# 2023 IEEE Aerospace Conference

Technical Cosponsors

AIAA SHAPING THE FUTURE OF AEROSPACE

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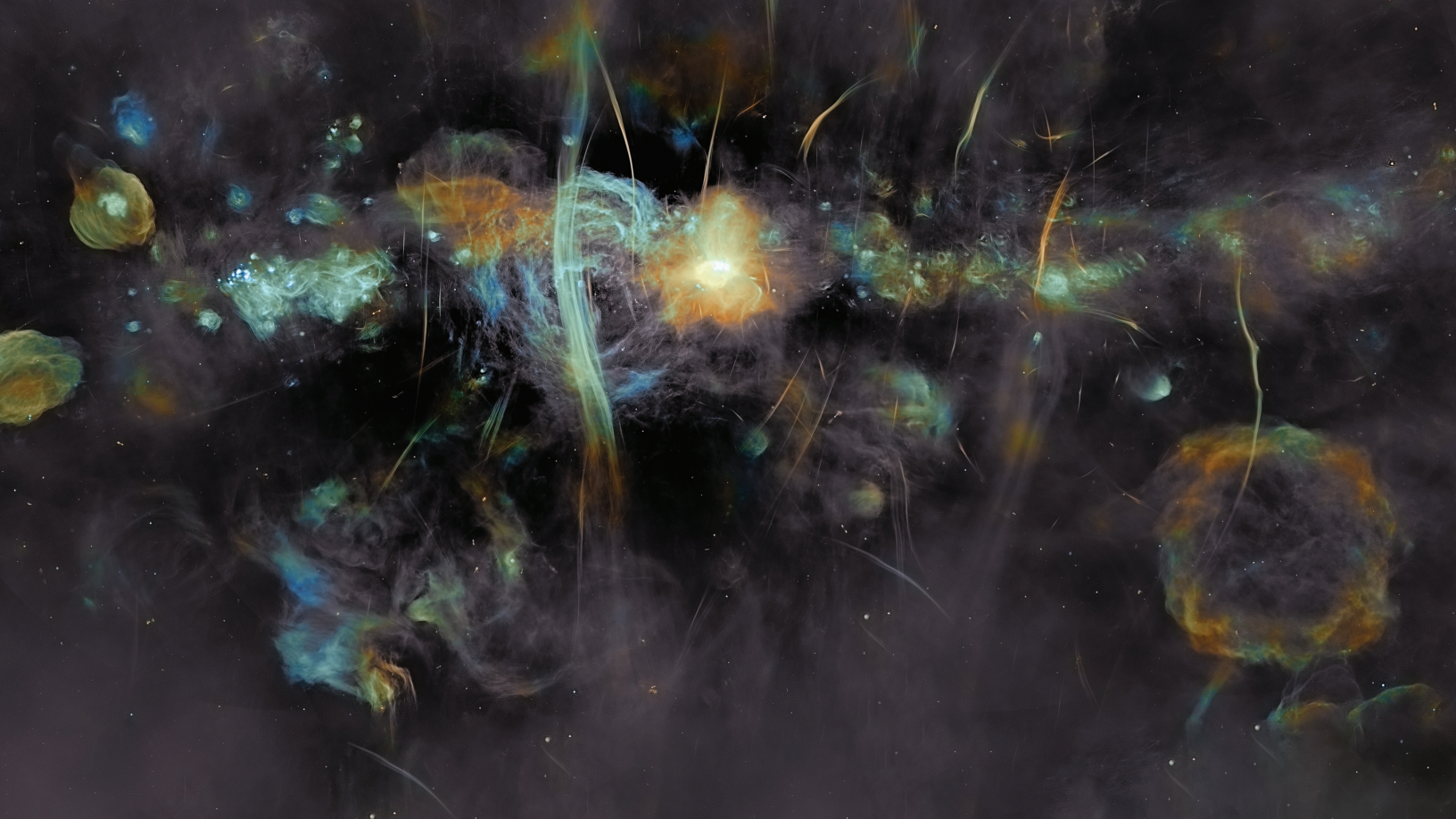
# CALL for PAPERS



Yellowstone Conference Center, Big Sky, Montana, March 4-11, 2023

# The Conference

The international IEEE Aerospace Conference, with AIAA and PHM Society as technical cosponsors, is organized to promote interdisciplinary understanding of aerospace systems, their underlying science and technology, and their application to government and commercial endeavors. The annual, week-long conference, set in a stimulating and thought-provoking environment, is designed for aerospace experts, academics, military personnel, and industry leaders. The 2023 conference is the 44th in the conference series.

# Who Should Attend

This is a conference for **Participants.** Consider attending if you have a professional interest in aerospace engineering or science and wish to:

- Present results and insights from your own work
- Interact with colleagues who present papers in your field
- Engage with people and ideas across a broad spectrum of aerospace technologies
- Understand how your organization might participate in next year's conference

# What Sets This Conference Apart

**High-Quality Papers and Presentations**. Each year, a large number of presentations are given by professionals distinguished in their fields and by high-ranking members of the government.

**Science and Aerospace Frontiers.** The plenary sessions feature internationally prominent researchers working on frontiers of science and engineering that may significantly impact the world. Registrants are briefed on cutting-edge technologies emerging from and intersecting with their disciplines.

**Multidisciplinary Focus.** This is the single general IEEE conference designed to facilitate cross-fertilization of aerospace disciplines and dialogue among members of government, industry, and the academic community.

**Exceptional Networking Opportunities.** The conference provides extraordinary opportunities for discussions and collaborative dialogue with aerospace pacesetters. Professional exchanges benefit the participants, their organizational sponsors, industry, and the engineering and scientific professions.

**Author Development.** The conference provides thorough and supportive paper reviews, relying on expert guidance from senior engineers and scientists and an opportunity for instructive interaction between author and reviewers.

**Conference Proceedings**. Electronic download of Conference Proceedings (comprised of 400+ papers) is included in the registration package.

**International Participation.** Representatives of 20 countries participated in the 2022 conference.

**Sequestered Venue.** The Yellowstone Conference Center and lodging are nestled closely together in the small village of Big Sky, fostering communications and ensuring easy access to all events.

# Exhibitors and Patrons

This unique venue is perfect for exhibiting products and materials in a central area of the conference and to sponsor both conventional and unconventional social events, getting your brand and products out in front of your customers.

## What Attendees Say: Simply the Best!

- Highly acclaimed IEEE Conference Proceedings with peer review.
- A fantastic conference that fosters collaboration at the same time it encourages participants to strengthen their personal and family relations. Amazing achievement!
- I've made invaluable connections every year.
- I really enjoyed the collaborative and supportive atmosphere. The exchange of ideas that resulted was something that I have not seen in any other conference that I have attended.
- It is the most technical aerospace conference and incredibly useful for networking. The plenary talks were wonderful, and the diversity of subjects was fantastic.
- No conference packs so much into one week.
- Never have I encountered such a concentrated and collaborative environment at a conference.
- The technical stature of this conference makes it one of the best places to present your ideas and receive competent comments.
- Allows me to interact with people in ways that are simply not possible otherwise. The benefit to my work has been tremendous.
- For my company, the networking and high profile of the conference are second to none!
- Beautiful facility, amazing staff, conference well organized. Junior conference amazingly well done.

# Technical Program

This Call invites papers reporting original work or state-of-the-art reviews that will enhance knowledge of:

- Aerospace systems, science and technology
- Applications of aerospace systems and technology to military, civilian or commercial endeavors
- Systems engineering and management science in the aerospace industry
- Government policy that directs or drives aerospace programs, systems and technologies

Specific topics planned for the 2023 Conference are listed in the **Tracks, Sessions and Organizers** section, pages 6–30.

# Networking Program

The Networking Program provides opportunities for engaging with other conference professionals beyond the technical sessions. Networking events include:

- Saturday arrival icebreaker reception
- Buffet dinners at four evening meetings
- Pre-dinner receptions
- Midweek mountainside lunch
- Networking "Java Jams" prior to afternoon sessions
- Post-session fireside ice cream socials
- Friday evening farewell dinner

**The costs for these are covered in the registration and guest registration fees.**

**Front Cover** – *This is the latest image of our Milky Way's center by the MeerKAT array of 64 radio dishes in South Africa. Spanning four times the angular size of the Moon (2 degrees), the image is impressively vast, deep, and detailed. Many known sources are shown in clear detail, including many with a prefix of Sgr, since the galactic center is in the direction of the constellation Sagittarius. In our Galaxy's Center lies Sgr A, found here in the image center, which houses the Milky Way's central supermassive black hole.* ***Photo Credit: I. Heywood/ SARAO/J.C. Munoz-Mateos.***

# Abstract Submission

An abstract of 500 words or less is due by **July 1, 2022** at the conference website www.aeroconf.org.

**Abstracts will be accepted ONLY through the conference website.** Accept/reject notices will be emailed promptly. Author instructions are on the website.

**Note:** The IEEE Aerospace Conference is designed as a venue for engineers and scientists to present and discuss their work. **Please submit only if you expect to attend the conference yourself to personally present your paper. (See IEEE Policies on Presentation and Reuse below.)**

# Paper Submission

Properly formatted papers of 6-20 pages must be submitted for review no later than **Friday, October 14, 2022**, a **firm** deadline! Each paper must be in final publishable format and submitted via the conference website as a PDF file. Use our format template to type your paper and see useful links: http://www.aeroconf.org/paper-submission. **Revised** papers responsive to reviewer comments must be submitted to the website by **Friday, January 13, 2023**. This is a **firm** deadline!

Questions regarding the review process may be directed to:

Lisa May and Hemali Vyas, Paper Review Co-Chairs
PaperReviewChair@aeroconf.org

**IEEE Copyright forms** (see link on your "My Submissions" page) must be signed and submitted by **Friday, January 13, 2023.**

Submitted papers are considered for track and conference **Best Paper Awards**, which are selected prior to the conference on the basis of technical innovation and quality of the written paper.

(See www.aeroconf.org for criteria.)

# IEEE Policies on Presentation and Reuse

### Publication of Conference Papers in the *IEEE Xplore* Digital Library

IEEE policy on publication of papers accepted for IEEE conferences states that "IEEE reserves the right to exclude a paper from distribution after the conference (e.g., removal from *IEEE Xplore*), if the paper is not presented at the conference."

*IEEE Xplore* is the association's digital library of over 4.5 million full-text documents. IEEE journals and conference proceedings are among the world's most highly cited technical publications.

### Reuse of Conference Papers in Journal Publications

IEEE policy recognizes and encourages the evolutionary publication process from conference presentation to scholarly publication. Guidelines for author reuse of their presented papers and other intellectual property rights can be found at:

https://www.ieee.org/publications/rights/author-originality.html

A list of IEEE journals can be found at:

https://www.ieee.org/membership-catalog/subscriptions.html

# Registration

The conference registration fee includes:

- Access to all technical sessions
- Electronic copy of Conference Proceedings
- Electronic copy of Conference Digest and Schedule
- Networking/Social Program
- Recreation activities discount

| REGISTRATION FEES (US$) Including Activities & Meals | Received by Nov 30, 2022 | Received after Nov 30, 2022 | Received after Jan 24, 2023 |
|---|---|---|---|
| IEEE & AIAA Members | 880 | 1,060 | 1,290 |
| Non-Members | 1,120 | 1,380 | 1,590 |
| Guests* and Jr. Engineers (Activities & Meals only) | 260 | 285 | 315 |

*Spouse/partner/child of primary registrant

# Travel and Lodging

Special rates for travel from major cities and lodging near the Yellowstone Conference Center are available through the conference travel agent. Check www.aeroconf.org after October 1, 2022. Book early for best choice.

# For More Information

**Visit Our Web Site**: www.aeroconf.org for additional information on abstract and paper submission, and any further notices on the 2023 Conference.

