Mission Success
Through Testing of
Critical Challenges

November 5–8, 2018
DoubleTree by Hilton Hotel
Annapolis, Maryland

www.SpaceSimCon.org
Welcome to the 30th Space Simulation Conference. With this year’s theme, “Mission Success Through Testing of Critical Challenges,” we celebrate the triumphs of our space simulation testing over the past 50+ years that have helped push us beyond the boundaries and limits of our test capabilities and allowed us to travel farther in space than ever before. We are flying to the sun with Parker Solar Probe, which will need to withstand temperatures outside the spacecraft that reach nearly 2,500°F (1,377°C), and in 2015 we watched New Horizons fly by Pluto, where there is little solar energy at all. We are also on the brink of launching the James Webb Space Telescope, which has the potential to take scientists back to the evolution of our universe.

Following on the heels of our past conference, which celebrated our conference’s 50th year in existence, we now celebrate another milestone of hosting our 30th conference. Our biannual conference gives technical personnel the opportunity to learn about some of the latest testing techniques by attending tutorial sessions as well as getting some nuggets of information from the great technical papers presented. The information is current and informative and covers topics from dynamics to contamination control techniques to thermal vacuum testing and facility modernizations. We also have some interesting topics on test techniques and data recording and processing.

In order for future missions to have “Mission Success Through Testing of Critical Challenges,” conference attendees will be instrumental in developing the proper testing techniques in a cost-effective manner, so that the scientific goals of the United States and the world can be successfully achieved. The Space Simulation Conference is an integral part of that success and will continue to be for many years to come. This conference continues to be a focus of technical experts from the United States with continued attendance and participation from our international partners. The conference is and has been a tremendous venue for experts and novices in the field to share experiences, techniques, triumphs, and even failures.

This year’s conference begins on Monday, November 5, with a full day of four tutorials. The tutorials are meant not only to educate the seasoned veteran but also to ensure that a young technician or engineer is off to the right start in his or her career. For details on each tutorial, please see the tutorial overview pages.
Technical presentations will begin on Tuesday, November 6. The technical proceedings are divided into six sessions with some great content. For a program schedule outlining the technical presentations, please see the Technical Program pages.

We have three great keynote speakers lined up to open each day and for the complimentary luncheon. We are excited to start off Tuesday with an opening keynote presentation by Ed Hawkins. Ed is a Principal Professional Staff member at the Johns Hopkins University Applied Physics Laboratory (APL) and will be talking about the Europa Clipper mission. It will be interesting to hear about the challenges of going to such a harsh environment and being able to survive in order to complete the mission.

For the Tuesday luncheon, we are honored to have Nicola Fox and Betsy Congdon as the keynote speakers. They are project scientist and lead engineer, respectively, for the thermal protection system on the Parker Solar Probe mission and will update us on the current trip to “touch” the sun.

To kick off Wednesday morning, the keynote speaker will be Melissa Grady Trainer, Research Space Scientist in the Planetary Environments Laboratory at NASA Goddard Space Flight Center. She will be talking about the Dragonfly rotorcraft lander mission, part of the New Frontiers Program proposals, which will explore surface composition and atmosphere about Titan.

The Wednesday night social event will be at the Chart House on the water in Annapolis. Although there won’t be an organized tour, if the weather permits, it is a beautiful area to take a little walk along the waterfront. We will have an organized social hour with hors d’oeuvres followed by a sit-down meal. But hopefully everyone will feel free to continue to mingle throughout our casual dinner.

If you work in the space simulation area, this conference is a place to learn new things, get updated on things going on in the industry, and network with other professionals who do what you do every day. I have been involved in the Space Simulation Conference for more than 10 years, and without a doubt it has been one of the most rewarding, educational, and career-advancing things I have done. I encourage everyone in the space simulation arena to attend. You will not be disappointed.

The 30th Space Simulation Conference is sponsored by IEST and cosponsored by ASTM, NASA, CSA, and APL. Continuous successful support by these sponsors has been vital for the past and present events.

The success of the 30th IEST Space Simulation Conference is in large part due to the support and dedication of the members of the Management and Technical Program committees. They make a tremendous team and, as always, have done an
incredible job bringing this conference together. I would like to specifically thank Ken Turner for his efforts in putting together the Technical Program. I believe it is the most difficult of all the tasks in preparing for this conference. I would like to thank those on the Technical Program Committee who support the authors of the papers with whatever they need and ensure that the papers and all other materials are submitted on time. I would like to thank the past General Chairs who have given great advice and guidance not just for this conference but throughout our industry.

