Research Center,
john.a.hogan@nasa.gov
Jeffrey Lee, NASA Ames Research Center,
jeffrey.m.lee@nasa.gov
Andrew Owens, NASA Langley Research Center,
andrew.c.owens@nasa.gov

ICES502: AIAA LS&S

Space Architecture

This session focuses on the application of architectural principles to the design of facilities beyond Earth (orbital, lunar, planetary, deep space and interplanetary), to provide supportive and comfortable living and working environments, mission risk management, and enjoyment of life, in full recognition of the technical challenges presented by the environment. Relevant topics include: Configurations and structures; Construction and robotics; Habitability design, including food and clothing; Human factors integration; Gravity regimes; Integration of life support systems within space habitats; Analogues, mockups, simulators, and field trials; Terrestrial applications to extreme environments and ground-based facilities; Education for space architects; Space Architecture as a discipline; Sustainability from space to Earth.

Georgi Petrov, Synthesis Int'l, gpetrov@gmail.com
Sandra Haeuplik-Meusburger, Vienna University of Technology, haeuplik@hb2.tuwien.ac.at
François Lévy, Synthesis Int'l, francosilevy@synthesis-intl.com

ICES503: AIAA LS&S

Radiation Issues for Space Flight

This session addresses major issues in space radiation and analysis, tools, and research that are being developed and applied to support the space exploration initiative to insure astronaut and avionics radiation protection and safety.

Lawrence Townsend, University of Tennessee, ltownsen@tennessee.edu

ICES504: AIAA LS&S

Management of Air Quality in Sealed Environments

This session enables experts who manage sealed or semi-sealed environments such as submarine, spacecraft, airliner air quality and mining sectors, to share new research findings on the control and management techniques of air pollutants . This session is open to papers on air quality standards, hazards associated with specific compounds, and monitoring / management of those compounds to pro¬tect the health of crew and passengers.

Tina Goodall, UK Ministry of Defence, tina.goodall266@mod.gov.uk
William Wallace, KBR, william.wallace-1@nasa.gov

ICES506: AIAA LS&S

Human Exploration Beyond Low Earth Orbit: Missions and Technologies

There are many potential destinations for human exploration beyond Low Earth Orbit (LEO), each with specific mission requirements, capabilities, and other attributes that may be common or unique. This session addresses mission designs, technology needs, vehicle systems and analyses for sending humans to destinations beyond LEO and into deep space. Discussions involving Deep Space Gateway and Mars Transport are of great interest, but other missions to cislunar space and surfaces of the Moon and Mars are relevant. Potential subjects include mission requirements, concepts, architectures, technology development needs, technology requirements, challenges, gaps and candidate system designs. Special attention will be given to Environmental Control and Life Support Systems (ECLSS), habitability, architectures, concepts of operation, trade studies, unique environmental considerations and planetary protection.

Dan Barta, NASA Johnson Space Center, daniel.j.barta@nasa.gov
James Chartres, Millennium Engineering & Integration (MEI), james.chartres@nasa.gov

ICES509: AIAA LS&S

Fire Safety in Spacecraft and Enclosed Habitats

This session covers all aspects of fire safety in closed environments including prevention, ignition, detection, flame spread, and suppression. Relevant subjects include material control for fire prevention; fire suppression; fire detection; fire signatures and toxicity; post-fire cleanup; risk assessment; material selection; fire related combustion research; lessons learned and design status of current systems; and life support and control system designs to enable fire detection and suppression. Applicable environments include EVA suits; past, present, and future space transportation vehicles; different gravitational levels; extra-terrestrial habitats; aircraft; ships; and submarines. The research and development studies can be either theoretical, experimental or numerical. Standardization work and case studies are also welcomed.

