40th ANNUAL AAS GUIDANCE & CONTROL CONFERENCE

February 2nd to February 8th, 2017

Thursday, Feb. 2nd and Friday Feb. 3rd
Thursday 7:30 AM – 4:00 PM
Friday 7:30 AM - Noon

CLASSIFIED SESSION
Classified Advances in G&C and Classified Recent Experiences

Location of Classified Session:
Ball Aerospace Broomfield Campus
10 Longs Peak Dr,
Broomfield, CO 80021

Beaver Run Resort
Breckenridge, CO
Room check-in at front desk
4pm Daily

Conference Registration
Friday 5:00 – 8:00 PM
Daily 6:30 – 10:00 AM and 4:00 – 6:00 PM

Registration Questions
Carolyn O’Brien 720-277-5851
Lis Garratt 303-931-7622
Amy Delay 303-884-5728

40th Annual AAS Guidance, Navigation & Control Conference Chairperson
Reuban Rohrschneider
Ball Aerospace
720-201-3957
rrohrsch@ball.com

Wireless Access in Conference Area
Username: AAS2017
Password: beaver

PAPER LOCATION:
AAS RMS has invited you to view the following shared folder for 2017 conference papers:
https://goo.gl/GqVC5h
Conference Schedule Overview

Thursday, February 2nd
Registration and Breakfast  7:30 – 8:30 AM
Classified Session  8:30 AM – 4:00 PM

Friday, February 3rd
Classified Session  8:30 AM – 12:00 Noon
Conference Registration  5:00 – 8:00 PM
Wine & Cheese Reception  6:00 – 9:00 PM

Saturday, February 4th
Conference Opening & Keynote Address at 7:00 AM
Morning Session  7:30 – 10:30 AM
AAS STEM SCAPE Event  10:30 AM – 4:00 PM
Mars Talk for Children  4:00 – 5:00 PM
Technical Exhibits  5:00 – 9:00 PM

Sunday, February 5th
Posters Session During Morning Break
Morning Sessions  7:00 – 10:00 AM
Beyond the Textbook Tutorial  11 AM – 2 PM
Afternoon Sessions  2:00 PM – 4:00 PM
  Superbowl party sponsored by Surrey
  4:15 PM in Imperial Ballroom

Monday February 6th
Morning Sessions  7:00 – 10:00 AM
Beyond the Textbook Tutorial  10:30 AM – 3:30 PM

Afternoon Sessions  4:00 – 6:00 PM
Networking Event  6:30 PM
Presentation of Student Awards  7:00 PM

Tuesday February 7th
Morning Sessions  7:00 – 10:00 AM
Beyond the Textbook Tutorial  10:15 AM – 12:15 PM
Afternoon Sessions  4:00 – 7:20 PM

Wednesday, February 8th
Morning Session  7:00 – 10:00 AM

Traditional Conference Located at:
Beaver Run
Conference Center
Breckenridge, Colorado
Room check-in at the Beaver Run Resort
front desk at 4:00 PM daily.
Conference Registration
Friday 5:00 to 8:00 PM
Daily 6:30 to 10:00 AM and 4:00 to 6:00 PM

Wine and Cheese Reception
6:00 – 9:00 PM in Imperial Ballroom

SATURDAY, February 4th
7am Conference Opening & Keynote Address

Session I
7:30-10:30 AM

Student Innovations in GN&C
This session embraces the wealth of research and innovative projects related to spacecraft GN&C being accomplished in the university setting. Papers in this session address hardware/software research as well as component, system or simulation advances. Papers submitted must have a student as the primary author and presenter. Papers will be adjudicated based on level of innovation, complexity of problem solved, perceived technical readiness level, applicability and fieldability to near-term systems, clarity of written and verbal delivery, number of completed years of schooling and adherence to delivery schedule. The session will be limited to 8 papers with the top 3 papers receiving awards.

