ICES 2021 CALL FOR PAPERS

ABSTRACT DEADLINE: 16 NOVEMBER 2020

ORGANIZED BY
ICES STEERING COMMITTEE

SUPPORTED BY
ICES Thermal and Environmental Control Systems Committee (TECS)
ICES International Committee (IIC)
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
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 crewed and uncrewed 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 (IIC), 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 10 July -15 July
- €150.00 single /€170.00 double (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 21, 2021 or until room block is full
- 7 (seven) Day Cancellation Policy: reservations fully cancelled or reduced within 6 days or less prior to arrival will be charged a one-night cancellation fee.

ORGANIZING COMMITTEE

Conference Chair
Stéphane Lapensée
European Space Agency

Conference Vice-Chair
Tom Leimkuehler
NASA Johnson Space Center

STEERING COMMITTEE

Art Avila
(TECS Program Chair)
Jet Propulsion Laboratory

Matthias Holzwarth
(IIC 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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Abstract Submittal Guidelines and Procedures

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 2021 (https://easychair.org/conferences/?conf=ices2021)
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 Monday, 16 November 2020 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

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

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

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

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

Authors will be notified of abstract acceptance or rejection on or about 14 December 2020. 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 Monday, 08 March 2021. 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 Monday, 03 May 2021 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).
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, joseph.f.gasbarre@nasa.gov
Hume Peabody, NASA Goddard Space Flight Center, hume.l.peabody@nasa.gov
Wes Ousley, Lentech, Inc., wes.ousley@nasa.gov

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, jennifer.r.miller@jpl.nasa.gov
Gaj Birur, NASA Jet Propulsion Laboratory, gajanana.c.birur@jpl.nasa.gov

ICES103: TECS/IIC
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, exploration vehicles, 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, rubik.b.sheth@nasa.gov
Andrea Ferrero, Thales Alenia Space, andrea.ferrero@thalesaleniaspace.com
Tom Leimkuehler, NASA Johnson Space Center, thomas.o.leimkuehler@nasa.gov

ICES104: TECS/IIC
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 insulation and 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
Philipp B. Hager, European Space Agency, philipp.hager@esa.int
Yann Cervantes, CNES, Yann.Cervantes@cnes.fr
Angel Alvarez-Hernandez, NASA Johnson Space Center, angel.alvarez-hernandez-1@nasa.gov
Brian O’Connor, NASA Marshall Space Flight Center, brian.f.oconnor@nasa.gov
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
Joe Gasbarre, NASA Langley Research Center, joseph.f.gasbarre@nasa.gov
Art Avila, NASA Jet Propulsion Laboratory, arturo.avila@jpl.nasa.gov

ICES106: TECS/ IIC
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

ICES107: TECS/ IIC
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, brian.briggs@jpl.nasa.gov
Hosei Nagano, Nagoya University, nagano@mech.nagoya-u.ac.jp

ICES108: TECS/ IIC
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 Defence and Space, martin.altenburg@airbus.com
Jose Rodriguez, NASA Jet Propulsion Laboratory, jose.l.rodriguez@jpl.nasa.gov
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: IIC

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: IIC

Satellite, Payload, and Instrument Thermal Control

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

Johannes van Es, NLR, johannes.van.es@nlr.nl
Patrick Hugonnot, Thales Alenia Space
Marco Molina, SITAEL
Hiroyuki Ogawa, Japan Institute of Space and Astronautical Science

ICES203: IIC

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: IIC/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
Paul Zabel, DLR
ICES 2021: IIC/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 Stufler, OHB System AG

ICES 2021: IIC/TECS

Crewed Orbiting Infrastructures, Habitats, Space Station and Payload Thermal Control
This session addresses thermal control on board the current Space Station and future long term, crewed (or crew-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

ICES 2021: IIC/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

ICES 2021: AIChE

Environmental Control & Life Support Systems (ECLSS) Modeling and Test Correlations
This session reports on applications and advances in modeling physiochemical and biochemical life support processes and tests, as well as in numerical modeling of fluid flow phenomena, cabin ventilation, and composition distributions in closed space habitats, such as the International Space Station, exploration spacecraft, the deep space and lunar habitats, and commercial crewed orbiter and spacecrafts.