**CONFERENCE-RELATED QUESTIONS**

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**JUNIOR CONFERENCE HELP**

Please visit: https://aeroconf.org/junior-engineering

**GENERAL HELP**

IEEE Aerospace Conference — Info@aeroconf.org

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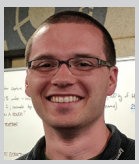

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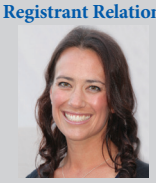

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Shirley Tseng

# SCHEDULE OVERVIEW

## 6 Days of Presentations, Over 175 Hours of Technical Sessions, and 20 Hours of Conference-Sponsored Technical Networking Events

**Registration and Icebreaker Wine & Cheese Reception**
**Saturday March 4, 6:30–9:00 PM**

| Sunday March 5 | Monday March 6 | Tuesday March 7 | Wednesday March 8 | Thursday March 9 | Friday March 10 |
|---|---|---|---|---|---|
| Continued Registration 8:45–11:30 AM | Technical Sessions 8:30 AM–Noon | Technical Sessions 8:30 AM–Noon | Technical Sessions 8:30 AM–Noon | Technical Sessions 8:30 AM–Noon | Technical Sessions 8:30 AM–Noon |
| Continued Registration 3:30–6:45 PM | Lunch Break 12:15–1:25 PM | Catered Lunch Noon–1:30 PM | Lunch Break 12:15–1:25 PM | Lunch Break 12:15–1:25 PM | Lunch Break 12:15–1:25 PM |
| | Panels 1:25–4:00 PM | Jr Engineering & Science Conference 2:00–4:00 PM | Panels 1:25–4:00 PM | Panels 1:25–4:00 PM | Ad Hoc Individual Track Planning Meetings |
| Java Jam 4:00–4:30 PM | Java Jam 4:00–4:30 PM | Ad Hoc Session Workshops (see announcement board for time and location) | Java Jam 4:00–4:30 PM | Java Jam 4:00–4:30 PM | Track/Session Organizers Planning Session for 2024 Conference 4:00–5:30 PM |
| Technical Sessions 4:30–5:45 PM | Technical Sessions 4:30–5:45 PM | | Technical Sessions 4:30–5:45 PM | Technical Sessions 4:30–5:45 PM | |
| Plenary Session 5:50–6:35 PM | Plenary Session 5:50–6:35 PM | | Plenary Session 5:50–6:35 PM | Plenary Session 5:50–6:35 PM | |
| Hosted Reception 6:35–7:05 PM | Hosted Reception 6:35–7:05 PM | Free Evening in Big Sky Village | Hosted Reception 6:35–7:05 PM | Hosted Reception 6:35–7:05 PM | Farewell Networking Catered Reception & Dinner 7:00–11:00 PM (Buffet open 7:00 –9:00 PM) |
| Catered Dinner 7:05–8:05 PM | Catered Dinner 7:05–8:05 PM | | Catered Dinner 7:05–8:05 PM | Catered Dinner 7:05–8:05 PM | |
| Plenary Session 8:05–8.50 PM | Plenary Session 8:05–8.50 PM | | Plenary Session 8:05–8.50 PM | Plenary Session 8:05–8.50 PM | |
| Technical Sessions 9:00–10:15 PM | Technical Sessions 9:00–10:15 PM | | Technical Sessions 9:00–10:15 PM | Technical Sessions 9.00–10:15 PM | |
| Après Session Fireside Cheer and Chat 10:15–11:00 PM | Après Session Fireside Cheer and Chat 10:15–11:00 PM | | Après Session Fireside Cheer and Chat 10:15–11:00 PM | Après Session Fireside Cheer and Chat 10:15–11:00 PM | |

**All dinners and networking activities are intended to promote, enhance, and facilitate technical discussions and long-term professional and personal relationships.**

# Tracks, Sessions & Organizers

## Track 1 Science and Aerospace Frontiers (Plenary Sessions)

**David Woerner** **david.f.woerner@jpl.nasa.gov**

Project Manager, Jet Propulsion Laboratory. Over 35 years of experience at the Jet Propulsion Laboratory. Currently, Systems Formulation Manager for the Radioisotope Power System Program at NASA and Chief Engineer for the Nuclear Space Power Office at JPL. Previously, Principal Engineer for the RPS Program, Manager of Launch Services and Multi-Mission Radioisotope Thermoelectric Generator for the Mars Science Laboratory, and Chief Engineer of the avionics for the Mars Pathfinder. Also worked on many deep space missions, including Galileo, Cassini, and Magellan missions. Chair of the Board of Directors for the IEEE Aerospace Conferences. Numerous NASA awards, including Exceptional Service and Exceptional Achievement Medals.

## Track 2 Space Missions, Systems and Architectures

**Steven Arnold**
**steven.arnold@jhuapl.edu**

Deputy Executive, Civil Space, APL. Oversees all Civil Space programs at APL, including NASA missions. Responsible for strategic activities such as core technology development, internal research and development, external partnering programs, program formulation, and program execution. BSEE, Virginia Tech; MSEE, Purdue University.

**Keyur Patel**
**keyur@jpl.nasa.gov**

Director for Astronomy and Physics, NASA Jet Propulsion Laboratory and represents the Directorate as a member of JPL's Executive Council. Formerly Deputy Director for Planetary Science, Director for the Interplanetary Directorate, and Deputy Director for Office of Safety and Mission Success.

### Session 2.01 Deep Space, Earth and Discovery Missions

Addresses status and results of missions in formulation, implementation, and operation. Session objective is to provide a full mission prospective and discuss the system level trade offs, challenges and lessons learned. From operational missions, results are discussed along with the in-flight challenges. Session addresses all types of missions from Earth orbiting to planetary to heliophysics to astrophysics missions.

**James Graf** **james.e.graf@jpl.nasa.gov**

Director, Earth Science and Technology Directorate, Jet Propulsion Laboratory

**Nick Chrissotimos** **nicholas.g.chrissotimos@nasa.gov**

Associate Director of Flight Projects Code 460, NASA Goddard Space Flight Center

**Keyur Patel** **keyur@jpl.nasa.gov**

Director for Astronomy and Physics, Jet Propulsion Laboratory

### Session 2.02 Future Space and Earth Science Missions

Concepts for future space or Earth science programs or missions, from early formulation through Phase B.

**Patricia Beauchamp** **patricia.m.beauchamp@jpl.nasa.gov**

Chief Technologist, Engineering and Science Directorate, Jet Propulsion Laboratory

**Arthur Chmielewski** **abc@jpl.nasa.gov**

Project Manager, Jet Propulsion Laboratory

**Alex Austin** **alexander.austin@jpl.nasa.gov**

Systems Engineer, Jet Propulsion Laboratory

### Session 2.03 System and Technologies for Landing on Planets, the Moon, Earth and Small Bodies

This session includes landing spacecraft, including precision and safe landing, atmospheric entry, descent, and landing/rendezvousing with small bodies.

**Ian Clark** **ian.g.clark@jpl.nasa.gov**

Systems Engineer, Jet Propulsion Laboratory

**Clara O'Farrell** **ofarrell@jpl.nasa.gov**

Guidance and Control Engineer, Jet Propulsion Laboratory

## Session 2.04 Access to Space and Emerging Mission Capabilities

The high cost of launch continues to be a roadblock to space missions large and small. The development of adapters (ESPA, PPOD, e.g.), the development of new launch vehicles, the acceptance of risk for accommodating secondary or auxiliary payloads, and the explosion of cubesat and smallsat capability have led to some creative approaches to space missions. This session is meant to showcase how our space colleagues are leveraging these emerging capabilities.

**Eleni Sims** sam.sims@aero.org

Project Engineer, The Aerospace Corporation

**Kara O'Donnell** kara.a.odonnell@aero.org

Principal Director, The Aerospace Corporation

## Session 2.05 Robotic Mobility and Sample Acquisition Systems

Use of robotic systems for in situ space exploration involving robotic mobility, manipulation, and sampling. All aspects of these robotic systems, including design, development, implementation, and operation are valued topics of presentation. Research prototypes as well as fielded or flown systems are of interest.

**Richard Volpe** volpe@jpl.nasa.gov

Section Manager, Jet Propulsion Laboratory

**Paul Backes** backes@jpl.nasa.gov

Group Supervisor, Jet Propulsion Laboratory

**Frances Zhu** zhu@higp.hawaii.edu

Assistant Research Professor, University of Hawaii at Manoa

## Session 2.06 Future Missions & Enabling Technologies for In Situ Exploration, Sample Returns

Future mission concepts, planetary protection technologies, sample handling techniques, novel technologies for in situ exploration, technologies not covered under robotic mobility and sample acquisition, human precursor mission concepts, and technologies that enable precursor missions.

**Patricia Beauchamp** patricia.m.beauchamp@jpl.nasa.gov

Chief Technologist, Engineering and Science Directorate, Jet Propulsion Laboratory

**Michael Johnson** michael.a.johnson@nasa.gov

Chief Technologist, Engineering and Technology Directorate, NASA Goddard Space Flight Center

**Elena Adams** elena.adams@jhuapl.edu

Systems Engineer, Johns Hopkins University/Applied Physics Laboratory

## Session 2.07 In Situ Instruments for Landed Surface Exploration, Orbiters, and Flybys

This session solicits papers that describe advanced instrument concepts and/or innovative analytical protocols that enable the characterization of surface and subsurface chemistry and geology (elemental, isotopic, molecular, mineralogical composition), astrobiological potential, geophysical processes (tectonics, internal structure, heat flow, geochronology), atmospheric chemistry and dynamics, dust and particles, charged particles/plasmas, and magnetic fields.

**Stephanie Getty** stephanie.a.getty@nasa.gov

Deputy Director, NASA Goddard Space Flight Center

**Xiang Li** xiang.li@nasa.gov

Research Scientist, NASA Goddard Space Flight Center

## Session 2.08 Space Exploration with Small, Low-Cost Missions

This session will explore the use of small spacecraft (smallsats, cubesats, etc.) to enable new, exciting low-cost missions for space exploration. This session will focus on: (1) small, low-cost missions in study, formulation, implementation, operations, and completed and (2) results and lessons-learned from small, low-cost missions that have flown.

**Young Lee** young.h.lee@jpl.nasa.gov

Technical Group Supervisor and Project Support Lead, Jet Propulsion Laboratory

**Andrew Petro** andrew.j.petro@nasa.gov

Program Executive, NASA Headquarters

## Session 2.09 Mission Design, Formation Flying and Constellations

This session covers all aspects of mission design for spacecraft flying to or about Earth, other celestial bodies and deep space. A subtopic is formation flying and constellations of two or more spacecraft, including mission designs, architecture of distributed systems, guidance and navigation and operational issues.

**Giovanni Palmerini** giovanni.palmerini@uniroma1.it

Professor, Guidance and Navigation, Sapienza Universita' di Roma

**Leonard Felicetti** leonard.felicetti@cranfield.ac.uk

Lecturer in Space Engineering, Cranfield University

**Ryan Woolley** woolley@jpl.nasa.gov

Systems Engineer, Jet Propulsion Laboratory

## Session 2.10 Space Radiation and its Interaction with Shielding, Electronics and Humans

The mitigation of adverse effects from radiation on humans and electronics in space is a critical step in mission success. This session focuses on research in understanding the nature of the radiation field in space and how that field is changed as it passes through shielding materials, electronics, and the human body. Topics include radiation measurements made in space, projectile and target fragmentation measurements and materials studies conducted at accelerator facilities on ground, radiation transport modeling, improvements of nuclear reaction models and radiation transport codes, shielding of electronics and humans, and benchmarking of measurements performed both in space and on ground for the verification and validation of the transport codes.

**Lembit Sihver** lembit.sihver@tuwien.ac.at

Professor Dr., Chalmers University of Technology

**Maria De Soria Santacruz Pich** maria.de.soria-santacruz.pich@jpl.nasa.gov

Systems Engineer, Jet Propulsion Laboratory

## Session 2.11 Space Debris and Dust: The Environment, Risks, and Mitigation Concepts and Practices

Operational satellites are at risk from collisions with the more than 20,000 trackable debris objects that remain in orbit today, as well as hundreds of thousands of objects, including micrometeoroids, that are too small to be cataloged. Beyond the realm of Earth-oriented orbits, unique and immensely valuable science-gathering spacecraft can also be exposed to similar hypervelocity collisional risks, but from cometary and asteroidal micro-milliscale particles (dust). Papers are invited that address the space debris population and growth projections; debris and dust characteristics; impact modeling and materials testing; modeling and simulation and/or test results that can lead to quantification of the risks to spacecraft in various orbits and exploration missions; and mitigation strategies including debris removal or repositioning, spacecraft shielding, orbit selection, and spacecraft operations. Papers documenting past mission anomalies traced to space debris, and mitigation strategies employed today, are also of interest.

**Kaushik Iyer** iyerka1@jhuapl.edu

Materials Physicist/Manager, Johns Hopkins University/Applied Physics Laboratory

**Douglas Mehoke** doug.mehoke@jhuapl.edu

SEM Group Supervisor of the Mechanical Systems Group, Johns Hopkins University/Applied Physics Laboratory

## Session 2.12 Asteroid Detection, Characterization, Sample-Return, and Deflection

This Session invites papers on flight and ground system concepts, mission concepts, and technologies that address the need to detect, characterize and deflect asteroids that could pose an impact hazard to Earth. Papers on instrument technologies and technologies for proximity operations near, and landing on, asteroids are also sought.

**Jeffery Webster** jeff.webster@aeroconf.org

Senior Systems Engineer, Jet Propulsion Laboratory

**Paul Chodas** paul.chodas@jpl.nasa.gov

Director, Center for Near-Earth Object Studies, Jet Propulsion Laboratory

## Session 2.13 Orbital Robotics: On-Orbit Servicing and Active Debris Removal

On-going and future missions involving in-space robotic systems and operations, to include On-Orbit Servicing, Active Debris Removal, Assembly, and Astronaut Assistance. All designs and methods to accomplish robotic tasks in orbit, such as mobility, manipulation, assembly or maintenance, are of interest. Specific aspects may be addressed, such as hardware design, open-loop or closed-loop control, rendezvous trajectory generation, computer vision, autonomy, tele-operation, experimental facilities on the ground, or others of relevance. Mission concept papers are to include technical development toward ground testing or flight operation.

**David Sternberg** david.c.sternberg@jpl.nasa.gov

Guidance and Control Engineer, Jet Propulsion Laboratory

**Markus Wilde** mwilde@fit.edu

Associate Professor, Florida Institute of Technology

# Track 3 Antennas, RF/Microwave Systems, and Propagation

**James Hoffman**
**jimh72@gmail.com**

Vice President of Engineering at Kinemetrics, Inc. Over 10 years experience in microwave instrument design for remote sensing applications. Formely the RF System Lead for the NI-SAR radar mission (NASA-ISRO) and the InSight Landing Radar.