National Chairpersons
David Geller, Utah State University
david.geller@usu.edu
Lt. Col. David Richie, United States Air Force Academy
David.Richie@usafa.edu

Local Chairpersons
Ian Gravseth, Ball Aerospace
igravseth@ball.com

David Chart, Lockheed Martin Space Systems Company
david.a.chart@lmco.com

Room: Peak 5

17-011 Spacecraft Dynamics Employing a General Multi-tank and Multi-thruster Mass Depletion Formulation
10:30 AM-4:00 PM

**AAS STEM-SCAPE Event**

In 2017, we will be hosting our third STEM event for one hundred high school students of diverse background from across the Denver metropolitan area. The event, called AAS STEM-SCAPE for “Student Career Arcs to Professional Engineers,” will trace the elements of a successful career journey in aerospace including High School and University education, initial employment and ultimately a rewarding profession. Our keynote speaker is Mike Gazarik, PH.D., Vice President of Engineering at Ball Aerospace, who will be followed by a STEM career panel. The event concludes with a short design project that will be co-led with student volunteers from the University of Colorado. If you are interested in volunteering at the event, please contact our Education Committee planning POCs:

**Local Chairpersons**
Michael Drews
michael.e.drews@lmco.com
Meredith Stephens, Ball Aerospace
mstephen@ball.com

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**Special Event for Children of Conference Attendees and the Beaver Run Employees at 4 PM**

**Room: Peak 14**

**NASA Speaker on Mars Exploration**

This presentation will inspire our next generation of engineers by offering kids the opportunity to interact with Miguel San-Martin, a leader in the US Mars exploration program!

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**Special thanks for sponsoring the student paper competition prizes goes to:**

- Intuitive Machines
- Adcole
- Blue Canyon Technologies
Session II  5:00-8:00 PM

Technical Exhibits
Room: Peaks 1-5

The Technical Exhibits Session is a unique opportunity to observe displays and demonstrations of state-of-the-art hardware, design and analysis tools, and services applicable to advancement of guidance, navigation, and control technology. The latest commercial tools for GN&C simulations, analysis, and graphical displays are demonstrated in a hands-on, interactive environment, including lessons learned and undocumented features. Associated papers not presented in other sessions are also provided and can be discussed with the author. Come enjoy an excellent complimentary buffet and interact with the technical representatives and authors. This session takes place in a social setting and family members are welcome!

Local Chairpersons
Jim Russell, Lockheed Martin Space Systems Company
james.f.russell@lmco.com
Scott Glubke, NASA Goddard Spaceflight Center
scott.e.glubke@nasa.gov

Technical Exhibit Participants

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<tr>
<th>Airbus</th>
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<tr>
<td>Ball Aerospace</td>
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<td>BEI Precision Systems &amp; Space Company</td>
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<td>Blue Canyon Technologies</td>
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<td>Cayuga Astronautics</td>
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<td>Jena-Optronik GmbH</td>
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<tr>
<td>Lockheed Martin Space Systems Company</td>
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<td>NewSpace Systems</td>
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<td>Sierra Nevada Corp.</td>
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<td>SODERN</td>
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<td>Surrey Satellite Technology</td>
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<td>Univ. of Colorado Aerospace Eng. Sciences</td>
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<tr>
<td>Utah State University Space Dynamics Lab</td>
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SUNDAY, FEBRUARY 5th

Poster Session
Authors will be present in Break Room for morning session break (8:30 – 9AM).
Posters will be available for viewing throughout conference.

The Poster Session offers a unique forum for authors and interested parties to discuss relevant topics. Posters do not require an accompanying written paper. However, authors who wish to have their work published in the proceedings can submit a written paper along with the poster. The Poster Session will be available for viewing every day in the main conference room.

Local Chairpersons
Cheryl Walker, Lockheed Martin Space Systems Company
cheryl.a.walker@lmco.com

17-171 Uncertainty Analysis for Initial Relative Orbit Determination Using TDOA Measurements
S. Shuster (Utah State University)

17-172 Reflector Identification in Flash LIDAR Imagery
J. Christian (West Virginia University)

17-173 The Opportunities and Challenges of GNC on a Europa CubeSat
J. Thangavelautham (Arizona State University - SpaceTREx)

17-174 GNC of the SphereX Robot for Extreme Environment Exploration on Mars
J. Thangavelautham (Arizona State University - SpaceTREx)

17-175 Guidance, Navigation and Control of a Bucket Wheel for Surface Mining of Asteroids and Small-Bodies
J. Thangavelautham (Arizona State University - SpaceTREx)