I would especially like to thank those who are retired but still continue to provide invaluable support to the conference committees. Their continued dedication and enthusiasm make the extra work much easier to do and enjoy. I would like to thank the rest of the Management Committee, who take on specific roles and responsibilities for the conference and every year outperform the last.

IEST’s support has been invaluable to the success and growth of this conference. The vendor community that supports the Space Simulation Conference is composed of the companies that we in our industry use on a regular basis. Make sure you stop by each booth and get information on their products. You can also go to the Space Simulation website’s vendor page to get more information and a link to each vendor’s homepage.

Finally, I would like to thank Dynavac, m+p international, PHPK Technologies, PCB Piezotronics, and IEST for sponsoring the Wednesday night social event at the Chart House. Without their financial support for that event, we would not be able to have it.

The Management and Technical Program committees worked hard to provide you with an intellectually stimulating and socially rewarding venue. We are so happy you are here to take advantage of what the 30th Space Simulation Conference has to offer.

Brent Nielsen
General Chair

Hotel and IEST Information

Hotel contact number: 410-224-3150
IEST contact number: 847-981-0100
Tutorial
Monday, November 5, 2018

7:30 a.m.  Registration

8:10 a.m.  Introduction
Chair: Hadi Navid, John Hopkins University Applied Physics Laboratory

8:15 a.m.  SESSION 1
Direct Field Acoustic Testing (DFAT)

10:15 a.m.  Refreshment Break

10:30 a.m.  SESSION 2
An Overview of Modal Analysis

12:30 p.m.  Lunch on Your Own

1:30 p.m.  SESSION 3
Multi-component Force Measurement & Signal Conditioning

3:00 p.m.  Refreshment Break

3:15 p.m.  SESSION 4
Vacuum Generation for Space Simulation Chambers

4:15 p.m.  Completion of Tutorial Program
SESSION 1
Direct Field Acoustic Testing (DFAT)

Instructors: Daniel Hayes and Wes Mayne III
MSI-DFAT Services
www.marylandsound.com

This course will present the methodology and concepts necessary for the successful development and execution of a direct field acoustic test (DFAT). Material covered will include a review of the environmental characteristics, DFAT terms and definitions, and some background on and history of the development of the process and the current state of the art. Details on preparation and execution will include facility logistics and handling, configuration and layout, sound generation equipment, control and data processing procedures, and a review of the results to be expected from a successful test. The session will conclude with a summary of recommendations and discussion of some special topics relating direct and reverberant testing as well as a hands-on demonstration.

Daniel Hayes is a graduate of Purdue University with a B.S. in acoustical engineering. He currently works at MSI-DFAT Services, where he is involved in the design and support of the DFAT system. He also works on sound system/speaker design and engineering live shows.

Wes Mayne III has worked with test facility development and testing for over 30 years, including many high-intensity acoustic test facilities around the world. Wes currently works for MSI-DFAT Services supporting both actual DFAT tests and the development of vibroacoustic modeling for DFAT.

SESSION 2
An Overview of Modal Analysis

Instructor: Dr. Peter Avitabile, PE Director
Structural Dynamics and Acoustic Systems Laboratory
University of Massachusetts Lowell
www.uml.edu/Research/SDASL

Modal analysis is an extremely powerful tool used for identifying dynamic characteristics for a variety of different structures and systems. This tutorial session is intended to provide a very broad overview of the modal test process with simple illustrations of the process from test data acquired to reduction of data obtained. Some applications directed toward additional uses of the modal data are also presented.
Dr. Peter Avitabile has over 40 years of experience in design, analysis, finite element modeling, and experimental modal and structural dynamic testing. His main area of research is structural dynamics with specialization in the areas of modeling, testing and correlation of analytical and experimental models, and integration of analytical and experimental techniques. He has performed research, testing, and consulting for automotive, aerospace, defense, and computer/consumer related areas. Peter has written over 200 technical papers and given numerous seminars in the areas of experimental modal analysis, structural dynamics, vibration fixture design, and modeling and correlation.