**Glenn Hopkins**
**glenn.hopkins@gtri.gatech.edu**

Principal Research Engineer, Georgia Tech Research Institute: GTRI Fellow and Chief Engineer of the Antenna Systems Division of the GTRI Sensors and Electromagnetic Applications Laboratory, specializing in array antenna technologies. Interests include phased arrays, wide bandwidth antennas, digital beam forming and RF subsystems.

## Session 3.01 Phased Array Antenna Systems and Beamforming Technologies

Included are active power combining, thermal management, phasing networks, integration, power, test and evaluation and beamsteering, algorithm development and associated hardware implementations, and modeling and simulation for all levels of phased array development and beamsteering.

**Janice Booth** — **janice.c.booth2.civ@mail.mil**
Electronics Engineer, AMRDEC Weapons Development and Integration Directorate

**Glenn Hopkins** — **glenn.hopkins@gtri.gatech.edu**
Principal Research Engineer, Georgia Tech Research Institute

## Session 3.02 Ground and Space Antenna Technologies and Systems

Papers on all aspects of antenna systems for ground, ground to/from space and space communications, including reflector antennas and feeds, arrays, and transmit/receive subsytems.

**Farzin Manshadi** — **farzin.manshadi@jpl.nasa.gov**
JPL Spectrum Manager, Jet Propulsion Laboratory

**Chris Rose** — **chris.rose@viasat.com**
Chief Technology Office - Antenna Systems, Viasat

## Session 3.03 RF/Microwave Systems

Papers about RF and microwave systems or components, passive and active, including radar systems.

**Jim Hoffman** — **jimh72@gmail.com**
Vice President of Engineering, Kinemetrics, Inc.

## Session 3.04 Radio Astronomy and Radio Science

Papers on the techniques, hardware, systems, and results in the fields of Radio Astronomy and Radio Science.

**Mark Bentum** — **m.j.bentum@tue.nl**
Professor, Eindhoven University of Technology

**Melissa Soriano** — **webguru@aeroconf.org**
Payload Systems Engineer, Jet Propulsion Laboratory

## Session 3.05 Miniaturized RF/Microwave Technologies Enabling Small Satellite and UAV Systems

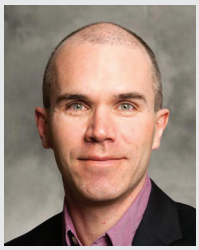
Papers in all fields that advance the state-of-art in the miniaturization of RF and microwave technologies. These include device technologies such as RF ASICs, MMICs, and system-on-chip; packaging technologies such as flexible electronics, 3D microwave integration, and hybrid techniques; instruments and systems for small satellites, and UAVs.

**Dimitris Anagnostou** — **danagn@ieee.org**
Associate Professor, Heriot Watt University

# Track 4 Communication & Navigation Systems & Technologies

**Kar Ming Cheung**
**kar-ming.cheung@jpl.nasa.gov**

Principal Engineer and Technical Group Supervisor, JPL's Communication Architectures and Research section. 30+ years in advanced channel coding, source coding, synchronization, image restoration, and communication analysis. NASA Exceptional Service Medal. BSEE, University of Michigan; MS and PhD, California Institute of Technology.



**John Enright**
**jenright@ryerson.ca**

Associate Professor in Department of Aerospace Engineering at Toronto Metropolitan University (formerly Ryerson University). His primary research interests concern the development of attitude sensors for spacecraft, optical navigation, and mobile robotics.

## Session 4.01 Evolving Space Communication Architectures

A forum in which to trace, examine and predict trends in the architectures of space communications and navigation, including ground infrastructure and support and interactions between terrestrial and space networks. Innovative concepts and game changing approaches with a system view are especially sought.

**Shervin Shambayati** **shervin.shambayati@aero.org**

Senior Systems Engineering, The Aerospace Corporation

## Session 4.02 Communication Protocols and Services for Space Networks

The focus is communication protocols and services supporting space systems, including ground- and space-based methods to increase efficiency, enable new exploration/applications, provide more secure systems, and improve Quality of Service. Techniques include relay communications, routing, delay/disruption tolerant networking, retransmission approaches, adaptive link/network/transport methods, demand access, and advanced scheduling. Novel space network architectures are of key interest, including microspacecraft swarms, sensor webs, and surface networks. Implementation and evolution of communications networking into space systems, as well as application to specific missions, are sought.

**Shervin Shambayati** **shervin.shambayati@aero.org**

Senior Systems Engineering, The Aerospace Corporation

## Session 4.03 Next Generation Space Systems: AESS GLUE

This session solicits papers on advanced, interdisciplinary, topics in Space System Engineering, based on the concept of interdependency of systems. This includes new broadband communications systems and techniques, their use platforms, such as small satellites, Internet-of-Remote Things and Internet-of-Space-Things, software control and implementation of sky communications and networks (SDR and SDN), end-to-end system considerations, augmented 3D reality for manned space missions, integration of navigation, communications and sensing functionalities, and advanced signal processing techniques for emerging space communications and data applications.

**Claudio Sacchi** **claudio.sacchi@unitn.it**

Associate professor, University of Trento

## Session 4.04 Navigation and Communication Systems for Exploration

Systems, technology, and operations for navigation and/or communication among elements involved in civil, commercial, or national security missions in any orbital domain (Earth and interplanetary). The session focuses on enabling technologies, strategies, new operational concepts and performance improvements for advancing mission capability.

**Patrick Stadter** **patrick.stadter@jhuapl.edu**

Principal Professional Staff, Johns Hopkins University/Applied Physics Laboratory

**David Copeland** **david.copeland@jhuapl.edu**

Principal Professional Staff, Johns Hopkins University/Applied Physics Laboratory

## Session 4.05 Relay Communications for Space Exploration

For a wide range of space exploration scenarios, multi-hop relay communications can provide significant benefits in terms of increased data return and reduced user burden (mass, power, cost) over conventional space-to-ground links. In this session we examine relay communications for both Earth-orbiting missions and missions throughout the solar system. Topics of interest include relay system architecture, relay spacecraft design (for both dedicated relay orbiters and for hybrid science/telecom spacecraft), relay telecommunications payload design, relay communication protocols, mission applications and operational experiences/lessons-learned.

**David Israel** **dave.israel@nasa.gov**

Exploration and Space Communications Projects Division Architect , NASA Goddard Space Flight Center

**Zaid Towfic** **zaid.j.towfic@jpl.nasa.gov**

Signal Analysis Engineer, Jet Propulsion Laboratory

## Session 4.06 Space Communication Systems Roundtable : Networking the Solar System

The roundtable will provide a forward-looking view of the development of a Solar System Internetwork - a layered architecture aimed at offering ubiquitous, high-bandwidth communication throughout the solar system in support of robotic and, ultimately, human exploration at the Moon and in deep space. Panelists will assess trends in physical layer capabilities, including migration to higher RF frequencies (Ka-band) and/or to optical wavelengths, as well as higher layers in the protocol stack, including networking protocols such as DTN. Based on assessment of forecasted commercial satcom trends, and building on the multi-hop relay capabilities operating today at Earth and at Mars, the roundtable will describe the evolution towards a true Solar System Internetwork in the coming decades.

**David Israel** dave.israel@nasa.gov

Exploration and Space Communications Projects Division Architect , NASA Goddard Space Flight Center

## Session 4.07 Innovative Space Communications and Tracking Techniques

This session solicits innovative contributions to improve flight and ground communication and tracking systems such as antenna arrays, software-defined radios, advance receivers, deployable antennas, relay satellites, Ka and Optical communications, novel signal formats, new coding methods, and CubeSat communications and tracking techniques.

**Kar Ming Cheung** kar-ming.cheung@jpl.nasa.gov

Technical Group Supervisor, Jet Propulsion Laboratory

**Alessandra Babuscia** alessandra.babuscia@jpl.nasa.gov

Telecommunication Engineer, Jet Propulsion Laboratory

## Session 4.08 Communication System Analysis & Simulation

This session solicits innovative contributions on modeling, analysis, and/or simulation of satellite, aerospace, or terrestrial communication systems. Topics include modeling and design of network services and systems, communication waveforms and modulation, integration of terrestrial and satellite networks, deep space communication systems, terrestrial and deep space relay communication networks, communication protocols for satellite communication, traffic modeling, traffic engineering and analysis, network measurements, network optimization and resource provisioning, next generation internet, overlay and virtual networks, autonomic communication systems, cross-layer & cross-system protocol design, and communication network monitoring.

**Marc Sanchez Net** marc.sanchez.net@jpl.nasa.gov

Telecommunications Engineer, Jet Propulsion Laboratory

## Session 4.09 Communications and/or Related Systems: Theory, Simulation, and Signal Processing

This session solicits innovative contributions on theory, modeling and simulation, and signal processing foundations of satellite, aerospace and terrestrial wireless communications.

**David Taggart** dtaggart1912@gmail.com

Engineer, Self

**Claudio Sacchi** claudio.sacchi@unitn.it

Associate professor, University of Trento

## Session 4.10 Wideband Communications Systems

This session solicits innovative contributions about wideband communication systems in terrestrial, satellite, and hybrid Space-terrestrial communications systems transmitting information at high data rates. Papers dealing with modelling and simulations of communications systems, evaluating performance, or describing hardware/software implementation of communication system components are welcome. Detailed topics include, but are not limited to: Broadband satellite and aerospace transmission; Broadband terrestrial wireless transmission; Millimeter wave communications; Spread-spectrum and CDMA communications; TV and HDTV broadcasting over satellite; Modulation and channel coding techniques; MIMO techniques; Antenna design; Multi-carrier communications; Multi-user transmission; Channel equalization; Carrier and timing synchronization; Radio resource management and scheduling; Emerging technologies for safety-critical and emergency communications; Emerging standards for terrestrial and satellite communications (LTE, LTE-A, WiMax, DVB-S2, IEEE 802.11x); Energy-efficient terrestrial and satellite communications; and networking.

**David Taggart** dtaggart1912@gmail.com

Engineer, Self

**Claudio Sacchi** claudio.sacchi@unitn.it

Associate professor, University of Trento

## Session 4.11 Software Defined Radio and Cognitive Radio Systems and Technology

This section presents papers on software and cognitive radio in general, and their application to space communications in particular. Both original and space-centric tutorial papers are welcome.

**Eugene Grayver** eugene.grayver@aero.org

Principal Engineer, The Aerospace Corporation

**Genshe Chen** gchen@intfusiontech.com

CTO, Intelligent Fusion Technology, Inc.

## Session 4.12 Global Navigation Satellite Systems

This session focuses on recent advances in satellite navigation. Current and future envisioned applications of GPS, GLONASS, Galileo, and Compass global navigation satellite systems (GNSSs) are addressed, as well as global, regional and local augmentation systems. The topics covered include next generation GNSSs, receiver technologies, interoperability, orbit computation, multi-sensor fusion, and navigation model, methods and algorithms.

**Gabriele Giorgi** gabriele.giorgi@dlr.de

Senior researcher, German Aerospace Center (DLR)

**Lin Yi** lin.yi.dr@ieee.org

Technologist, Jet Propulsion Laboratory

## Session 4.13 Space Navigation Techniques

Papers in this session are collected on topics of architecture, hardware and algorithms relating to space navigation techniques including, but not limited to: Ground-based deep space navigation using NASA Deep Space Network, ESA Deep Space Antenna, as well as similar deep space navigation facilities from China, India, Japan, etc. Navigation at lunar surface and deep space gateway; Navigation in deep space CubeSats missions; Spacecraft formation flying navigation; Navigation in rendezvous missions; Novel navigation methods (e.g. using pulsars); Relative navigation between spacecraft; Spacecraft navigation with GNSS (Papers accepted under this topic can overlap with the GNSS session topics, and please expect coordination in the final program arrangement); Spacecraft navigation with in-situ sensors including but not limited to magnetometers, inertial sensors, etc.; Navigation robustness; Autonomous navigation; Integrated navigation.

**Lin Yi** lin.yi.dr@ieee.org

Technologist, Jet Propulsion Laboratory

**John Enright** jenright@ryerson.ca

Associate Professor, Toronto Metropolitan University (formerly Ryerson University)

## Session 4.14 CNS Systems and Airborne Networks for Manned and Unmanned Aircraft

This session focuses on communications, navigation and surveillance systems, including on-board and ground-based systems for all vehicles operating in the National Airspace System (NAS): manned and unmanned vehicles, fixed wing and rotor-craft, general aviation, civil transport and military that may carry passengers, cargo or are performing surveillance-type missions. Topics range from concept development, simulation and modeling, technology development and verification, through flight testing and certification. Emerging fields include surface wireless networks, ADS-B, Datacomm, airborne network security, UAS integration, satellite-based CNS, and international activities.

**Jamal Haque** jamal_haq@yahoo.com

Sr.Principal Engineer, Raytheon

**Dylan Hasson** dylan.hasson@dot.gov

General Engineer, Volpe National Transportation Systems Center

## Session 4.15 Aerospace Cyber Security and Cyber-Physical Systems

Computer networks, information technology, and cyber security are contributing significant advances as well as challenges in aerospace. Systems that integrate with the cyberspace and enable safe, efficient and/or profitable operation and performance, with minimal or no human intervention, are of growing interest to the community. This session focuses on related timely topics including, but not limited to, security, privacy, and safety issues/developments in the following areas: aerospace software, data and multimedia distribution; next-generation air traffic control systems; IVHM; aeronautical and space networks; airport and airline information systems; aircraft, UAS/UTM/UAM/AAM, spacecraft and commercial space vehicles; cloud computing, cyber-physical systems, and IoT.