Grunde Jomaas, University of Edinburgh, grunde.jomaas@ed.ac.uk
Gary A. Ruff, NASA Glenn Research Center, gary.a.ruff@nasa.gov
David Urban, NASA Glenn Research Center, david.urban@nasa.gov
Stephen Peralta, NASA White Sands Test Facility, stephen.f.peralta@nasa.gov

ICES510: AIAA LS&S

Planetary and Spacecraft Dust Properties and Mitigation Technologies

This session focuses on the properties of planetary and asteroid surface dust linked to environment description, within vehicles and external to spacecraft in flight or landed and on mitigation technologies for internally generated dust and externally brought from planetary medium. The effects of dust will pose significant challenges to space operations for crewed and robotic missions. Papers are solicited on environmental concerns and on mitigation strategies for life support systems and dust encountered in planetary surface environments. Mitigation strategies may involve cleaning and repelling approaches for the protection and nominal performance of susceptible hardware, and the capture and filtration of airborne dust that may enter the pressurized volumes of spacecraft and habitats. Characterization and measurements of lunar, Martian, asteroid or internally generated dust properties that provide engineering data for the development of mitigation technologies are also of interest.

Marie-Christine Desjean, CNES, Marie-Christine.
Desjean@cnes.fr
Juan H. Agui, NASA Glenn Research Center,
juan.H.Agui@nasa.gov

ICES511: AIAA LS&S

Reliability for Space Based Systems

This session covers the design, testing, and analysis for system reliability and maintainability. Relevant subjects include, risk assessment, verification and validation, accelerated life testing and aging, environmental screening, acceptance, and qualification testing. Special attention is given to failure modes and mechanisms associated with electronic devices, mechanical assemblies, chemical processing, and life sciences; and the corresponding impacts on system level performance.

Todd H. Treichel, Sierra Nevada Corporation
todd.treichel@sncorp.com
Gregory L. Davis, NASA Jet Propulsion Laboratory
gregory.l.davis@jpl.nasa.gov

ICES513: AIAA LS&S

Computational Modeling for Human Health and Performance Analysis

This session covers practical application of computational modeling (deterministic and probabilistic) for analysis of human health and performance risks, and countermeasure development. Discussion areas include modeling and simulation of physiologic, biomechanical and behavioral responses to reduced gravity, radiation, spacecraft environment, planetary environment, extravehicular activity, crew dynamics, ergonomics, work-load, and countermeasure prescriptions (exercise and non-exercise).

Claas Olthoff, Technical University of Munich,
C.Olthoff@tum.de
Ana Diaz Artiles, Texas A&M University,
adartiles@tamu.edu

What if my abstract doesn't seem to fall into any of the above Technical Topics?

ICES600:

Other

If you are not sure of the best placement for your abstract, please submit to ICES600

Panel Proposals

This year's conference will feature speakers, poster presenters and four days of technical presentations with over 40 sessions covering topics related to human exploration, living and working in space and surviving in extreme environments. Do you have a suggestion for a panel session? The ICES Steering Committee wants your help in bringing together innovative, enthusiastic and technical minds for a discussion on what lies ahead for the human spaceflight community as we continue to explore our solar system.

Prospective moderators, panelists, and/or contributors can submit their idea for a panel session by providing a title, 300-word abstract of the panel and suggestions for POTENTIAL panel participants. Abstracts for panel sessions should be submitted to the **ICES700** technical session in Easy Chair. Proposed panel sessions will be evaluated solely on the basis of their suitability for inclusion in the program.

The deadline for receipt of panel abstracts via electronic submittal is **Friday, 08 November, 2019** by 12:00 midnight Eastern Standard Time. Authors having trouble submitting abstracts electronically should send an email to: info@ices.space.

Questions pertaining to the panel session abstract, format, organization or policy should be referred to the ICES 2020 Panel Chair:

Kevin Duda
Draper Laboratory
kduda@draper.com

Panel session submitters will be notified of abstract acceptance or rejection on or about **09 December 2019.** Submitters of accepted abstracts will work collaboratively with the ICES 2020 Panel Chair to finalize the panel session organization, format, and list of panelists.

Call For Posters

The **ICES Student Poster Competition** is a program aimed at stimulating student participation and provides an excellent forum for students to present their work in an informal and interactive setting. Posters are ideal for presenting speculative or late-breaking results, or for giving an introduction to interesting, innovative work. Posters are intended to provide students and ICES participants with the ability to connect with one another and discuss the work presented.