SESSION 3
Multi-component Force Measurement & Signal Conditioning

Instructor: Bill Zwolinski, Product Manager
Kistler Instrument Corporation
www.kistler.com

Piezoelectric sensor technology provides robust dynamic measurement capabilities as well as quasi-static measurement over a wide range of operational conditions. At the heart of higher-performance operation is innovative sensor design and the use of piezoelectric materials—including quartz and a proprietary crystal technology, Piezostar—as well as signal conditioning with charge amplifiers. The goal is to extend performance in areas such as sensitivity, frequency response, resolution, and accuracy. Practical considerations for instrumentation to measure reaction forces/moments are discussed relative to applications such as micro-vibration, cryo-cooler vibration, thrust stands, reaction wheels, environmental considerations such as cryo/vacuum/flight, impact, and force limited vibration. Instrumentation considerations include sensor geometry, preloading, bending moment, cross-talk, sensor mounting/alignment, resonance, noise, rangeability, scalability, cabling, and signal conditioning with extended filter capabilities and digital/analog output.

Bill Zwolinski has been Product Manager, General Manager-U.S. Technology Center, Product Director, and Head of Test and Measurement at Kistler Instrument Corporation. He received his M.Sc.EE from the University of Connecticut and an MBA in technology management and marketing from University of Phoenix.
SESSION 4
Vacuum Generation for Space Simulation Chambers

Instructor: Edward Ho, Product Manager
Pfeiffer Vacuum Inc.
www.pfeiffer-vacuum.com

This tutorial will provide an overview of pumping technologies used in vacuum generation for space simulation. Generation of vacuum and the measurement of vacuum level encompasses many topics that need consideration. Historically, large vacuum systems were dominated by diffusion and cryogenic pumps; however, advances in technology have brought turbo pump and dry rough pump technologies to the forefront. The benefits of turbo pump technology and practical issues dealing with large space simulation chambers need to be understood.

During the tutorial, the pros and cons of diffusion, cryopump, and turbo pump technology in creating high vacuum for large chambers will be compared. In particular, there will be a focus on turbo pump technology and its operational requirements, which includes properly sizing the pumping system. The tutorial will also address how to properly maintain turbos and discuss possible service issues such as long down times between pump operation. Finally, we will investigate the area of modern vacuum measurement, analysis, and leak detection.

Edward Ho received his B.S. in chemical engineering from the University of California, Berkeley. Subsequently, he spent some years in the Regenerative Life Support Group at NASA Ames Research Center developing materials for CO₂ adsorption. He has been with Pfeiffer Vacuum for 17 years with a focus on turbo pumps.
Social Events

**Tuesday Luncheon**
Coastal Ballroom
featuring Keynote on Parker Solar Probe Mission
by Nicky Fox and Betsy Congdon

**Tuesday Evening**
Welcome Reception
5–7 p.m. in Mainsail (Expo) Ballroom
Hot hors d’oeuvres and cash bar

**Wednesday Evening**
Reception at the Chart House
Annapolis Harbor

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**Important Note**
The luncheon, reception, and social event at the Chart House are only included for conference attendees who register for the 3-day conference or conference + tutorial package.
*Conference attendees wishing to attend the Chart House reception event must be registered for the conference by November 1.

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**Sponsors**

The conference management team would like to express their appreciation to Dynavac, m+p international, PHPK Technologies, and PCB Piezotronics, for their joint sponsorship commitments, which made the exciting evening social event possible.
Reception at the Chart House - Annapolis Harbor

Please join us at our conference reception on Wednesday evening, November 7, at the Chart House in Annapolis. Enjoy scrumptious hors d’oeuvres followed by a seated dinner while socializing with attendees.

Chart House is a Maryland treasure through and through. Like its menu filled with local ingredients, part of Chart House’s appeal comes from its position in the community. Formerly a historic boat house that was the primary shipyard for John Trumpy & Sons, Chart House seafood restaurant provides stunning views of Spa Creek. And a million-dollar remodel sets Chart House apart from the competition. No matter what time of year you visit, you are assured not only the best seafood Annapolis has to offer but also some of the best scenic dining in the northeast. Hors d’oeuvres will start at 5 p.m., followed by the seated dinner at 5:30 p.m. where you will have choice of three outstanding entrées.