**Krishna Sampigethaya** sampiger@erau.edu

Department Chair and Associate Professor, Embry-Riddle Aeronautical University

**Jamal Haque** jamal_haq@yahoo.com

Sr.Principal Engineer, Raytheon

# Track 5 Observation Systems and Technologies

**Gene Serabyn**
**gene.serabyn@jpl.nasa.gov**

Senior Research Scientist at JPL developing high-contrast coronagraphy and interferometry techniques for direct exoplanet imaging, and microscopy techniques for remote life detection.

**William Danchi**
**william.c.danchi@nasa.gov**

Senior Astrophysicist, NASA Goddard Space Flight Center in Greenbelt, Maryland. Current projects include tthe Cosmic Evolution Through UV Spectroscopy (CETUS) Probe Study, research on exoplanets forming in transitional protoplanetary disks and on the effect of space weather on exoplanet habitability and potential for life.

## Session 5.01 Space Based Optical Systems and Instruments

This session covers all aspects of design, assembly, alignment and testing of optical systems and instruments for applications including astronomy, energy, defense and remote observation. Topics range through design and engineering to integration, alignment, test and control of space-based large optical systems.

**Ryan McClelland** **rmccle@gmail.com**
Research Engineer, NASA Goddard Space Flight Center

**Bogdan Oaida** **bogdan@jpl.nasa.gov**
Systems Engineer, Jet Propulsion Laboratory

## Session 5.02 Balloon-based Observatories

This session covers all aspects of balloon-based observatories. Papers discussing existing and proposed balloon-based observatories, instruments and systems, and important techniques and subsystems such as pointing control systems are welcome, together with results and future plans.

**J. Kent Wallace** **james.k.wallace@jpl.nasa.gov**
Member, Technical Staff, Jet Propulsion Laboratory

**Gene Serabyn** **gene.serabyn@jpl.nasa.gov**
Senior Research Scientist, Jet Propulsion Laboratory

## Session 5.03 Exoplanet Instruments, Missions and Observations

Current and future missions such as TESS, JWST and WFIRST, as well as potential missions such as HabEx, OST and LUVOIR promise to revolutionize exoplanet science, and astrophysics in general. All such missions involve new technological approaches that provide access to new regions of observational parameter space. This session focuses on the new technologies, and the missions and observations thereby enabled.

**William Danchi** **william.c.danchi@nasa.gov**
Senior Astrophysicist, NASA Goddard Space Flight Center

**Gene Serabyn** **gene.serabyn@jpl.nasa.gov**
Senior Research Scientist, Jet Propulsion Laboratory

## Session 5.04 Atmospheric Turbulence: Propagation, Phenomenology, Measurement, Mitigation

This session deals with all aspects of wave propagation through atmospheric turbulence. Topics of interest to this session are adaptive optics systems, deformable/fast-steering mirror modeling and control algorithms, wave front sensing, laser beacon systems and modeling, scintillation, anisoplanatism, atmospheric turbulence characterization and modeling, deconvolution/imaging algorithms, partially-coherent light, and scattering.

**Jack McCrae** **jack.mccrae@afit.edu**
Research Assistant Professor, Air Force Institute of Technology

**Noah Van Zandt** **n.r.vanzandt@gmail.com**
Electro-Optical Engineer, Air Force Research Laboratory

## Session 5.05 Image Processing

A forum on the theory and practice of image restoration and analysis. Potential topics include image registration, feature detection and estimation, image denoising, multimodal image fusion, and hardware/software architectures for image storage and processing.

**William Danchi** **william.c.danchi@nasa.gov**
Senior Astrophysicist, NASA Goddard Space Flight Center

## Session 5.06 Optical Detection and Analysis of Near Earth Objects (NEOs) and Resident Space Objects (RSOs)

This session focuses on systems, data products, and processes related to the optical detection, characterization, and tracking of Near-Earth Objects (NEOs) and resident space objects (RSOs). Possible topical areas include: small automated optical systems for the tracking of man-made objects and space debris, methods for characterizing and analyzing unresolved objects, multi-site and multi-operator cooperative data fusion and analysis, and operational image processing capabilities that contribute to NEO surveillance and space domain awareness (SDA).

**Michael Werth** **mikewerth1@gmail.com**

Senior Electrophysics Engineer / Scientist, Boeing Company

## Session 5.07 Techniques and Instruments for Extant Life Detection

Various instruments can be used to search for evidence of both extant and past life in a variety of environments, such as Mars and the Ocean Worlds. Ultimately, multiple different instruments will be needed to identify and classify any potential life through independent measurements. This session addresses the various techniques that can potentially play a role in life detection, ranging from microscopy to mass spectrometry, as well as sample collection and handling approaches, and associated data processing. These techniques can include terrestrial and biomedical methods that can be extended to life detection on planetary missions.

**Chris Lindensmith** **lindensm@mail.jpl.nasa.gov**

Systems Engineer, Jet Propulsion Laboratory

**J. Kent Wallace** **james.k.wallace@jpl.nasa.gov**

Member, Technical Staff, Jet Propulsion Laboratory

# Track 6 Remote Sensing

**Jordan Evans**
**jordan.p.evans@jpl.nasa.gov**

Project Manager, Europa Clipper. Previously the Deputy Director for Engineering and Science at JPL and Division Manager of JPL's Mechanical Systems Division. Development experience with space projects at both NASA Goddard and JPL, including FUSE, WFC3, GLAST, LISA, and MSL along with numerous architecture studies.

**Darin Dunham**
**darin@vectraxx.com**

LM Fellow and Spiral Chief Engineer, C2BMC Missile Defense National Team, Lockheed Martin, Huntsville. Working on target tracking and discrimination algorithms within the Ballistic Missile Defense System. Served almost 10 years in the Marine Corps. MSEE, Naval Postgraduate School; BSEE, Carnegie Mellon.

## Session 6.01 Systems Engineering Challenges and Approaches for Remote Sensing Systems

The need to make a particular measurement from a particular vantage point drives us to build sophisticated remote sensing instruments and launch them on similarly sophisticated spacecraft, aircraft, submersibles, balloons, etc. This session explores the highly coupled nature of the instrument, platform architecture, flight path design, ground system and mission operations, and the systems engineering challenges and solutions employed. Topics include instrument influences on platform architectures and flight path design, platform-to-instrument integration, trade studies, trends and novel solutions.

**Todd Bayer** **todd.j.bayer@jpl.nasa.gov**

Principal Systems Engineer, Jet Propulsion Lab

**Travis Imken** **travis.imken@jpl.nasa.gov**

Systems Engineer, Jet Propulsion Laboratory

## Session 6.02 Instrument and Sensor Architecture, Design, Test, and Accommodation

This session covers topics related to the physical or functional architecture and design of instruments/sensors. Topics include hardware/software trade studies, fault protection approaches, unique or innovative system interfaces, accommodation of payloads within a system, system-level instrument/sensor testing, instrument/sensor integration, test, and calibration, and approaches to the processes involved in engineering an instrument or sensor.

**Matthew Horner** **mhorner@jpl.nasa.gov**

Mechanical Systems Engineer, Jet Propulsion Laboratory

**Keith Rosette** **keith.a.rosette@jpl.nasa.gov**

Deputy Project Manager, Jet Propulsion Laboratory

## Session 6.03 Imaging Spectrometer Systems, Science, and Applications

This session covers the design, integration, calibration, and operation of imaging spectrometer instruments and hyperspectral sensors. Technology development and data processing techniques are also included, as well as proposed instruments and lessons learned from all phases.

**Peter Sullivan** peter.sullivan@jpl.nasa.gov

Electrical Engineer, Jet Propulsion Lab

## Session 6.04 Radar Systems and Signal Processing

This session focuses on radar systems and signal processing. Topics include the design of surveillance and imagining radars, as well as other novel applications of radar. Synthetic Aperture Radar (SAR), Space-time Adaptive Processing (STAP), multi-static radar, compressive sensing, target, clutter, and interference models, and any other radar related topics are of interest. We are inclusive of the theoretical aspects of radars, as well as the engineering problems of practical importance.

**Donnie Smith** donnie.smith@gatech.edu

Radar Engineer, Waymo

**Thomas Backes** tdbackes@gmail.com

Engineer, Georgia Institute of Technology

## Session 6.05 Information Fusion

This session focuses on exploitation of all sources of information, including physical sensor data, context information, and human inputs. Methodologies for effective multi-sensor multi-target tracking of highly disparate sources are of interest, as are algorithms and advances in downstream analysis of track data for situational awareness.

**Stefano Coraluppi** stefano.coraluppi@ieee.org

Chief Scientist, Systems & Technology Research

**Craig Agate** cagate@toyon.com

Senior Staff Analyst, Toyon Research Corporation

## Session 6.06 Multisensor Fusion

Papers that address all aspects of information fusion for the integration of multiple sensors are sought. Of particular interest are the theoretical aspects of some popular questions. When is sensor fusion better than a single sensor? How does one ensure that sensor fusion produces better results? Papers that document algorithms that address one of the many challenges in multisensor/multitarget tracking or multisensor resource management are also sought.

**William Blair** dale.blair@gtri.gatech.edu

Principal Research Engineer, Georgia Tech Research Institute

**Laura Bateman** laura.bateman@jhuapl.edu

System Engineer, Johns Hopkins University/Applied Physics Laboratory

## Session 6.07 Applications of Target Tracking

Tracking of targets, both cooperative and uncooperative, moving under water, on water, on land, in air or in space, with sonar, radar or electro-optical sensors. Fusion of data from multiple sensors. Algorithms for handling target maneuvers and data association. Estimation of sensor properties (biases, noise variances).

**John Glass** jglass20@gmail.com

Systems Engineer, Raytheon Technologies

**John Grimes** john.p.grimes@baesystems.com

Scientist, BAE Systems, Inc

## Session 6.08 Guidance, Navigation and Control

The target of this section is collecting the most recent works of research and development regarding guidance, navigation and control (GNC) in order to provide an exhaustive (as much as possible) picture of the state of art and a likely key to the reading of today's new challenges. With this section we intended to give emphasis both to the more interesting theoretical aspects of the matter and to engineering problems of great practical importance, so a wide spectrum of arguments is welcomed.

**Christopher Elliott** christopher.m.elliott@lmco.com

LM Fellow, Lockheed Martin Aeronautics Company, Texas Christian University, The University of Texas at Arlington

**Matthew Lashley** matthewvlashley@gmail.com

Senior Research Engineer, GTRI

## Session 6.09 Fusion Integration of Sensor Harvesting

Methods for situation awareness/assessment, threat/impact analysis, sensor/processing refinement, user/man-machine interfaces, and mission awareness/responsiveness. Techniques for system design leveraging information fusion for Command, Control, Communications, Computers, and Cyber Intelligence, Surveillance and Reconnaissance (C5ISR) over multi-domain sensor data and intelligence collections. Applications focusing on space, air, and architecture developments for efficient and effective distributed net-centric operations, edge computing, and complex networks. Approaches for software/hardware dynamic data-driven applications systems (DDDAS) improvements, context-enhanced results, and avionics protocols for big data scenarios. Use of information fusion to optimize and coordinate machine analytics with users for human-machine teaming.

**Erik Blasch** **erik.blasch@gmail.com**

IEEE Aerospace & Electronic Systems Society, Air Force Research Laboratory

**Peter Zulch** **peter.zulch@us.af.mil**

Engineer, Air Force Research Laboratory

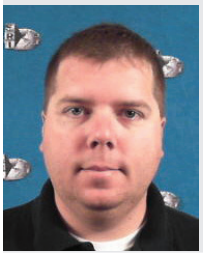
# Track 7 Avionics and Electronics for Space Applications

**John Samson**
**jrsamson1970@gmail.com**

Research Affiliate/Aerospace Consultant, Morehead State University. 50+ years experience in onboard processing for space and airborne applications. Over 50 publications in onboard processing systems and architectures. Senior Member IEEE, Associate Fellow AIAA. Graduate of IIT, MIT, and University of South Florida.

**John Dickinson**
**jrdicki@sandia.gov**

Manager, R&D at Sandia National Labs. Experience in spacecraft & payload systems engineering and avionics design & test on Kepler, WISE, JUNO, IBEX, RBSP, MMS, SPP, Solar Orbiter, CYGNSS, and multiple government programs. BSEE, Johns Hopkins University; MSEE, Georgia Institute of Technology.



**Patrick Phelan** **pphelan@swri.org**

Manager at Southwest Research Institute (SwRI) in San Antonio, TX, USA in the Space Science and Engineering Division. He received a B.S. in Computer Engineering in 2005 and a M.S. in Electrical Engineering in 2006, both from the Georgia Institute of Technology. He has been with SwRI for more than sixteen years serving in a variety of roles with growing responsibility on space programs. Most recently, he is serving as a project manager and systems engineer for several DoD technology demonstration programs.