17-176 Combined Thermal Control and GNC: An Enabling Technology for Surface Probes and Small Robots
J. Thangavelautham (Arizona State University - SpaceTREx)

17-177 Precise Pointing of CubeSat Telescopes without Reaction Wheels
J. Thangavelautham (Arizona State University - SpaceTREx)

17-178 Entry, Descent and Landing System for CubeSat Sized Drop-off Payloads
J. Thangavelautham (Arizona State University - SpaceTREx)

17-179 Optimal Observability Maneuvers & Trajectory Design for Constrained Spacecraft Translational Motion
F. Franquiz (Embey-Riddle Aeronautical University)

17-180 Optical Target Tracking with User Input for Autonomous Vehicle Guidance
M. Anderson (United States Air Force Academy)

17-181 Electrospray Propulsion for Precise Position and Attitude Control
D. Courtney (Busek Co.)

17-182 Speed-Constrained Three-Axes Attitude Control Using Kinematic Steering
H. Schaub (University of Colorado)

17-183 Low SWAP Torque Rods Including Cube Sat Sized Rods
J. Krebs (Cayuga Astronautics)

17-184 Effects of uncertainties in the atmospheric density on the probability of collision
C. Bussy-Virat, A. Ridley, J. Getchius (Univ. of Michigan)
SUNDAY, FEBRUARY 5th

Dual Morning Sessions

SESSION III 7:00-10:30 AM

Entry Descent & Landing GN&C

Entry, Descent, and Landing technologies have evolved in recent years, including new studies for landing on the Moon, Mars, and other celestial bodies, as well as new experiences for landing rocket stages after launch. This session offers a venue for discussions about heat mitigation strategies for atmospheric entry, discussions about targeted descents, and G&C technology developments for landers.

National Chairpersons
Zach Putnam, University of Illinois, zputnam@illinois.edu
Miguel San-Martin, NASA Jet Prop. Lab, alejandro.m.sanmartin@jpl.nasa.gov

Local Chairperson
Tim Bevacqua, Lockheed Martin Space Systems Company, timothy.bevacqua@lmco.com
Jeff Parker, University of Colorado, parkerjs@Colorado.EDU
James Pavik, University of Colorado, james.pavek@gmail.com

Room: Peak 5

P. B. Brugarolas (JPL)

17-032 Characterization of Guidance Algorithm Performance for Drag Modulation-Based Aerocapture
M. Werner, R. Braun (Georgia Tech)

17-033 Guidance Trades for High Ballistic Coefficient Mars Lander Trajectories
T. Anderson, R. Braun (Georgia Tech)

17-034 High-Ballistic Coefficient Mars EDL with Supersonic Retropropulsion
C. Noyes, A. Wolf (JPL)

17-035 An Assessment of Aerodynamic Flaps for Planetary Entry Trajectory Control
J. Sepulveda, Z Putnam (University of Illinois at Urbana-Champaign)

17-036 The Lander Vision System for Mars 2020 Entry Decent and Landing

17-037 Landing on Europa: Challenges, Technologies, and a Strategy

17-038 The Intelligent Landing System for Safe and Precise Landing on Europa
N. Trawny, A. Katake, M. San Martin, D. Skulsky, A. Johnson (JPL)
SUNDAY, FEBRUARY 5th

Dual Morning Sessions

SESSION IV  7:00-8:30 AM

   GN&C Beyond The Space Industry

Much of the fundamental physics, industry practices, and technology common to GN&C in the space industry are directly applicable to science/engineering commerce and research beyond aerospace. This session explores GN&C algorithms, hardware and applications beyond spacecraft and launch vehicles. Papers with application in the adjacent sectors of energy, transportation, medicine, and robotics are encouraged.

National Chairpersons
Tim Crain, Intuitive Machines
tim@intuitivemachines.com

Local Chairpersons
Meredith Stephens, Ball Aerospace
mlstephe@ball.com

SESSION XVI  9:00-10:45 AM

   Scientific Discoveries Enabled by GN&C

This session looks at the scientific results that GN&C has helped deliver. From exoplanet detections to Martian habitability, G&C engineering has played a significant role in enabling some of the most exciting scientific discoveries of our generation. These findings not only add to the body of scientific knowledge, they light the public’s imagination and inspire tomorrow’s scientists and engineers.