Chang Hyun Son, The Boeing Company, chang.h.son@boeing.com
Nikolay Ivanov, Peter the Great Saint Petersburg Polytechnic University, Russia, ni@rsk.ru
Cynthia Reuland, Aerodyne, cynthia.l.reuland@nasa.gov
Kevin Braman, The Boeing Company, kevin.m.braman@boeing.com
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
Kevin Braman, The Boeing Company, kevin.m.braman@boeing.com
Cynthia Reuland, Aerodyne, cynthia.l.reuland@nasa.gov
Nikolay Ivanov, Peter the Great Saint Petersburg Polytechnic University, Russia, ni@rusk.ru
Cliff Martin, The Boeing Company, cliff.martin@boeing.com

ICES302: AIChe/ASME/IIC
Physico-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
Darrell Jan, NASA Ames Research Center, Darrell.l.jan@nasa.gov
Patrick Oger, Airbus Defence and Space, Patrick.oger@airbus.com

ICES303: AIChe/IIC
This session addresses research, development, and improvement of physico-chemical technologies and systems associated with Water Recovery & 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 water 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
Petr Andreychuk, RSC Energia

ICES304: AIChe/IIC
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
Mike Flynn, NASA Ames Research Center
Matteo Lamantea, Thales Alenia Space
Annie Meier, NASA Kennedy Space Center
Jurek Parodi, WYLE Labs
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, NASA Johnson Space Center
Jordan Holquist, Paragon Space Development Corporation

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@nasa.gov
Jochen Keppler, University of Stuttgart, keppler@irs.uni-stuttgart.de
Lucie Poulet, NASA Postdoctoral Program, Kennedy Space Center, lucie.poulet@nasa.gov

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, gerald.b.sanders@nasa.gov

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 crewed spaceflight, uncrewed 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
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, francoislevy@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
ICE504: 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 protect 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

ICE506: 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 Gateway, cis-lunar space and lunar missions are of great interest, but other missions including Mars transit and Martian surface are also relevant. Potential subjects include mission requirements, concepts, integrated ground testing including humans-in-the-loop, test beds and analogs, 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, mission architecture, 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

ICE509: 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

ICE510: 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.

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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
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 can be submitted to the conference submission site 01 February to 09 April 2021 using the steps outlined below:

1. Access Easy Chair for ICES 2021 – https://easychair.org/conferences/?conf=ices2021
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, 23 April, 2021. 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 2021 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.

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The year 2020 will be forever remembered and through the hardships it will be an important year in our history for generations to come. I believe that the year 2020 will be marked as the year of community - where people came together to help each other through this devastating health and economic crisis. Even though ICES 2020 was postponed, our own community of dedicated authors, session chairs and organizing committees managed to publish 229 papers. What a remarkable achievement! I also wanted to highlight the initial 570 abstracts and 382 draft manuscripts that we received to kick off the submission process. On behalf of the ICES Steering Committee, thank you for your interest and dedication to the ICES community.

It is not clear what the future holds for us, but we are hopeful that 2021 will be the year that the ICES community comes back together to share our research and celebrate the 50th Anniversary of the International Conference on Environmental Systems in the historical city of Lisbon, Portugal.

The ICES Steering Committee looks forward to organizing a successful conference and celebrating 50 years of collaboration. We appreciate your interest in submitting an abstract for this premier technical conference in environmental life support and thermal control systems and we hope to see you in beautiful and sunny Lisbon in July 2021!

Stéphane Lapensée
ICES 2021 Conference Chair

Abstract Deadline
16 November 2020

Author Notification
14 December 2020

Draft Manuscript Deadline
08 March 2021

Poster Abstract Deadline
09 April 2021

Final Manuscript Deadline
03 May 2021