## Session 7.01 High Performance Computing and On-Board Data Processing for Space Applications

Explore innovations and new developments in spacecraft on-board and embedded computing architectures. Example hardware topics: processors, data handling and companion processing ASICs and FPGAs, multicore processing architectures, application of soft-core embedded FPGA processors, emerging GPU technologies for space-based applications, on-orbit reconfiguration, and new or applied standards for embedded space electronics applications. Example software topics: machine learning techniques, embedded cluster computing, on-board big data analytics, power-aware optimal reconfiguration algorithms, reconfigurable software-implemented hardware fault tolerance algorithms and designs, evolutionary platforms, and autonomous computing designs. Papers should address, as applicable: processing performance, size-weight-power (SWaP) comparisons of different components and architectures, standardized form factors, protocols and interfaces, radiation hardness by design, process, or technology, mitigation of other spacecraft environmental factors, software support, and integration and test of elements. Descriptions and performance of actual development, test, flight, or mission usage are highly sought.

**Jamal Haque** **jamal_haq@yahoo.com**

Sr.Principal Engineer, Raytheon

**Robert Merl** **merl@lanl.gov**

Electrical Engineer, Los Alamos National Laboratory

## Session 7.02 Peripheral Electronics, Data Handling, and Interconnects for Space Applications

This session explores novel concepts for hardware and software technologies that support but are peripheral to the main computing core. Example topics include: novel instrument or payload hardware and software technologies; network connections architectures; high speed interconnects; mixed signal and systems-on-a-chip technologies; onboard signal, data, and command processing; telecommand reception, decoding, and distribution; payload data pre-processing; dedicated accelerators for data processing; transmission and storage (e.g. compression, encoding, parallel processing for payloads (GIPs, GFLOPs), etc.); fault-tolerance mechanisms; autonomous operations, reconfigurable approaches, and failsafe strategies; emerging and novel designs and tests for high performance embedded computing platforms; temporal and spatial reuse of systems' resources; sensor, detector, and imager readout circuits; high resolution/ high speed ADCs and DACs; resource efficient (mass/ volume ) miniaturized multi-channel/ parallel systems; circuit designs for analog and digital processing functions; and designs for integrated communications systems applications on a chip.

**Patrick Phelan** pphelan@swri.org

Manager - R&D, Southwest Research Institute

**Mark Post** mark.post@york.ac.uk

Lecturer, University of York

**Michael Epperly** mepperly@swri.edu

Senior Program Manager, Southwest Research Institute

## Session 7.03 Assembly, Integration, and Test for Electrical Space Systems

This session explores all aspects of assembly, integration, and test of electrical space systems. This includes assembly, integration, and test efforts at the board-level for RF, analog, or digital card assemblies; box-level for command, telemetry, data handling, data processing, control, power, or mixed-purpose avionics; subsystem-level for instruments/payloads; or system-level for entire spacecraft electrical subsystems. Papers can address innovative uses of test software, test scripts, mission simulation, human-computer interface, electrical support ground equipment, and harnessing to accomplish integration and test. Papers also address unique system engineering and configuration control approaches to manage test, and transition from system test to launch and mission operations.

**Eric Bradley** eric.bradley@nrl.navy.mil

Computer Engineer, Naval Research Lab

**Eric Rossland** eric.rossland@nrl.navy.mil

Electronics Engineer, Naval Research Laboratory

## Session 7.04 Avionics for Small Satellites, Nano-Satellites, and CubeSats

This session presents a survey of newly designed and heritage electrical and avionics subsystems for application in smaller spacecraft, including CubeSats. Example topics include: attitude determination and control; telemetry systems; command and data handling; power systems; thermal systems; and guidance and navigation systems, all scoped for small satellites (<50kg). Participants include fundamental research organizations, such as universities and national laboratories, as well as system providers, such as defense departments, and industry partners.

**John Dickinson** jrdicki@sandia.gov

Manager, Research & Development, Flight Edge Compute Systems, Sandia National Laboratories

## Session 7.05 Power Electronics for Aerospace Applications

This session explores advanced power electronics designs and systems for space and avionics applications. Example topics include: power devices; wide bandgap power semiconductors; power electronics; electro-magnetic devices; photo-voltaic modules; energy storage and battery management systems and power systems. Papers discuss technical aspects of power electronics including extreme thermal and power requirements, radiation hardening, efficiency and power management, tolerance to aerospace environments, and reliability.

**Christopher Iannello** chris.iannello@nasa.gov

NASA Technical Fellow for Electrical Power, NASA NESC

**Peter Wilson** prw30@bath.ac.uk

Professor, University of Bath

## Session 7.06 Electronics for Extreme Environments

This session explores innovations in electronics technologies and packaging that help enable operation of electronics in extreme environments, including space. Technologies resilient to extremes in temperature, radiation, and launch vehicle environments are relevant. Example topics include: materials and techniques for assembling and testing microelectronics; component packaging, attachment, and connectors; thermal/mechanical/electrical/radiation performance comparisons; reliability and failure analyses; adaptation of manufacturing methods for space applications; and integration of diverse modules such as MEMS, power electronics, sensors, optics, RF and microprocessors.

**Mohammad Mojarradi** mohammad.m.mojarradi@jpl.nasa.gov

Manger, Componnent Engineering and Assurance, Jet Propulsion Laboratory

## Session 7.07 Fault Tolerance, Autonomy, and Evolvability in Spacecraft and Instrument Avionics

This session explores adaptation, including Fault Tolerance, Autonomy, and Evolvability, in space electronics. Adaptation reflects the capability of a system to maintain or improve its performance in the presence of internal or external changes, such as faults and degradations, uncertainties and variations during fabrication, modifications in the operational environment, or incidental interference. This session addresses all aspects of adaptivity for spacecraft and instrument avionics with the scope of papers encompassing theoretical considerations, design solutions, and actual techniques applied to space flight operations.

**Tom Hoffman** thoffman@jpl.nasa.gov

Project Manager, Jet Propulsion Laboratory

**Didier Keymeulen** didier.keymeulen@jpl.nasa.gov

Principal, Member Technical Staff, Jet Propulsion Laboratory

## Session 7.08 Guidance, Navigation, and Control Technologies for Space Applications

This session explores sensor, actuator, and processing innovations related to the guidance, navigation, and control of space vehicles. This session welcomes manuscripts that discuss technologies applicable to satellites, probes, landers, launchers, and other space-related missions.

**John Enright** jenright@ryerson.ca

Associate Professor, Toronto Metropolitan University (formerly Ryerson University)

**Leena Singh** lsmindstorm@gmail.com

Senior Staff, Lincoln Laboratory

**Jacob McGee** jmcgee@swri.org

Research Engineer, Southwest Research Institute

## Session 7.09 Emerging Technologies for Space Applications

This session explores a wide range of advanced, novel, and cutting edge device technologies for space applications. Example topics include: advanced MEMS devices; 3D circuit printing; innovative embedded electronics applications (including multi-functional components); as well as the leveraging of advanced commercial electronics for space applications. This session also serves as a catch-all for unique advanced technology topics that do not fit cleanly into other sessions or are inherently multi-disciplinary in nature.

**William Jackson** william.jackson01@l3harris.com

Senior Scientist, L3Harris Technologies

**Michael Mclelland** michael.mclelland@swri.org

Executive Director, Space Systems Directorate, Southwest Research Institute

## Session 7.10 COTS Utilization for Reliable Space Applications

This session explores the use of commercial, off-the-shelf electronics and technologies in a space environment. Using commercial electronics not intended for an application in a space environment is becoming increasingly common. Topics of interest include: adaptations of COTS electronics for fault tolerance and environmental resilience; flight proven COTS electronics; novel implementations of electrical functions using COTS components; and results of COTS component use. Papers address theoretical considerations, design solutions, and actual techniques applied to space flight operations.

**Douglas Carssow** douglas.carssow@nrl.navy.mil

Electronics Engineer, Naval Research Laboratory

## Session 7.11 Designing Spacecraft Hardware for EM Compatibility, Signal Integrity, and Power Integrity in Space Applications

This session explores the advanced and innovative techniques recently developed that ensure spacecraft (S/C) hardware are designed and hardened for electromagnetic compatibility (EMC) with emphasis on signal integrity and power integrity (SI/PI) of the unit electronics. Topics of interest include: risks posed by Electromagnetic Interference (EMI), SI/PI, DC magnetic cleanliness and Electrostatic Discharge (ESD) present in spacecraft instruments, International Space Station instruments, spacecraft & space launch vehicle systems, robotics, and crewed vehicles. Papers address a wide range of topics and present innovative modeling and hardware solutions to EMC on the part, board, box, system, multi-system, planetary, and interplanetary levels. The harshness of the space environments necessitates a broader view of EMC issues than traditional terrestrial projects, often leading to creative methods and solutions that can benefit our society's efforts elsewhere on Earth.

**Jeffrey Boye** jeffrey.boye@jhuapl.edu

Engineer, Johns Hopkins University/Applied Physics Laboratory

**Pablo Narvaez** pablo.narvaez@jpl.nasa.gov

Principal Engineer/Section Manager, Jet Propulsion Lab

**James Lukash** emiguy@gmail.com

Principal Systems Engineer, Lockheed Martin Space

# Track 8 Spacecraft & Launch Vehicle Systems & Technologies

**Robert Gershman**
**robert.gershman@jpl.nasa.gov**

Principal Engineer, MSR Senior Staff at JPL. Previously Assistant Program Manager, Exploration Systems Engineering; Planetary Advanced Missions Manager; Deputy Manager, Galileo Science & Mission Design; Supervisor, Mission Engineering. At MDAC: Saturn & Skylab propulsion systems, Launch Team member for 3 Apollo missions.

**Bret Drake**
**bret.g.drake@aero.org**

Associate Director, The Aerospace Corporation: Lead system engineering and programmatic assessments of advanced space systems. Previously at NASA, led design and analysis studies of human exploration in missions to the Moon, Near-Earth Objects, and Mars. BS., Aerospace Engineering, University of Texas at Austin..

## Session 8.01 Human Exploration Beyond Low Earth Orbit

This session seeks papers addressing the broader aspects of human and scientific exploration including planning, development, system concepts, and execution of missions beyond low Earth orbit toward the lunar surface and on to Mars. Sample topics include systems architecture studies of human missions to cislunar space, the Moon and Mars, design reference mission analyses, strategic concepts, and broader trade study and systems engineering analyses for any aspect of human and scientific space exploration systems beyond low-Earth orbit. Lunar landers, surface systems and sustainable concepts for lunar exploration extensibility toward Mars exploration missions are in focus.

**Bret Drake** **bret.g.drake@aero.org**

Associate Director, The Aerospace Corporation

**Kevin Post** **kevin.e.post@nasa.gov**

Mission Design Engineer, Booz Allen Hamilton

## Session 8.02 Human Exploration Systems Technology Development

This session seeks papers dealing with technology development for human exploration of space. This can include development efforts with technology readiness levels anywhere from laboratory to full-scale flight demos. It can also include assessments of technology needs of programs, program elements, or individual mission concepts.

**Andrew Petro** **andrew.j.petro@nasa.gov**

Program Executive, NASA Headquarters

**Matthew Simon** **matthew.a.simon@nasa.gov**

Habitation and Lunar Architecture Lead, NASA Langley Research Center

## Session 8.03 Advanced Launch Vehicle Systems and Technologies

This session seeks papers covering on-going development and future advances in space transportation from Earth to orbit and distant destinations. Topics including transportation architectures, launch vehicles, infrastructure, transportation business and enabling technologies are of interest.

**Melissa Sampson** **melissa@melissasampson.com**

Business Development Leader, Melissa Sampson Consulting

**Randy Williams** **randall.l.williams@aero.org**

Systems Director, The Aerospace Corporation

## Session 8.04 Human Factors & Performance

This session seeks papers on human performance, integration, and operations within complex spacecraft systems. Suggested human factors topics may include cockpit and flight deck displays and controls, autonomous crew performance, handling qualities and flight performance, human-robotic interaction and performance, team performance and dynamics, training, countermeasures technologies/systems, and behavioral health and performance during short- and long-duration spaceflight. Papers including operations to experimental and modeling approaches, both in the laboratory and in spaceflight analog locations are of interest.

**Jessica Marquez** **jessica.j.marquez@nasa.gov**

Human System Engineer, NASA Ames Research Center

**Kevin Duda** **kduda@draper.com**

Group Lead, Space & Mission Critical Systems, The Charles Stark Draper Laboratory, Inc.

## Session 8.05 Space Human Physiology and Countermeasures

This session focuses on the physiological aspects of humans in space and current or future countermeasures and technologies to maximize human health and performance in the space environment. Suggested topics include (but are not limited to) bone loss, muscle atrophy, psychological effects, sensory-motor deconditioning, extravehicular activity, cardiovascular adaptation, Spaceflight Associated Neuro-ocular Syndrome (SANS), decompression sickness, radiation, exercise, injury biomechanics, or artificial gravity. Physiological and psychological aspects of missions at Space Analogue sites are also of interest. Both experimental and modeling approaches are welcome.

**Ana Diaz Artiles** adartiles@tamu.edu

Assistant Professor, Texas A&M University

**Andrew Abercromby** andrew.abercromby-1@nasa.gov

Lead - Human Physiology, Performance, Protection and Operations (H-3PO) Laboratory, NASA Johnson Space Center

**Torin Clark** torin.clark@colorado.edu

Assistant Professor, University of Colorado at Boulder

## Session 8.06 Mechanical Systems, Design and Technologies

This session seeks papers on spacecraft configurations, structures, mechanical and thermal systems, devices, and technologies for space flight systems and in situ exploration. Papers addressing mechanical systems design, ground testing, and flight validation are also encouraged.