National Chairpersons
Stephen Lee, NASA Jet Propulsion Lab
steven.w.lee@jpl.nasa.gov
James O’Donnell, NASA Goddard Space Flight Center
james.r.odonnell@nasa.gov

Local Chairpersons
Michael Osborne, Lockheed Martin Space Systems Company
michael.l.osborne@lmco.com

Room: Peak 4

17-041  GN&C Outside of Aerospace
T. Crain, S. Stewart (Intuitive Machines)

17-042  Withdrawn

17-043  Agile Autonomy: Vision Enable Navigation for Arial Robotics
M. Akella, M. Almeida (The University of Texas at Austin)

17-044  Combined Thermal Control and GNC: An Enabling Technology for Surface Probes and Small Robots
J. Thangavelautham, S. Rabade (Arizona State University)

17-161  LISA Pathfinder: First steps to observing gravitational waves from space
P. McNamara (ESA)

17-162  Mars Reconnaissance Orbiter: Continuing 10 Years of Discovery at Mars
R. Zurek (NASA JPL)

17-163  Withdrawn

17-164  Mars Volatile Evolution and Climate Change: Results From the MAVEN Spacecraft Mission
B. Jakosky (CU LASP)

17-165  Science from the Lunar Reconnaissance Orbiter Mission enable by Guidance, Navigation and Control
J. Keller (NASA GSFC)
Control Structure Interaction

Advanced space based instrument systems rely on increasingly stable and ever more accurate positioning platforms to continue to expand their science capabilities. Systems range from inertially fixed systems to orbiters, deep space explorers, landing systems, robotic exploration systems on primitive bodies, etc. In addition, instrument systems can range from simple body fixed sensors to complex articulated instruments that are increasingly larger and structurally softer. All of the above include Guidance, Navigation, and Control systems for attitude control and, in some cases, fine boresight control, and/or articulation control systems. The interaction of these controls systems and their associated structures, sensors and mechanisms, and the impact this interaction has on the performance of the underlying mission is the focus of this session. The session organizing committee invites authors to submit papers that explore Control Structures Interaction related architectures, design methodologies, advanced analytical techniques, integrated modeling and simulation advances, verification and validation methodologies, and other related topics.

**National Chairpersons**
Jack Aldrich, NASA Jet Propulsion Laboratory
Jack.B.Aldrich@jpl.nasa.gov
James Allison, University of Illinois Urbana-Champaign
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Soon-Jo Chung, Caltech
sjchung@caltech.edu

**Local Chairpersons**
Oscar Alvarez-Salazar, NASA Jet Propulsion Laboratory
oscar.s.alvarez-salazar@jpl.nasa.gov

**Room: Peak 5**

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<tr>
<th>Session</th>
<th>Title</th>
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<td>17-051</td>
<td>Evaluation of non-minimum phase notch filter for spacecraft structural mode stabilization</td>
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<td>17-052</td>
<td>High Fidelity Multi Body Deployment Dynamics Model and Control strategy for NISAR</td>
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<td>17-053</td>
<td>Boresight pointing analysis and control design for NISAR with large reflector</td>
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<td>17-054</td>
<td>Models for NISAR Pointing Performance Prediction</td>
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<td>17-055</td>
<td>Narrowband Rejection of Reaction Wheel Induced Line of Sight Disturbances for the WFIRST Mission</td>
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SUNDAY, FEBRUARY 5th

Dual Afternoon Sessions

Session VI  2:00-4:00 PM

GN&C Challenges of Space Mining

In recent years, the identification, acquisition and use of space resources has gained a great deal of attention across the industry. The success of this endeavor: reaching, extracting, utilizing (in-situ) and/or returning those resources, directly depends on the ability to guide, navigate and control the robotic systems needed to meet the challenges. This session will highlight the Guidance, Navigation and Control aspects of the many initiatives under consideration for the coming decade.