Bus transportation will be provided from the Annapolis DoubleTree Hotel and back.
7:30 a.m.  Registration
8:15 a.m.  Welcome – Conference General Chair
          Brent Nielsen – Northrop Grumman Aerospace Systems
8:20 a.m.  Welcome – IEST
          IEST Representative
8:30 a.m.  Keynote Speaker – Europa Clipper
          Dr. Ed Hawkins – Johns Hopkins University
          Applied Physics Laboratory
9:30 a.m.  Welcome – Technical Program Chair
          Ken Turner – Johns Hopkins University Applied Physics Laboratory

SESSION 1 – New or Refurbished Facilities
Chair: Jeff Kegley – NASA Marshall Space Flight Center
Co-Chair: William Dupuis – Northrop Grumman IS
9:35 a.m.  Refurbishment of NASA’s Johnson Space Center Liquid Nitrogen Bulk Storage Tanks in Preparation for Thermal Vacuum Optical Testing of the James Webb Space Telescope (JWST)
          Sammy Garcia – NASA Johnson Space Center
10:00 a.m. Refreshment Break – Visit Vendor Booths
10:30 a.m. Modernization of NASA Johnson Space Center’s Chamber A to Support Cryogenic Vacuum Optical Testing of the James Webb Space Telescope (JWST)
10:55 a.m. Renovation of Thermal Vacuum Chambers at Idaho National Laboratory (INL) for Testing of Radioisotope Power Systems (RPS)
          Jaymon Birch – Idaho National Laboratory (INL)
11:30 a.m. Luncheon in the Coastal Ballroom
          Luncheon Presentation – Parker Solar Probe
          Speakers: Nicola Fox and Betsy Congdon – Johns Hopkins University Applied Physics Laboratory

SESSION 2 – Dynamic Testing for Space Applications
Chair: Brian Langmyer – Northrop Grumman IS
Co-Chair: Kelly Beattie – MIT-LL
1:15 p.m.  Development of NRC New Generation of Acoustic Spectrum Control System for High-Intensity Noise Testing
          Yon (Eric) Chen – National Research Council Canada (NRCC)
1:40 p.m. A Direct Field Acoustic Control System Based on ANSI S1.11 Third Octave Band Measurements Made Possible Due to Advances in Signal Processing and Speaker Technology
Dale Schick – m+p international
2:05 p.m. Protecting Flight Hardware during Spacecraft Vibration Testing through Greater Understanding of the Control Systems’ Ability to Control and Limit Responses
Shelly Conkey – Johns Hopkins University Applied Physics Laboratory
2:30 p.m. Refreshment Break – Visit Vendor Booths
3:00 p.m. Structural Testing of High-Value Test Articles: Integrated Risk Mitigation in Vibration Test Systems
Chris Sensor – Data Physics Corporation – US
3:25 p.m. Parker Solar Probe; Horizontal MIS Method for Mass Properties
Felipe Ruiz – Johns Hopkins University Applied Physics Laboratory
3:50 p.m. Lunar Environment Simulation for a High Performance Motor
Joe O’Connell – NASA Langley Research Center
4:15 p.m. Daily Closing Remarks – General Chair
5–7 p.m. Welcome Reception in Mainsail (Expo) Ballroom
SESSION 3 – Thermal-Vacuum Testing for Space Applications

Chair: Keith Fields – NASA Jet Propulsion Laboratory (JPL)
Co-Chair: Gugu Rutherford – NASA Langley Research Center

9:30 a.m. Use of a Combined Data Acquisition and Control System during a Large Spacecraft TVAC Tests Campaign
Elie Choueiry – David Florida Laboratory, Canadian Space Agency

9:55 a.m. Creating the Required Deep Space Environments for Testing the James Webb Space Telescope (JWST) at NASA Johnson Space Center’s Chamber A
Andrew Francis – NASA Johnson Space Center

10:20 a.m. Refreshment Break – Visit Vendor Booths

10:50 a.m. A Low-Cost, High-Fidelity Thermal Control Method for Testing in a Mars Environment
Christopher Johnson – NASA Goddard Space Flight Center

11:15 a.m. Thermal Design Verification Testing of the Solar Array Cooling System for Parker Solar Probe
Eric Wallis – Johns Hopkins University Applied Physics Laboratory

11:40 a.m. Lunch on Your Own

SESSION 4 – Molecular & Particulate Contamination

Chair: Shelly Conkey – Johns Hopkins University Applied Physics Laboratory
Co-Chair: Jim Snyder – The Aerospace Corporation

1:20 p.m. ALD Grown Metal Oxide Films for the Detection of Molecular Contaminants on Spacecraft
Gugu Rutherford – NASA Langley Research Center (NRC)
1:45 p.m. **Sources and Solutions for Contamination Issues in Space Simulation (TVAC) Systems**  
*J.R. Gaines – Kurt J. Lesker Co.*