**Lisa May** lisa.may@aeroconf.org

Chief Technologist, Commercial Civil Space, Lockheed Martin Space

**Alexander Eremenko** alexander.e.eremenko@jpl.nasa.gov

Mechanical Systems Engineer, Jet Propulsion Laboratory

## Session 8.07 Spacecraft Propulsion and Power Systems

This session seeks papers on the development and infusion of in-space propulsion and power technologies for future NASA deep space science missions and Earth orbiting applications. The session's primary focus is on in-space applications and is not intended for human spaceflight topics or launch vehicles.

**Erica Deionno** erica.deionno@aero.org

Principal Director, The Aerospace Corporation

**Richard Hofer** richard.r.hofer@jpl.nasa.gov

Supervisor, Electric Propulsion, Jet Propulsion Laboratory

## Session 8.08 Nuclear Space Power Generation

The Nuclear Space Power Generation session invites papers on all things nuclear and related to space power: concepts for dynamic power systems and static generators at all scales, conversion technologies, fuel processing, reactors for manned and unmanned space missions, lessons learned and best practices, plans for future devices, models and simulations, test results, government policies, nuclear launch safety, infrastructure, and technologies on any scale that address the future success of space missions.

**Christofer Whiting** chris.whiting@udri.udayton.edu

Principal Research Scientist, University of Dayton

**Concha Reid** concha.m.reid@nasa.gov

Program Manager, National Aeronautics and Space Administration

## Session 8.09 Systems and Technologies for CubeSat/Smallsats

This session seeks papers covering technologies and systems for very small spacecraft (secondary platforms such as CubeSat, ESPA and ASAP-class) that enable "big" science and technology missions on a small budget. Papers that evaluate flight or testing results are strongly encouraged.

**Michael Swartwout** mswartwo@slu.edu

Assistant Professor, Saint Louis University

**Justin Boland** justin.s.boland@jpl.nasa.gov

System Engineer, Jet Propulsion Laboratory

## Session 8.10 Systems and Technologies for Ascent from Planetary Bodies, a Multidisciplinary Problem

This session covers both the individual technologies, the system level interactions and trades, and the issues that influence the design of ascent systems leaving the surface of planetary bodies, such as the Moon, Mars, Phobos and others within our solar system. It addresses issues like the impacts of thermal constraints, propulsion design and performance, GN&C, aerodynamic impacts, and packaging constraints for both crewed and robotic ascent vehicle design.

**Tara Polsgrove** tara.polsgrove@nasa.gov

Lead Systems Engineer, Human Landing System, NASA Marshall Space Flight Center

**Ashley Karp** ashley.c.karp@jpl.nasa.gov

Mars Launch Manager, Jet Propulsion Laboratory

# Track 9 Air Vehicle Systems and Technologies

**Christian Rice**
**christian.rice@navy.mil**

Chief Test Engineer, Rotary Wing, Naval Air Systems, Command, Patuxent River, MD. BS, Aerospace and Ocean Engineering; MS, Aviation Systems.

**Christopher Elliott**
**christopher.m.elliott@lmco.com**

Technical Fellow, Flight Control and Vehicle Management Systems Team and Quantum Information Science Research Team, Lockheed Martin Skunk Works, Fort Worth. Over 20 years experience. Adjunct Professor, Texas Christian Univ. and UT, Arlington. AIAA Associate Fellow. BS, MS and PhD, Aerospace Engineering, Univ. of Texas.

## Session 9.01 Air Vehicle Modeling, Simulation, Flight Testing, and V&V

This session focuses on methodology and techniques for the modeling, simulation, flight testing, and verification and validation (V&V) of atmospheric vehicles including piloted, remotely piloted, and autonomous platforms including fixed wing, rotary wing, and any other aerial vehicle(s). The Air Vehicle Modeling, Simulation, Flight Testing, and V&V session is open to any atmospheric vehicle concept including fixed wing, rotary wing, propulsive and buoyant lift applications for Earth-based or other Planetary Atmospheric GNC applications (atmospheric referring to the envelope of gases that surrounds any planet or dwarf planets or moons within or outside the solar system).

**Brian Kish** **bkish@fit.edu**

Assistant Professor, Florida Institute of Technology

**John Ennis** **skippy.ennis@gmail.com**

CH-53K Test Pilot, KBR, Inc.

## Session 9.02 Air Vehicle Autonomy and Artificial Intelligence for Atmospheric Platforms

This session includes papers on all aspects of autonomy and artificial intelligence and machine learning for Air Vehicle applications including piloted, remotely piloted, and autonomous platforms in atmospheric flight. Example topics may include human and automony interaction; real time prognostics and integrity monitoring and mitigation; path planning in dynamic and uncertain environments; conflict detection and resolution; and work from experimental to operational applications.

**Felipe Gonzalez** **felipe.gonzalez@qut.edu.au**

Associate Professor, Queensland University of Technology

**Will Goins** **wgoinsaerospace902@gmail.com**

Sr. Principal Electronics Engineer, Ierus Technologies

## Session 9.03 Air Vehicle Integrated Systems, Sensors, Safety-Critical Hardware, and Avionics

This session includes a broad focus on topics ranging from integrated systems, sensor technologies and safety critical hardware, and operator feedback and avionics technologies for atmospheric flight applications including piloted, remotely piloted, and autonomous platforms. Papers may address concepts and practices for the design, integration and testing of these systems for improving aircraft performance, operator situational awareness, survivability, energy state, and airspace deconfliction. Novel sensor concepts and sensor fusion, aircraft state estimation, and operator feedback are all important example topics for this session.

**Andrew Lynch** **vvtp01@gmail.com**

Acquisition Lead, Naval Air Systems Command

**Will Goins** **wgoinsaerospace902@gmail.com**

Sr. Principal Electronics Engineer, Ierus Technologies

## Session 9.04 Air Vehicle Flight Guidance, Navigation, and Control Theory and Application

This session focuses on Atmospheric Flight Control and includes theory, application, and future or historical operational example topics ranging from guidance algorithms and path planning; navigation state estimation and sensing and control variable construction; to flight control law loop closure design, synthesis, and evaluation. The Air Vehicle Flight GNC session is open to any atmospheric vehicle concept including piloted, remotely piloted, and autonomous platforms categorically ranging from fixed wing, rotary wing, propulsive and buoyant lift applications for Earth-based or other Planetary Atmospheric GNC applications (atmospheric referring to the envelope of gases that surrounds any planet or dwarf planets or moons within or outside the solar system). Example topics may include linear and nonlinear derivation, analysis and simulation results to experimental or operational flight events and lessons learned.

**Tom Mc Ateer** **thomas.mcateer@navy.mil**

System of Systems Test and Evaluation, NAVAIR

**Christopher Elliott** **christopher.m.elliott@lmco.com**

LM Fellow, Lockheed Martin Aeronautics Company, Texas Christian University, The University of Texas at Arlington

## Session 9.05 Air Vehicle Distributed, Cooperative, and Multi-Vehicle GNC

This session focuses on atmospheric flight applications including piloted, remotely piloted, and autonomous platforms utilizing the concept of distributed systems and/or agents either working together cooperatively or competitively in a multiple vehicle environment. Example topics may range from resource allocation and command and control of complex, autonomous systems to self-organization and autonomous operation and decision making. Guidance, Navigation, and Control (GNC) concepts may include the successful design, deployment, operation, evaluation, and certification of any homogeneous or mixed type of multi-vehicular GNC system.

**Christopher Elliott** — **christopher.m.elliott@lmco.com**

LM Fellow, Lockheed Martin Aeronautics Company, Texas Christian University, The University of Texas at Arlington

**Felipe Gonzalez** — **felipe.gonzalez@qut.edu.au**

Associate Professor, Queensland University of Technology

# Track 10 Software and Computing

**Kristin Wortman**
**kristin.wortman@jhuapl.edu**

Principal professional staff, Space Exploration Sector's Space Mission Assurance group, APL. Support DART, EZIE and Dragonfly missions and several NSS missions as the lead software assurance engineer. Adjunct professor, CS Department, University of Maryland. B.S., CIS; M.S., Software Engineering, University of Maryland.

**Virgil Adumitroaie**
**virgila@jpl.nasa.gov**

Data Scientist, JPL. Working on planetary atmospheric and magnetospheric modeling. Past research in high-speed turbulent combustion modeling, data dimensionality reduction, neural networks, signaling pathways, decision support, climate data assimilation, and scientific software development. Ph.D., ME, University at Buffalo.

## Session 10.01 Computational Modeling

The focus of this session is Computational Modeling in any discipline, with emphasis on the mathematical model of the phenomenology and on the numerical algorithms used for solution. Disciplines include fluid dynamics and fluid/thermal sciences, earth and planetary physics, systems engineering studies, sensor management and sensor modeling, and radar and signal processing.

**Darrell Terry** — **darrell.terry@att.net**

Consultant, Surveillance Systems Group, Massachusetts Institute of Technology

**Virgil Adumitroaie** — **virgila@jpl.nasa.gov**

Data Scientist, Jet Propulsion Laboratory

## Session 10.02 Innovative Software Engineering and Management Techniques and Practices

Practices followed during development and management of aerospace software systems vary across the industry. This divide seems to be growing as emerging markets, such as commercial space and cubesats, adopt techniques from other software domains while the traditional aerospace market works to tailor existing processes. Suggested topics covering both experience and research in software engineering and management techniques with both flight and ground system development such as: innovative software architectures, code reuse, software project management, COTS integration, alternative design and implementation approaches, new programming languages and unique approaches to software test and verification. Other software engineering topics will also be considered in this session.

**Kristin Wortman** — **kristin.wortman@jhuapl.edu**

Principal Professional Staff, Johns Hopkins University/Applied Physics Laboratory

**Ronnie Killough** — **rkillough@swri.org**

Director - R&D, Southwest Research Institute

## Session 10.03 Software Architecture and Design

Appropriate software architecture is critical to the design, development and evolution of all software systems, and its role in the engineering of software-intensive applications in the aerospace domain has become increasingly important. This session solicits novel ideas on the foundations, languages, models, techniques, tools, and applications of software architecture technology. Topics include software architecture for space mission systems; architecture across software, system and enterprise boundaries; architectural patterns, styles and viewpoints; architecture frameworks; design reasoning, capturing and sharing design decisions; and open architectures, product-line architectures, and systems of systems software architects' roles and responsibilities.

**Martin Stelzer** — **martin.stelzer@dlr.de**

Research Associate, German Aerospace Center (DLR)

**Peter Lehner** — **peter.lehner@dlr.de**

Robotics Research Scientist / Engineer, German Aerospace Center (DLR)

## Session 10.04 Software Quality, Reliability and Safety Engineering and Other Illities

The focus of this session is to share systematic practices followed in aerospace to ensure an adequate confidence level that a software system conforms to its requirements and will perform in a safe and reliable manner. Software quality, reliability and safety engineering covers methodologies and techniques used for assessment of the development cycle, verification, validation and test programs, standards, models, certifications, tools, data analysis and risk management. This session is also a forum for discussion on other illities, such as software maintainability.

**Kristin Wortman** kristin.wortman@jhuapl.edu

Principal Professional Staff, Johns Hopkins University/Applied Physics Laboratory

**Paul Wood** paul.wood@swri.org

Staff Computer Scientist, Southwest Research Institute

## Session 10.05 Model-based Systems and Software Engineering

This session is concerned with the application, or potential application, of advanced model-based approaches, methodologies, techniques, languages, and tools to the aerospace domain. Topics ranging from theoretical and conceptual work in these areas to specific, concrete applications, in scope from small software systems to complex monolithic systems to large system-of-systems, are welcome. Other driving current themes include: coordination and usage of multiple types of models, e.g., digital twins, descriptive versus behavioral models; the use of MBSE simulations and analyses in support of architecture development; the application of information visualization techniques for improved MBSE deliverables; the use of MBSE in specialized domains such as fault protection or electrical systems engineering. The Session's areas of interest including model-based architecture and analysis, design, control systems, verification and testing, simulation, domain specific languages and transformations, aircraft, spacecraft, instruments, flight systems, ground systems, planning and execution, guidance and navigation, and fault management.

**Alexander Murray** alex.murray@jpl.nasa.gov

Senior Systems Engineer, Jet Propulsion Laboratory

**Oleg Sindiy** oleg@jpl.nasa.gov

Senior Systems Engineer, Jet Propulsion Laboratory

## Session 10.06 Implementing Artificial Intelligence for Aerospace

This session considers how to create state-of-the-art single and multi-agent technologies for developing 'intelligent' systems in both hardware and software. It will include papers related to all areas of single- and multi-craft aerospace mission systems and autonomous control (ground station, spacecraft/satellite, unmanned aircraft and ground rovers) and papers related to partially and fully autonomous aerospace systems. Techniques considered will include, but are not limited to genetic algorithms, swarm intelligence, probabilistic AI, machine and reinforcement learning, training & learning tools, human trust in AI, and intelligent multi-agent systems. This session invites papers on best practices towards implementing new state-of-the-art autonomy and intelligence systems for aerospace. Papers on novel machine learning algorithms for single and multi-agent systems including centralized and decentralized protocols, guaranteed bounded-input bounded-output stability, and comparison with conventional closed-loop control are of particular interest. Clustering, distributed, or formation flying missions and control techniques for low-cost, small-size craft are also welcomed.