National Chairpersons
Angel Abbud-Madrid, Director – Center for Space Resources, Colorado School of Mines
aabbudma@mines.edu

Local Chairpersons
Dan Kubitschek, University of Colorado/Boulder LASP
daniel.kubitschek@lasp.colorado.edu
Alex May, Lockheed Martin Space Systems Company
alexander.j.may@lmco.com

Room: Peak 4

17-061 OSIRIS-REx Launch Orbit Determination Analysis and TCM-1 Reconstruction
J. Leonard, P.G. Antreasian, E. Carranza, B. Page, D. Stanbridge, D. Wibben (KinetX), M. Moreau (NASA GSFC)

17-062 Early Operational Maneuvers for OSIRIS-REx: Design and Early Performance Assessment
D. Wibben, K. Williams, D. Stanbridge, P. Antreasian (KinetX), M. Moreau, B. Barbee, R. Qureshi (NASA GSFC)

17-063 OSIRIS-REx Dynamics Supporting Asteroid Surface Properties Science
W. Hafer (Lockheed Martin SSC)

17-064 Attitude Determination and Control of the Asteroid Origins Satellite 1 (AOSAT 1)
R. Teja Nallapu, E. Asphaug, J. Thangavelautham (Arizona State University), S. Shah (United Launch Alliance)

17-065 Optimal Aerobraking Trajectories in the Cis-Lunar Economy
N. Campbell, T. Bennett, B. Argrow, J. Ralph (University of Colorado)

Superbowl Party
Sponsored by Surrey
4:15 PM in the Imperial Ballroom
Family members of conference attendees are welcome!
Sandwiches and appetizers will be served.
Afulomofin NASA and commercial space missions hinges greatly on increased autonomous rendezvous, proximity operations and docking GN&C technologies as more visiting vehicles interact to complete increasingly complex missions. This session seeks to explore the latest advancements in GN&C related to relative navigation through new sensor suite technologies such as image based optical navigation and LIDAR sensing technologies, relative guidance and automated docking. Rendezvous and docking refers to GN&C technologies which permit cooperative or uncooperative vehicle mating and which have additional applications to upcoming asteroid missions.

National Chairpersons
Jack Brazzel, NASA Johnson Space Center
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John Christian, West Virginia University
john.christian@mail.wvu.edu

Local Chairpersons
Ellis King, Charles Stark Draper Laboratory
eking@drapercom
John Bendle, Lockheed Martin Space Systems Company
john.r.bendle@lmco.com

17-071 The RVS3000 and RVS3000-3D LIDAR Sensors

17-072 Receding Horizon Control for Uncooperative Rendezvous During Debris Removal Mission
T. Woodbury, A. B. Probe, C. K. Moody, B. Janisch, J. E. Hurtadoy (Texas A&M University)

17-073 Reduced-Dynamics POSE Estimation for Non-Cooperative Spacecraft Rendezvous Using Monocular Vision
S. Sharma, S. D’Amico (Stanford University)

17-074 Real-Time Optimal Trajectory Planning for Orbital Rendezvous, Satellite Inspection, and Docking Based on Convex Optimization
N. Ortolano (Utah State University), A. Avery (Space Dynamics Lab), D. K. Geller (Utah State University)

17-075 Performance of the Seconds Generation Detector for the Vision Navigation Sensor (VNS)
R. R. Rohrschneider, M. S. Bradley, J. Funderburg, and S.M. Lutgring (Ball Aerospace)

17-076 The Development and Testing of Visual Odometry for Proximity Operations and Docking Using ISS Selfie
D. Woffinden (Charles Stark Draper Laboratory), S. Robinson (NASA JSC)

17-077 Paper Withdrawn

17-078 Restore-L Rendezvous and Proximity Operations Overview
E. Skelton (Lockheed Martin Space Systems Company), M. A. Vavrina (a.i. Solutions)
Small Satellite GN&C
Cubesats and smallsats range in mass from less than 1kg up to 180kg, and are gaining in popularity and utility. At the high end of this mass range, 100 to 180kg ESPA-class spacecraft are now trusted platforms for scientific and defense missions and offer pointing accuracy, pointing stability, and position knowledge that is compatible with Earth science missions. For cubesats, the GN&C capabilities are advancing quickly in an effort to support science and technology development missions. Both classes are now pushing the envelope to provide features that were previously only available on much larger class satellites, such as autonomous RPO and docking as well as significant on-board mission data processing capabilities. This session is open to papers covering both hardware and software aspects of smallsat and cubesat GN&C. Papers on technology development for GN&C and mission GN&C experience are welcomed.