2:10 p.m. **Blind to Chemistry: Molecular Contaminant Films We Could Be Missing during Visual Inspections and the Potential Impact to System Performance**  
*Dr. Elaine Seasly – NASA Langley Research Center (NRC)*

2:35 p.m. **Refreshment Break – Visit Vendor Booths**

3:05 p.m. **Controlling Spores in Cleanrooms and Controlled Areas**  
*Joe McCall, SM (NRCM) – STERIS Life Sciences*

3:30 p.m. **Daily Closing Remarks – General Chair**

4:30 p.m. **Boarding Bus to Chart House for Cocktail Reception and Dinner**
7:30 a.m. Registration

8:15 a.m. Welcome – Conference General Chair
Brent Nielsen – Northrop Grumman Aerospace Systems

8:20 a.m. Welcome – Technical Program Chair
Ken Turner – Johns Hopkins University Applied Physics Laboratory

SESSION 5 – Novel Test Requirements & Approaches
Chair: Yan Lui – NASA Goddard Space Flight Center
Co-Chair: Deborah Waters – NASA Glenn Research Center
8:25 a.m. Risk Reduction of Integration and Testing Operations Using Augmented Reality on Parker Solar Probe
Devin Hahne – Johns Hopkins University Applied Physics Laboratory

8:50 a.m. Development and Testing of Space Environment Simulation Containing Lunar Simulant
Taeil Chung – Korea (KICT)

SESSION 6 – Special Topics
Chair: Mary Cerimele – NASA Johnson Space Center (JSC)
Co-Chair: Richard Cooper – NASA Marshall Space Flight Center
9:20 a.m. Preparing for the Unthinkable: Contingency Planning and Facility Preparations for Thermal-Vacuum Testing of the James Webb Space Telescope
Kenneth Anderle – NASA Johnson Space Center – Jacobs Technology Inc.

9:45 a.m. Refreshment Break
10:05 a.m. Evaluations of Candidate Materials for Advanced Space-Rated Vacuum Seals to Explore Space Environment Exposure Limits
Patrick Dunlap Jr. – NASA Glenn Research Center

10:30 a.m. Exposure of Thermal Control Paints to Space-Simulated Environment
Daniel Engelhart – Assurance Technology Corporation

10:55 a.m. Atomic Oxygen Erosion of EVA-Stranded Soft-Goods on the ISS
John Alred, Ph.D. – NASA Lyndon B. Johnson Space Center

11:20 a.m. Conference Closing Remarks – General Chair
11:30 am Completion of Technical Program
Tuesday Keynote Speaker

Europa Clipper Mission

Ed Hawkins

Dr. Edward Hawkins III will speak about the Europa Clipper mission to place a spacecraft in orbit around Jupiter in order to perform a detailed investigation of the Galilean moon, Europa. The mission poses many technological challenges, requiring the spacecraft and payload to perform in one of the harshest environments in the solar system. Meeting those challenges promises to return insights into a world that shows strong evidence for a liquid water ocean beneath an icy crust. The water oceans could host conditions favorable for life. This talk provides an overview of the mission as well as details of the primary imaging instrument, EIS, and discusses how one designs an instrument to observe this unexplored world while satisfying the severe planetary protection requirements and surviving the harsh radiation environment.

Ed received a B.S. in electrical engineering from the University of Maryland and then joined the Space Exploration Sector of the Johns Hopkins University Applied Physics Laboratory (APL), developing space instruments. He has led numerous instrument development efforts, including those for the NEAR-Shoemaker multispectral imager, the Ulysses HI-SCALE instrument, and the MESSENGER MDIS instrument, and he is currently developing the dual camera system on the Europa Clipper mission. After the University of Maryland, Ed continued his educational pursuits while continuing to design and build space instruments at APL, receiving an M.S. in applied physics, an M.A. in physics, and a Ph.D. in physics, all from the Johns Hopkins University (JHU). For more than 10 years, he has been teaching graduate courses in the Applied Physics curriculum in the Whiting School of Engineering at JHU. Ed is currently a member of the APL Principal Professional Staff and supervisor of the Optical Systems Development Section.
Speaker Information

Tuesday Keynote Speakers
Parker Solar Probe
Nicola Fox and Betsy Congdon

To unlock the mysteries of the sun’s corona, but also to protect a society that is increasingly dependent on technology from the threats of space weather, Parker Solar Probe (PSP) is being sent to touch the sun. Nicky Fox, director of NASA’s Heliophysics Division, and Betsy Congdon, lead engineer for the PSP thermal protection system, will present the goals and status of the mission.