**Jeremy Straub** jeremy.straub@ndus.edu

Assistant Professor, North Dakota State University

**Daniel Clancy** daniel.clancy@gtri.gatech.edu

Senior Research Engineer, Georgia Tech Research Institute

## Session 10.07 Human-Systems Interaction

Humans are the most critical element in system safety, reliability and performance. Their creativity, adaptability and problem-solving capabilities are key to resilient operations across the different aerospace applications. This session focuses on the technologies and techniques leading to effective interfaces and interaction between humans and spacecraft, robots, and other aerospace systems. Specific topics of interests include HCI-HMI, multimodal sensory integration such as vision, haptics and audio, situational awareness, tele-operation interfaces, visualization, virtual and mixed reality environments, augmented reality and natural user interfaces as applied to design, production, operations, and analysis, as well as training and for decision support. Novel solutions/experiences from other domains and their application in aerospace domain, specifically contributing to an efficient human systems interaction are also of interest.

**Janki Dodiya** janki.dodiya@iu.org

Professor of Computer Science,

**Andreas Gerndt** andreas.gerndt@dlr.de

Head of Department, German Aerospace Center (DLR)

## Session 10.08 Image Processing and Computer Vision

The focus of this session is both theoretical and experimental work on Image Processing and Computer Vision in aerospace applications. The disciplines include, but not limited to image-based navigation, image classification, image reconstruction, image segmentation, feature extraction, image compression, object detection and tracking, image correlation, coding and limitations, computational complexity, adaptive algorithms, video coding (e.g., MPEG, H.265), hardware and bandwidth limitations, key improvements, contributions, and lessons learned.


**Amir Liaghati** amir.l.liaghati@boeing.com

Electricall Engineer, Boeing

**Yumi Iwashita** yumi.iwashita@jpl.nasa.gov

Robotics Technologist, Jet Propulsion Lab

**Samuel Bibelhauser** samuel.bibelhauser@jhuapl.edu

Engineer, Johns Hopkins University/Applied Physics Laboratory


# Track 11 Diagnostics, Prognostics and Health Management (PHM)


**Andrew Hess**
**andrew_hess@comcast.net**


Consultant to government and industry on advanced diagnostics, prognostics, data and predictive analytics, CBM, smart manufacturing, health and asset management of machines and engineering systems. Previously program office lead for the JSF PHM effort. Current President of the PHM Society.


**Wolfgang Fink**
**wfink@email.arizona.edu**


Associate Professor and Edward & Maria Keonjian Endowed Chair, University of Arizona with joint appointments in the Departments of ECE, BME, SIE, AME, and Ophthalmology & Vision Science. AIMBE Fellow, PHMS Fellow, SPIE Fellow, UA da Vinci Fellow, UA ACABI Fellow, and Senior Member IEEE. Ph.D., Physics, University of Tübingen, Germany.

## Session 11.01 PHM for Aerospace Systems, Subsystems, Components, Electronics, and Structures

Advanced Diagnostics and PHM can be and is applied separately or concurrently at the device, component, subsystem, structure, system and/or total platform levels. This session will give PHM developers, practitioners, integrators, and users a chance to discuss their capabilities and experiences at any or all of these application levels. Discussion of the integration of PHM capabilities across these various levels of application is welcome and encouraged. Applications involving propulsion systems, fuel management, flight control, EHAS, drive systems, and structures are particularly solicited.


**Andrew Hess** andrew_hess@comcast.net

President, The Hess PHM Group, Inc.


## Session 11.02 PHM for Autonomous Platforms and Control Systems Applications

This session focuses on diagnostics and prognostics for autonomous system applications and control systems. This would include autonomous system architectures, electronic controls, control systems, and electronic systems for both the item under control and the controlling system. Methods for autonomous decision making, fault detection, rate of progression, and consequence or mission risk are encouraged. The session also is looking for novel technical approaches to use diagnostic and prognostic information to provide control input adjustments that can slow or reverse fault progression.


**Derek De Vries** derek.devries@ngc.com

Senior Fellow, Nothrop Grumman Propulsion Systems


## Session 11.03 PHM System Design Attributes, Architectures, and Assessments

Design of complex systems, such as aircraft and space vehicles, requires complex trade-offs among requirements related to performance, safety, reliability, and life cycle cost. The development of effective architectures and implementation strategies are extremely important. This session will focus on the application of methods such as testability, diagnosability, embedding sensors, prognostics, remaining useful life estimates used to design complex aerospace systems, and architectures to design, enable, and implement complex aerospace systems. We invite papers discussing new methodologies, lessons learned in application of health management methods in system design, and operational experience with health management capabilities embedded into systems early in the design process.


**Andrew Hess** andrew_hess@comcast.net

President, The Hess PHM Group, Inc.

**Derek De Vries** derek.devries@ngc.com

Senior Fellow, Nothrop Grumman Propulsion Systems

## Session 11.04 Non-Destructive Testing and Sensor Technologies for PHM Applications

This session is designed to bring together researchers and engineers developing sensors applicable to SHM and IVHM. Papers are invited on MEMS, MOEMS, nanotechnology, BIOS, quantum dots, chemical sensors, optical sensors, and imaging sensors that can be integrated with nondestructive testing applications for structural health monitoring and diagnostics. Descriptions of novel and disruptive sensor technologies are solicited.

**Morteza Safai** **morteza.safai@boeing.com**

Sensors Engineer / Technical Fellow, Boeing Company

## Session 11.05 PHM for Non-Aerospace Applications

This session seeks contributions in non-aerospace but related applications, e.g., automotive industry, trains, marine, oil & gas, etc. Both programmatic and technology presentations are solicited, particularly those focused on capabilities, cost benefits, and lessons learned.

**Andrew Hess** **andrew_hess@comcast.net**

President, The Hess PHM Group, Inc.

## Session 11.06 PHM for Commercial Space Applications

This session seeks papers on diagnostics, prognostics, health management (PHM) and autonomous fault management for satellites and other commercial space applications. Papers are sought in the areas of satellites, launch vehicles, and other new space ventures (e.g., tourism, natural resource exploitation). Papers may address research, actual flight experience, and future planning related to satellite and launch vehicle PHM and fault management.

**Wolfgang Fink** **wfink@email.arizona.edu**

Associate Professor, University of Arizona

**Andrew Hess** **andrew_hess@comcast.net**

President, The Hess PHM Group, Inc.

**Derek De Vries** **derek.devries@ngc.com**

Senior Fellow, Nothrop Grumman Propulsion Systems

## Session 11.07 PHM for Human Health and Performance

This session is an effort to bridge PHM to Space Medicine as part of Integrated System Health Management (ISHM) and healthcare domains as applied to High Value Human Asset. PHM for HH&P is focused on tracking status of very healthy individuals 24/7, as well as ensuring a sustained top-level performance required on manned space exploration missions. Papers are sought that show how systems engineering and MBSE with PHM techniques and methodologies, such as predictive analytics, predictive diagnostics, root cause analysis, virtual sensors, data and information fusion, data mining, and big data analytics with computationally generated biomarkers can serve as a scientific and engineering foundation for building both evidence-based and analytics-based individual health maintenance/support for human assets. Objectives include developing and demonstrating PHM capabilities for assessing, tracking, predicting, and ultimately improving long-term individual human health status to ensure mission success.

**Alexandre Popov** **alexandre.popov@mail.mcgill.ca**

NASA Emeritus Docent at the U.S. Space and Rocket Center and AIAA Systems Engineering Technical Committee (SETC) Member, AIAA SETC

**Wolfgang Fink** **wfink@email.arizona.edu**

Associate Professor, University of Arizona

## Session 11.08 PHM and Digital Engineering and Transformation

This session solicits contributions in the areas of PHM applications focused around the recent Digital Twin and Digital Thread paradigm, Model Based System Engineering, and Enterprise-wide Digital Transformation in aerospace and associated industries.

**Andrew Hess** **andrew_hess@comcast.net**

President, The Hess PHM Group, Inc.

**Mark Walker** **mark.walker@d2ktech.com**

Chief Technologist, D2K Technologies

## Session 11.09 Panel: PHM from a Practitioner's Perspective – a Potpourri of Capabilities, Issues, Case Studies, and Lessons Learned

Practitioners in the PHM field are solicited to share their experiences and observations as part of a distinguished panel of experts. A short presentation will be required of all participants that describes their focus topic within the PHM and CBM+ domains. This session will cover a broad range of research, lessons-learned experiences and application topics covering the challenges and innovative engineering and/or business approaches associated with the development and implementation of PHM capabilities and CBM+ architectures. The session will feature presentations by senior leaders in the field and a panel discussion. Panel members from PHM communities, academia, government, and industry, will focus on strategies that have or will resolve historical issues, and challenges, and provide insight. Interested parties should contact the session organizers.

**Andrew Hess** **andrew_hess@comcast.net**

President, The Hess PHM Group, Inc.

# Track 12 Ground and Space Operations

**Mona Witkowski**
**mona.m.witkowski@jpl.nasa.gov**

Flight Director and Deputy Project Manager for the CloudSat Mission and Operations Mission Manager for the GRACE Follow-On Mission at JPL. Recipient of NASA Exceptional Service Medal for TOPEX/Poseidon Mission Assurance and NASA Exceptional Achievement Medal for Deep Space Network Risk Management.

**Carlos Gomez Rosa**
**carlos.gomez@nasa.gov**

Ground System Manager and future Mission Ops Manager for the GeoCarb Mission, Goddard Space Flight Center. Former Ops Management with Landsat 9, MAVEN, and GOES-O Missions. MS in Engineering, JHU. Robert H. Goddard Award for Exceptional Achievement in Engineering; NASA Honor Award/Exceptional Achievement Medal.

## Session 12.01 Spacecraft Flight Operations: Innovative Approaches for Orbital and Surface Mission Operations

This session solicits papers which highlight innovative approaches for conducting spacecraft orbital and surface mission operations. Responding to in-flight anomalies, mission operations challenges, automation, risk reduction and space debris collision avoidance, are also topics that are encouraged. Additional topics solicited include: challenges to managing single or multi-mission operations, operating satellite constellations, small satellite operations, team development, staffing, cost reduction and lessons learned for future missions.

**Mona Witkowski** **mona.m.witkowski@jpl.nasa.gov**
Flight Director / Deputy Project Manager, Jet Propulsion Laboratory

**Heidi Hallowell** **heidi.hallowell@ballaerospace.com**
Principal GNC Engineer, Ball Aerospace

## Session 12.02 Mission Planning, Mission Operations Systems, Ground Systems, and Payload/Instrument Operations

This session focuses on the design, development, and implementation of mission operations systems, ground data systems, payload/instrument operations, and flight-ground interfaces. Topics may include: methods and technologies that support all aspects of mission design, development, planning, testing, and operations. This can include areas related to uplink (e.g., procedures, planning, scheduling, commanding/sequencing), downlink (e.g., telemetry and data processing and analysis, and response), and strategic planning. We also welcome ideas related to the design, integration, and automation of efficient ground systems. Submissions will be evaluated primarily on novelty, technical innovation, and broader impact to the planning and operations communities.

**Kedar Naik** **kedar.naik@ballaerospace.com**
Principal AI Technical Lead, Ball Aerospace

**Robert Lange** **robert.d.lange@jpl.nasa.gov**
Mission Systems System Engineer, Jet Propulsion Laboratory

## Session 12.03 Human Space Flight Development, Operations and Processing

This session focuses on all aspects of Human Spaceflight processing and operations across all mission regimes. Research topics including the design, and development of manned spacecraft hardware and support systems, as well as operations research focused on pre-flight, in-flight and post-flight activities is encouraged. Additionally, research dedicated to specific areas such as flight operations including IVA and EVA, landing and recovery of crewed spacecraft, and the physiological and psychological effects on human beings during all of these mission types and phases is also encouraged.

**Michael Lee** **michael.r.lee@nasa.gov**
Deputy Manager, Mission Management & Integration, NASA Kennedy Space Center

**William Koenig** **william.j.koenig@nasa.gov**
Production Operations Lead, NASA Kennedy Space Center

## Session 12.04 Information Technology and Cyber Security Roles in Operations

Efficient network design and implementation are necessary for the protection of space system assets and mission execution capabilities. This session welcomes approaches for IT design tailored for the aerospace domain. Security engineering to prevent intrusions and situational awareness tools to monitor the system and detect attacks, are evolving technologies enabling increased protection for the mission. In addition, mission resilience to cyber attack is an emerging field critical for protecting the mission. Other topics include: unique cyber vulnerabilities/solutions for space systems, the implementation of network security and information security techniques, advanced CONOPS, implications for NIST's Risk Management Framework for Space, analytics applied to space systems, and lessons learned.

**Jeremy Straub** **jeremy.straub@ndus.edu**
Assistant Professor, North Dakota State University

**Atif Mohammad** **amoham19@uncc.edu**
Professor, University of North Carolina at Charlotte

## Session 12.05 Automation and Machine Learning Applications in Spacecraft Operations

This session invites contributions that are concerned with the applications of machine learning and data science techniques to deal with the increasing amounts of data being collected in spacecraft operations on flight and/or ground segments. These techniques could be related to any subsystem of the spacecraft, including telecom, power, thermal, or specific instrument data and that of the ground segments. Topics ranging from theoretical and conceptual treatment in these areas to specific and operational treatments are solicited. The benefits of these techniques are very wide in scope from enhancing operator productivity by providing diagnostic tools that detect and explain causes of anomalous behavior either in real-time or by post-processing, to automating mission operations. These benefits are also crucial for smaller missions, such as the emerging CubeSats missions, that typically have very lean teams.