National Chairpersons
Chuck Clagett, NASA
charles.e.clagett@nasa.gov
Jason Westphal, Applied Defense
JWestphal@AppliedDefense.com

Local Chairpersons
Jake Griesbach, Ball Aerospace & Technologies Corp.
jgriesba@ball.com
MONDAY, FEBRUARY 6th

TUTORIAL SESSION  10:30 AM-3:45 PM
Beyond the Textbook:  Commercial SSA
By AGI

Session IX  4:00-6:00 PM
European Technology
Demonstrations

European demonstration missions past, present and future. This session will present an overview of the AOCS and GNC aspects of European In-Orbit Demonstration missions as run by the European Space Agency and National Agencies in Europe. IOD missions have played a key role in the development of technology and continue to become even more important as a way to derisk future missions, demonstrate and finalize the testing of new sensors and actuators and to gain experience of environments, new design approaches and new operational concepts. The session will focus not only on current IOD missions, but also showcase key past missions with the lessons learned from them and potential future missions.

National Chairpersons
Stephen “Phil” Airey, ESA TEC-ECC
stephen.airey@esa.it

Steeve Kowaltschek, ESA
steeve.kowaltschek@esa.int

Local Chairpersons
Stu Schimkat, Airbus North America
Stu.Schimkat@airbusna.com

Room: Peak 5

17-091  The PRISMA Formation Flying Mission: Retrospective and Legacy of GNC Experiments
Per Bodin (OHB Sweden)

17-092  Flight Demonstration of Re-Entry GNC in the Intermediate Experimental Vehicle (IXV)
Rodrigo Haya-Ramos (SENER)

17-093  The PROBA family: successful platforms for the in-orbit demonstration of innovative and autonomous GNC techniques
Stefano Santandrea (European Space Agency)

17-094  Proba-3: High precision Formation Flying in HEO
Rafael Contreras (SENER)

17-095  LIRIS flight data exploitation and comparison to ATV
Olivier Mongrard (European Space Agency)

SOCIAL NETWORKING EVENT
6:00 to 7:30 PM
In the Imperial Ballroom
Opportunity for conference attendees and guests to network with others. The winners of student competition will be announced; and continued networking after the formal event is encouraged!
TUESDAY, FEBRUARY 7th

Parallel Morning Sessions

Session X  7:00-10:00 AM

Precision Pointing

The level of pointing performance required by modern applications is unprecedented. Greater and greater pointing accuracy is sought across a variety of terrestrial and orbital systems. Many photometric applications require an arc-second or better performance to accomplish their mission objectives. Our Precision Pointing session will examine the current state of the art in observatory (spacecraft, instrument and antenna) pointing solutions that satisfy the needs of the industry.

National Chairpersons
Paul Mason, NASA Goddard Space Flight Center
paul.a.mason@nasa.gov
Albert Bosse, MDA
Albert.Bosse.ctr@mda.mil

Local Chairpersons
Jastesh Sud, Lockheed Martin Space Systems Company
Jastesh.sud@lmco.com
Larry Germann, Left Hand Design Corp.
germannl@lefthand.com

Room: Peak 4

17-111  Robustness of ASTRIX Optic Gyros in Space Radiative Environment
A. Paveau (Airbus)

17-112  A Comparison of Thruster Selection That Enables Precision Pointing
N. Davis (GSFC)

17-113  Precision Pointing of a GEO-Hosted Imaging Spectrometer
H. Gutierrez (Ball)

17-114  High Accuracy, Low SWaP Interferometric Star Tracker for Space Applications
M. Jacoby (OPCI)

17-115  Precision Pointing for the Wide-Field Infrared Survey Telescope (WFIRST)
E. Stoneking (GSFC)

17-116  Leonardo Fine Guidance Sensor: sub-arcsecond pointing accuracy for the Euclid European Observatory
F. Boldrini (Leonardo)

17-117  Precision Pointing in Space using Arrays of Shape Memory Alloy based Linear Actuators
J. Thangavelautham (ASU)

17-118  Inflight Performance of the SDO Fine Pointing Science Mode
P. Mason (GSFC)
TUESDAY, FEBRUARY 7th
Parallel Morning Sessions
Session XI 7:00-10:00 AM

Advances in GN&C (Part 1)
Many programs depend on heritage, but the future is advanced by those willing to design and implement new and novel architectures, technologies, and algorithms to solve the GN&C problems. This session is open to papers with topics ranging from theoretical formulations to innovative systems and intelligent sensors that will advance the state of the art, reduce the cost of applications, and speed the convergence to hardware, numerical, or design trade solutions.