Each poster will be judged based on technical rigor, poster format, and the student's ability to convey the poster content to the judges through an oral presentation. University/college students are invited to submit abstracts on their proposed poster in accordance with the procedures described below. The student's abstract and poster should be relevant to ICES; that is, they should follow the same theme of the general conference.

Instructions

Poster Abstracts must be entered through the conference submission site called Easy Chair no later than **Friday, April 17, 2020** using the steps outlined below.

EasyChair
The conference system

1. Access Easy Chair for ICES 2020 – **https://easychair.org/conferences/?conf=ices2020**
2. Log in or create an account
3. Click on "Submissions" in top menu
4. Click on "Add a submission" in upper right corner
5. Select Track ICES800: Student Poster Abstracts
6. Follow all remaining steps in Easy Chair to complete the Author Information, as well as the Title and Abstract sections. (Please be sure to designate at least ONE author as the "corresponding author" – person to receive all communications regarding the poster submission)

Authors will be notified of poster presentation acceptance **NO LATER THAN Friday, April 24, 2020.** All poster participants will be required to pay one of the two **Student** Registration Fees to attend the conference. Each poster entry will receive 1(one) complimentary ticket to Wednesday night's banquet. Monetary awards will be given for the top 3 posters.

Questions about the student poster competition?
Contact the ICES 2020 Student Poster Chair – Shawn Macleod: shawn.macleod@collins.com

Conference Policies

"No Paper, No Podium" and "No Podium, No Paper" Policies

If a written paper is not submitted by the final manuscript deadline, authors will not be permitted to present the paper at the conference. It is the responsibility of those authors whose papers or presentations are accepted to ensure that a representative attends the conference to present the paper. If a paper is not presented at the conference, it will be withdrawn from the conference proceedings. These policies are intended to eliminate no-shows and to improve the quality of the conference for attendees.

Publication Policy

ICES will not consider for presentation or publication any paper that has been previously published elsewhere.

WARNING-Technology Transfer

Prospective authors are reminded that technology transfer guidelines have considerably extended the time required for review of abstracts and completed papers by U.S. government agencies. Internal (company) plus external (government) reviews can consume 16 weeks or more. Government review if required is the responsibility of the author. Authors should determine the extent of approval necessary early in the paper preparation process to preclude paper withdrawals and late submissions. The conference technical committee will assume that all abstracts papers and presentations are appropriately cleared.

Export Control Compliance

Export Control Rules and Regulations apply to the export and import of defense articles and defense related items, i.e. dual use items. Information in the public domain is outside the purview of Export Control. (Please note that proprietary company information is not considered to be in the public domain). All authors submitting material to the International Conference on Environmental Systems (ICES) are expected to comply with all applicable Export Control Regulations, which might include any national, European or US Law (ITAR or EAR Regulations). If necessary authors must obtain clearances for their works to be freely published in ICES Proceedings. Authors who are U.S. nationals (including green card holders); work for a U.S.-based organization, regardless of where they are physically located; or work at a U.S. location of a non-U.S.-based organization must also ensure that US Export Control compliance has been obtained for any and all papers submitted to ICES for publication as part of the conference proceedings. ICES maintains the assumption that each author involved in government contracts will meet their contract obligations and that these obligations will, by definition, satisfy the requirements for Export Control compliance.

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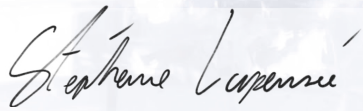
On behalf of the ICES Steering Committee, I would like to thank you for your interest in participating in this year's 50th International Conference on Environmental Systems to be held in the historical city of Lisbon, Portugal. We are looking forward to celebrating and to organizing another successful conference. We appreciate your interest in submitting an abstract for the premier technical conference in environmental life support and thermal control systems. Please note the important dates listed below and we hope to see you in beautiful and sunny Lisbon.



WWW.ICES.SPACE

Stéphane Lapensée
ICES 2020 Conference Chair

Abstract Deadline
08 November 2019

Author Notification
09 December 2019

Draft Manuscript Deadline
06 March 2020

Final Manuscript Deadline
01 May 2020

50th INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SYSTEMS