**Mazen Shihabi** mazen.m.shihabi@jpl.nasa.gov

Technical Group Supervisor, Jet Propulsion Laboratory

**Zaid Towfic** zaid.j.towfic@jpl.nasa.gov

Signal Analysis Engineer, Jet Propulsion Laboratory

# Track 13 Systems Engineering, Management, and Cost

**Jeffery Webster**
**jeff.webster@aeroconf.org**

Retired Senior Systems Engineer. NASA/Jet Propulsion Laboratory: Project Support Lead-Project Support Office; Mission Systems Concepts Section-Mars Trace Gas Orbiter; Project Planner & Systems Engineering; Associate Engineer, Mission & Systems Concepts Section.

**Torrey Radcliffe**
**torrey.o.radcliffe@aero.org**

Associate Director, Space Architecture Department, The Aerospace Corporation. Background in preliminary spacecraft design, space architecture development and portfolio analysis of manned and unmanned systems. S.B, S.M. and PhD in Aeronautics and Astronautics from MIT.

## Session 13.01 Systems Architecture, Engineering and System of Systems

This session is dedicated to papers dealing with the fundamental challenges associated with architecting and high level systems engineering of large-scale systems and systems-of-systems, including development and application of tools and techniques that support both architecting and system engineering processes (e.g., Architecture Descriptions, Model Based Systems Engineering, Architecture Decision Support), maintaining the integrity of "the architecture" across the project lifecycle, and discussions of successful (and not so successful) architecting and systems engineering endeavors with an emphasis on the lessons learned.

**Lisa May** lisa.may@aeroconf.org

Chief Technologist, Commercial Civil Space, Lockheed Martin Space

**Daniel Selva** dselva@tamu.edu

Assistant Professor, Texas A&M University

**Dean Bucher** dean.a.bucher@aero.org

Principal Director, The Aerospace Corporation

## Session 13.02 Management and Risk Tools, Methods and Processes

This session addresses tools, methods, and processes for managing aerospace system development programs/projects, mission operations, technology development programs, and systems engineering organizations. Topics include analyzing risks; managing all life cycle phases of programs/projects; using project-level management disciplines including project management, systems engineering, scheduling, safety and mission assurance, and configuration management; and improving training and capability retention (passing expertise between generations of systems engineers); and managing aerospace technology development programs. This session covers the topic of risk management in aerospace endeavors, including new insights from the successful application of risk management, and lessons learned when risk management did not prevent realization of consequences. Applications include commercial, military and civil space systems, and commercial and military aircraft systems.

**Jeremiah Finnigan** jeremiah.finnigan@jhuapl.edu

Senior Professional Staff, Johns Hopkins University/Applied Physics Laboratory

**Robin Dillon Merrill** rld9@georgetown.edu

Professor, Georgetown University

## Session 13.03 Cost and Schedule Tools, Methods, and Processes

This session addresses cost and schedule analysis tools, methods, processes, and results including design trades for design concepts and technologies throughout a project's life cycle. Topics addressed include cost or schedule model development, regression analysis and other tools, historical studies addressing trends, databases, government policies, industry training, mission cost analysis, operations and supporting/infrastructure cost, mission portfolio analysis, case histories, lessons learned, process control, and economic and affordability analysis that assesses program/project viability.

**Stephen Shinn** stephen.a.shinn@nasa.gov

Chief Financial Officer (Acting), NASA Headquarters

**Eric Mahr** eric.m.mahr@aero.org

Senior Project Leader, The Aerospace Corporation

## Session 13.04 Advances in Conceptual Design Methods and Applications

This session is dedicated to the discussion of the current state of practice and future advances in conceptual design methods and applications. The goal is to foster the application of Digital Engineering (DE) in conceptual design, concurrent engineering, and collaborative engineering practices across the lifecycle, including advances in team-based systems engineering methods and novel applications of concept design methods. Example topics include MBSE applications, optimization techniques, results visualization, digital twin integration, and trade space exploration.

**Rob Stevens** robert.e.stevens@aero.org

Director of Model Based Systems Engineering Office, The Aerospace Corporation

**Alfred Nash** alfred.e.nash@jpl.nasa.gov

Lead Engineer, Team-X, Jet Propulsion Laboratory

## Session 13.05 System Simulation and Verification

This session addresses the design, implementation, and use of system-level simulations to measure or verify the performance and utility of space, ground, and related systems.

**Virgil Adumitroaie** virgila@jpl.nasa.gov

Data Scientist, Jet Propulsion Laboratory

**Gregory Falco** falco@jhu.edu

Assistant Professor, Johns Hopkins University

## Session 13.06 System Verification & Validation and Integration & Test

This session focuses on the Verification & Validation and Integration & Test processes and case studies for Projects/Flight/Sub systems, and systems of systems.

**Benjamin Solish** bsolish@jpl.nasa.gov

Systems Engineer, Jet Propulsion Laboratory

**Sarah Bucior** sarah.bucior@jhuapl.edu

Systems Engineer, Johns Hopkins University/Applied Physics Laboratory

## Session 13.07 Strategic Technology Planning, Management & Infusion

This session addresses strategic planning, research, development, and infusion of innovative technology to meet the future needs of civil space, commercial space, and national security space users. It includes technology strategy and roadmaps, technology maturation, and mission infusion to overcome the valley of death. This session also focuses on opportunities as well as legal and operational challenges as associated with partnerships, technology transfer, commercialization, and recent developments in aerospace startup accelerators for public and private sectors.

**Rob Sherwood** rob.sherwood@aero.org

Principal Director, CTO Strategy Integration Office, The Aerospace Corporation

**Theodore Bujewski** tbujewski@yahoo.com

Director, Science and Technology Integration, US Space Force, Department of Defense

## Session 13.08 Promote (and Provoke!) Cultural Change

"Culture Eats Strategy for Breakfast!" * Culture is a byproduct of habits, and this session explores how to create habits, environments, and nutrients that help great things grow. * Peter Drucker, noted management consultant, educator, and author.

**David Scott** **2davescott@gmail.com**

NASA Retiree (for the moment), (Self)

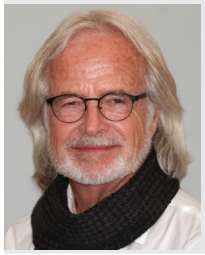
**Rob Sherwood** **rob.sherwood@aero.org**

Principal Director, CTO Strategy Integration Office, The Aerospace Corporation

**John Ryskowski** **jfryskowski@yahoo.com**

President, JFR Consulting

# Track 14 Government Plans, Policies and Education



**Richard Mattingly** **richard.l.mattingly@jpl.nasa.gov**

Richard Mattingly is a member of the Mars Program Formulation Office at NASA's Jet Propulsion Laboratory (JPL), where he was in charge of numerous architectural studies on Mars Sample Return starting in the early 2000's He has also managed systems engineering groups for JPL's projects implemented in partnership with industry, and instrument and payload development. He has been involved in the formulation and development of many of JPL's planetary and Earth-orbiting spacecraft and payloads since the 1970's.

## Session 14.01 PANEL:14.01 Technology Development for Science-Driven Missions

Increasing the pace of Technology Infusion is critical for many of the upcoming SMD missions. The panel will focus on how infusion occurs within the Mars Program Office on Mars missions, how PESTO in the Planetary Science Division (PSD) has spurred novel methods to encourage infusion within and between PSD awards and how Europa Clipper, as a flagship mission, currently infuses technology.

**Patricia Beauchamp** **patricia.m.beauchamp@jpl.nasa.gov**

Chief Technologist, Engineering and Science Directorate, Jet Propulsion Laboratory

## Session 14.02 PANEL: Emerging Technologies for Mars Exploration

This panel will discuss the unique technology needs for future Mars exploration, including those for robotics explorers as well as groundbreaking technologies for future human missions. Panelists will highlight a variety of emerging technologies that can enable these future pathways for Mars exploration.

**Larry Matthies** **lhm@jpl.nasa.gov**

Technology Coordinator, Mars Exploration Program, Jet Propulsion Laboratory

## Session 14.03 PANEL: Access To Space and Emerging Mission Capabilities

The high cost of launch continues to be a roadblock to space missions large and small. The development of adapters (ESPA, PPOD, e.g.), the development of new launch vehicles, the acceptance of risk for accommodating secondary or auxiliary payloads, and the explosion of cubesat and smallsat capability have led to some creative approaches to space missions. This panel is meant to showcase how our space colleagues are leveraging these emerging capabilities.

**Eleni Sims** **sam.sims@aero.org**

Project Engineer, The Aerospace Corporation

**Kara O'Donnell** **kara.a.odonnell@aero.org**

Principal Director, The Aerospace Corporation

## Session 14.04 PANEL: Progress and Plans for the Deep Space Human Exploration Architecture

NASA has been charged with leading a sustainable program of exploration with commercial and international partners to enable human expansion beyond low-Earth orbit (LEO). Realizing this vision requires advancement of key capabilities and an implementation approach that pulls from the best NASA and the global industry can offer. NASA's human exploration activities are driving the development of high-priority technologies and capabilities using a combination of unique in-house activities and public-private partnerships to develop and test prototype systems that will form the basis for future human spaceflight missions. This panel will discuss the current plans and status of the NASA exploration programs implementing the deep space architecture including progress toward the first flights of SLS and Orion, development of the Gateway, Human Landing System, and plans for lunar surface capabilities.

**Greg Chavers** **greg.chavers@nasa.gov**

Technical Integration, NASA Headquarters

## Session 14.05 PANEL : Mars Exploration Science: Mars Sample Return and Beyond

The panel will present the science of the Mars Exploration Program, which will include the latest discoveries from ongoing missions such as MRO, Curiosity, TGO, and the most recent explorer, InSight. Panel discussion will address questions driving future missions. What do we hope to learn from the next mission, the Mars 2020 Rover, and the samples cached for return to Earth? What is the potential for future missions and the discoveries they could make?

**Michael Meyer** **michael.a.meyer@nasa.gov**

Lead Scientist, Mars Exploration Program, NASA Headquarters

## Session 14.06 PANEL : ISS Transition and the Commercialization of LEO

In this discussion, panelists will update NASA's plans for International Space Station Transition and LEO commercialization. The panelists will discuss policy, strategies, and activities in progress and planned on the ISS to enable a commercial LEO economy where NASA is one of many customers. The panelists will also discuss goals for the ISS in the 2020's leading up to the transition.

**Robyn Gatens** **robyn.gatens@nasa.gov**

Director, ISS, NASA Headquarters

# Junior Engineering & Science Conference

## Yellowstone Conference Center
## Big Sky, Montana March 7, 2023

**Junior Conference Submission Deadlines**
**Junior Abstract Deadline : January 17, 2023**
**Junior Presentation Deadline : February 14, 2023**

### Who may participate

Any student, 1st through 12th grade, who is registered at the conference as an official guest of a primary registrant, is eligible to present a paper as a Junior Engineering & Science Speaker.

### Number of participants

To provide sufficient time for each presentation, the number of participants will be limited to 25. Preference will be given to the earliest submissions.

### Topics

Topics with direct or tangential relationship to science, engineering, or mathematics are encouraged.

### Student's Research

The presentation should describe one of the following:

1. An original idea accompanied by supportive reasoning and data
2. An experiment, invention or field work
3. A review summarizing a topic of interest.

### How to Submit Your Presentation

1. Write a short **abstract** describing your topic.
2. Have your parent or guardian who is registered for the conference register you as a junior engineer, complete a release form, and submit your abstract to Session 15.01 (Junior Conference) on the conference website, www.aeroconf.org (select Session 15.01 Junior Engineering Conference). **The abstract cut-off date is Tuesday, January 17, 2023**. You will receive an email confirmation of acceptance.
3. Prepare a 5–10 slide PowerPoint presentation of your work. The title slide should include your name, age, grade, special interests, and (if you choose) a photo of yourself. You may have help from an adult, but the presentation should be primarily your own work.
4. Once your abstract is confirmed, submit your PowerPoint presentation to the conference website as soon as possible. **The presentation deadline is Tuesday, February 14, 2023**. No late presentations will be included in the conference.
5. Prior to the conference all Junior Engineering & Science presentations will be loaded onto a single laptop. You will have an opportunity to practice before giving your presentation.
6. After the last presentation, all participants will receive an electronic copy of the Junior Engineering & Science Conference Proceedings.

Please check the Junior Conference webpage for additional information: https://aeroconf.org/junior-engineering


**2023 Junior Engineering & Science Conference Contacts**

Co-Chair **Rich Terrile** — E-mail **rich.terrile@jpl.nasa.gov**
Co-Chair **Christine Terrile** — E-mail **christine@aeroconf.org**


**Back Cover** – *At this stage of Webb's mirror alignment, known as "fine phasing," each of the primary mirror segments have been adjusted to produce one unified image of the same star using only the NIRCam instrument. This image of the star, which is called 2MASS J17554042+6551277, uses a red filter to optimize visual contrast.* ***Photo Credit: NASA/STScI***

# 2023 IEEE Aerospace Conference

**Kendra Cook, Conference Chair**
**IEEE Aerospace Conferences Office**
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