National Chairpersons
Bill Frazier, NASA/JPL
william.e.frazier@jpl.nasa.gov
Lt. Col. David Richie, United States Air Force Academy
david.richie@usafa.edu

Local Chairpersons
James McQuerry, Ball Aerospace (Retired)
mcquerrydj@comcast.net
Mike Beda, Lefthand Design Corp.
mbeda@lefthand.com
Lee Barker, Lockheed Martin Space Systems Company
lee.a.barker@lmco.com

Room: Peak 5
17-121 On the Automatic Generation of Recursive Attitude Determination Algorithms
T. McClure (Uncommon Lab)

17-122 Analytical Attitude Determination from a Specific Rate Profile
P. Zentgraf (Rosenheim University)

17-123 An Advanced Architecture for Optimizing Earth Science Data Collection Based Upon Model Predictive Control
M. Lieber, C. Weimer, R. Rohrschneider, L. Ruppert, B. Bauer, J. Applegate (Ball Aerospace)

17-124 Kinematic Steering Law Enabling Conically Constrained Spacecraft Attitude Control
M. Ramos, H. Schaub (UC Boulder)

17-125 ASTROgyro

17-126 Time Domain Stability Margin Assessment Method
K. Clements (NASA)

17-127 Modeling Solar Radiation Pressure with Self-Shadowing Using Graphics Processing Unit
P. Kenneally, H. Schaub (UC Boulder)

17-128 Analytical Position and Velocity Partials for Conic and Non-Conic Trajectories
R. Gottlieb (Odyssey), W. Fowler (UT Austin), T. Feagin (UH Houston)
TUESDAY, FEBRUARY 7th

**TUTORIAL SESSION**  10:30 AM-12:30 PM

Beyond the Textbook: General Mission Analysis Tool (GMAT)

Speaker: Steve Hughes, NASA Goddard Space Flight Center

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**Parallel Afternoon Sessions**

**Session XII**  4:00-7:20 PM

**Advances in GN&C (Part 2)**

Due to an outstanding turnout for the Advances in GN&C session, this is a continuation of the morning session.

**National Chairpersons**
Bill Frazier, NASA/JPL
william.e.frazier@jpl.nasa.gov
Lt. Col. David Richie, United States Air Force Academy
david.richie@usafa.edu

**Local Chairpersons**
James McQuerry, Ball Aerospace (Retired)
mcquerrydj@comcast.net
Mike Beda, Lefthand Design Corp.
mbeda@leflhand.com
Lee Barker, Lockheed Martin Space Systems Company
lee.a.barker@lmco.com

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**Room: Peak 5**

**Session 17-131**  Yaw Steering Analysis for Tundra Orbits
E. Sperber, D. Carter, P. Silversmith
(Aerospace Corp)

**Session 17-132**  GOES-R GPS Receiver Airlink Testing Concept to Conclusion
S. Winkler, A. Krimchansky, D. Freesland, G. Ramsey, K. Patel
(Lockheed Martin)

**Session 17-133**  Auriga Star Tracker for Constellations & Small Satellites
B. Gelin, L. Eychenne (SODERN)

**Session 17-134**  Moving Mass Actuator Control for Mars Entry Vehicles
K. Lohan, Z. Putnam (UI Urbana)

**Session 17-135**  Withdrawn

**Session 17-136**  Airbus DS CMG - An Enabler for High Pointing Accuracy Missions
P. Faucheux (Airbus)

**Session 17-137**  Ground-Based Ephemeris Verification for the GOES Spacecraft
D. Zanon (Relative Dynamics)

**Session 17-138**  Performance Characterization of GOES-R On-Orbit GPS Based Navigation Solution
J. Gillette, M. Concha (Relative Dynamics)
Parallel Afternoon Sessions
Session XIII  4:00-7:20 PM

Advanced Propulsion for Space Systems

The development of advanced propulsion technologies is critical for enabling more ambitious human and robotic space exploration missions. Innovative developments in chemical, electric, nuclear, and propellantless propulsion will provide higher performance and greater operability, enabling new approaches for launch and near Earth, cis-lunar, and deep space exploration. This session will highlight advanced propulsion technologies for launch vehicles and spacecraft being matured by NASA, DOD, industry, and academia.