On September 4, 2018, Dr. Nicola “Nicky” Fox began official duties as director of NASA’s Heliophysics Division, leading the agency’s efforts to study the sun and its effects on Earth and the solar system.

Prior to taking on this role, she had been with the Johns Hopkins University Applied Physics Laboratory (APL) since 1998 as a research scientist, studying various aspects of the geospace impact of coronal mass ejection events from the sun. She served as the Chief Scientist for heliophysics in APL’s Space Research Branch. Nicky was the project scientist for PSP, where her main role was to ensure the scientific integrity of the mission. She represented the PSP science team in all aspects of the project, led the Science Working Group activities, and liaised with the mission engineering team and the NASA/Goddard and Headquarters program offices.

Prior to joining APL, Nicky was a USA National Research Council fellow at NASA Goddard Space Flight Center and a research scientist at Raytheon, with special responsibilities for the operations of the NASA Polar spacecraft and the International Solar Terrestrial Physics Program. She earned a Ph.D. in physics from the Imperial College of Science & Technology, an M.S. in telematics from the University of Surrey, and a bachelor’s degree in physics from the Imperial College of Science & Technology.
Speaker Information

Elizabeth “Betsy” Congdon is a member of the Senior Professional Staff at the Johns Hopkins University Applied Physics Laboratory (APL). She has more than 10 years of experience in the analysis, design, manufacture, integration, and testing of spaceflight hardware for NASA programs. She was the Lead Engineer for the thermal protection system for PSP. Betsy spent the first decade of her career developing and testing the solar shield.

Currently, Betsy is the Lead Mechanical Engineer for NASA’s Double Asteroid Redirection Test (DART) mission. She has experience in extreme environment design, material testing, and manufacturing. She has authored several papers on materials and testing development for the PSP mission. Betsy holds a B.S. in mechanical engineering from Stanford University and an M.S. in mechanical engineering from the Johns Hopkins University, and she is currently working on her Ph.D. in mechanical engineering at the Johns Hopkins University.
Dr. Melissa Trainer will speak about the Dragonfly rotorcraft lander mission. It is proposed as a New Frontiers Program that is designed to take advantage of Titan’s environment to be able to sample materials and determine the surface composition in different geologic settings. This revolutionary mission concept would provide the capability to explore diverse locations in order to characterize the habitability of Titan’s environment and even to search for chemical signatures that could be indicative of water-based and/or hydrocarbon-based life.

Melissa is a Research Space Scientist in the Planetary Environments Laboratory at NASA Goddard Space Flight Center, with research interests in the composition of planetary atmospheres and the production of organic molecules and aerosols via atmospheric synthesis. She currently serves as the Associate Laboratory Chief of the Planetary Environments Laboratory.

Melissa was a co-investigator and Deputy Instrument Scientist for the cryogenic sampling inlet and Neutral Mass Spectrometer on the proposed Titan Mare Explorer (TiME) mission, which completed Phase A study in 2012. She was a co-investigator on the Discovery Candidate Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging (DAVINCI) mission, which completed Phase A study in 2016. She is one of two deputy principal investigators and the lead for the mass spectrometer on the Dragonfly mission concept to Titan, which is conducting a Phase A study under consideration for New Frontiers.

Melissa completed her B.A. at Franklin and Marshall College in 2000, graduating magna cum laude with a major in chemistry and a minor in abstract mathematics. She completed her Ph.D. in chemistry from the University of Colorado in 2006.
Meeting Management Committee

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Brent Nielsen – Northrop Grumman Aerospace Systems

Technical Program Chair
Ken Turner – Johns Hopkins University
Applied Physics Laboratory

Tutorial Chair
Hadi Navid – Johns Hopkins University
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Gugu Rutherford
NASA Langley Research Center

James Snyder
The Aerospace Corporation

Ken Turner
Johns Hopkins University
Applied Physics Laboratory

Deborah Waters
NASA Glenn Research Center

Program provided by
Johns Hopkins University
Applied Physics Laboratory
The following vendors are exhibiting at the Conference Exposition. Further information about their companies and products can be found at the Conference “Virtual EXPO” at expo.spacesimcon.org.

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Vendor Map

30th Expo Floorplan

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