National Chairpersons
Jeff Sheehy, NASA
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Local Chairpersons
John Abrams, AMA
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Christopher McLean, Ball Aerospace & Technologies Corp.
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John Reed, United Launch Alliance
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Room: Peak 4

17-141  Performance Characterization of a Cold Gas Propulsion System for a Deep Space CubeSat
M. Sorgenfrei (NASA/ARC)

17-142  Proposed Technology Demo Mission for the Phase II NIAC Electric Sail Investigation
B. Wiegmann (NASA/MSFC)

17-143  Advanced Thermal Insulations for Launch Vehicles
G. Mills (Ball)

17-144  Low Enriched Uranium Nuclear Thermal Propulsion Systems
M. Houts (NASA/MSFC)

17-145  HYDROS: High Performance Water-Electrolysis Propulsion for CubeSats and Microsats
K. James (TUI)

17-146  Human Exploration of the Solar System by 2100
R. Litchford (NASA)

17-147  Scalable High Power Hall Thruster Propulsion for Space Asset Transport into the 2030s and Beyond
A. Hoskins (Aerojet Rocketdyne)

17-148  Breakthrough StarShot – Humanity’s Interstellar Initiative
P. Worden (Breakthrough Initiatives)

17-082  BCP-100 Small Satellite Guidance Navigation and Control on the Green Propellant Infusion Mission
C. McLean, B. Marotta (Ball Aerospace)
WEDNESDAY, FEBRUARY 8th

Session XIV    7:00-10:00 AM

Recent Experiences

This session focuses on recent experiences in spaceflight GN&C, providing a forum to share insights gained through successes and failures. Discussions typically include GN&C experiences ranging from Earth orbiters to interplanetary spacecraft. This session is a traditional part of the conference and has shown to be most interesting and informative.

National Chairpersons
Rachel Dudik, United States Naval Observatory
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Sam Thurman, NASA Jet Propulsion Lab
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Local Chairpersons
Jim Chapel, Lockheed Martin Space Systems
jim.d.chapel@lmco.com

Room: Peak 5

17-151 Dawn Spacecraft Performance at Ceres: Results of Hybrid Control for Ceres Mapping
B. Smith, M. Salami, R. Lim, A. Feldman (NASA/Jet Propulsion Laboratory)

17-152 Late mission experiences of the Kepler Space Telescope
D. Putnam, D. Wiemer, K. McCalmont-Everton (Ball Aerospace)

17-153 CryoSat-2: In-Orbit Star Tracker Improvements
E. Maestroni (ESA), D. Fornarelli (Rhea Group), N. Mardle, P. Davidsen (Terma AS), S. Airey, M. Krassenburg (ESA), N. Duske (Airbus DS)

17-154 Reaching New Heights in Intern Programs
G. Arend, J. Reed (United Launch Alliance), K. Ackerman, N. Beale, J. Cole, J. Davis (Ball Aerospace)

17-155 Dynamic Control System Performance during Commissioning of the Space Technology 7 – Disturbance Reduction
O. Hsu, P. Maghami, J. O'Donnell, C. Dunn, J. Ziemer (NASA Goddard Space Flight Center)

17-156 On-Orbit Performance of the XACT GN&C Subsystem
M. Baumgart, D. Hegel, B. Rogler, D. Sanders (Blue Canyon Technologies)

17-157 In-Flight Pointing Accuracy Assessment and GNC Commissioning Overview for the Dual-Spinning SMAP (Soil Moisture Active Passive) Spacecraft
T. Brown, T. Sung (NASA/Jet Propulsion Laboratory)
2017 Conference Planning Committee

John Abrams        Analytical Mechanics Assoc.
Oscar Alvarez-Salazar  NASA/JPL/CIT
Lee Barker           LMSSC
Mike Beda            Left Hand Design
John Bendle          LMSSC
Tim Bevaqua          LMSSC
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Cheryl Walker        LMSSC

41st Annual AAS Guidance & Control Conference
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