Session 0…….7:00-10:00 AM daily

POSTER SESSION
AVAILABLE EVERY DAY

The Poster Session which is set up in the breakfast room will be available for viewing every day. Authors will be on hand to discuss their projects and answer questions. A full list of these presentations can be found on Page ____.

Local Chairperson
Kyle Miller, Ball Aerospace & Technologies Corp., kbmiller@ball.com, 303-939-5505

ALL PAPERS WILL BE LOCATED AT https://docs.google.com

Login Name: AASGNC@Gmail.com

Password: AASGNCPASSWORD

SATURDAY, FEBRUARY 4th

7 AM Conference Opening by Michael Osborne

Followed by

PLENARY SPEAKER

Keith Uebele

of Intel Corporation

Speaking on: "The Future of Computing for Space and Ground Systems: Exploring the Limits"

Session I……..7-10:30 AM

SPACE DEBRIS — TRACKING, CHARACTERIZATION & MITIGATION

A safe space environment without substantial debris threats is crucial for scientific, defense, and commercial needs. Debris mitigation is a topic of global concern and has international attention. An improved understanding of what debris is up there, where it is, and how it is moving is important to characterize what actions we must take. Methods to help prevent satellite collisions and breakups are continuously being refined and employed in operations, and innovative ways to actively remove debris are gaining more traction. This session covers these topics to ensure that space debris will not obstruct our future in space.

National Chairpersons
Moriba Jah, AFRL, moriba.jah@kirtland.af.mil, 505-853-2629
Scott Daw, TASC Inc., Scott.Daw@TASC.com, 719-572-8726

Local Chairpersons
Alex May, Lockheed Martin Space Systems, alexander.j.may@lmco.com, 303-977-6620
Cheryl Walker, TASC Inc., Cheryl.walker@tasc.com, 719-572-8727

12-011 **High-Accuracy Satellite Conjunction Assessment and Collision Avoidance Support from an Operational Perspective**, Robert Massey (SRA International, Inc.)

12-012 **USSTRATCOM SSA Data Sharing**, Maj.Duane E. Bird (USSTRATCOM/J31)

12-013 **SPADOC Track Association and Short Arc Initial Orbit Determination,** James Peugh (SRA International, Inc.)

12-014 **Space Object Mass-Specific Inertia Matrix Estimation from Photometric Data**, Richard Linares (State University of New York at Buffalo), Fred A. Leve, Moriba K. Jah, John L. Crassidis (AFRL)

12-015 **Improved Methods for Tracking and Characterizing Inactive Space Objects**, Richard Linares (State University of New York at Buffalo), Moriba K. Jah, Kyle J. DeMars (AFRL)

12-016 **Space Debris Reorbiting Using Electrostatic Actuation**, Erik A. Hogan, Hanspeter Schaub (University of Colorado)

12-017 **Design of Spacecraft Missions to Remove Multiple Orbital Debris Objects**, Brent W. Barbee (NASA GSFC), Salvatore Alfano (Center for Space Standards and Innovation (CSSI), Elfego Piñon, Kenn Gold, and David Gaylor (Emergent Space Technologies, Inc.)

Session II……5:00-8:00 PM

TECHNICAL EXHIBITS

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 the 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!

TECHNICAL EXHIBIT PARTICIPANTS

a.i. solutions, Inc.
ACUTRONIC USA Inc.
Astro-und Feinwerktechnik Adlershof GmbH
Ball Aerospace & Technologies, Corp.
Bei Precision Systems & Space Company
EADS-Astrium SAS
EADS Sodern
Emergent Space Technologies Inc.
Jena-Optronk GmbH
Lockheed Martin Space Systems Company
MathWorks, Inc.
MIT Space Systems Laboratory
Monarch High School
Rockwell Collins
SELEX Galileo
Sierra Nevada Corporation
Simulogix
SSBV Space and Ground Systems
Surrey Satellite Technology

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Zach Wilson, Lockheed Martin Space Systems, zachary.s.wilson@lmco.com, 303-971-4799

SUNDAY, FEBRUARY 5th

Session III……..……..7:00-10:00 AM

SPACE WEATHER TUTORIAL

Understanding near-Earth space and atmospheric effects are critical to satellite design and effective on-orbit operation of spacecraft and payload systems (including RF and scientific payloads). Atmospheric density impacts Orbital Determination (OD) in the Low Earth Orbit (LEO) regime. Ionospheric and proto-ionospheric physics result in RF signal delays and scintillation. The spacecraft in-situ environment will drive on-orbit impacts that include electrostatic discharge events, single event upsets and other effects resulting from trapped radiation and other solar particle events. This session will include a tutorial of the current state of space and upper-atmospheric physics and provide an overview of its impact to orbital missions.

National Chairperson
Tim Walsh, NOAA/GSFC, timothy.j.walsh@nasa.gov, 301-286-1739
Bob Rutledge, NOAA/Space Weather Prediction Center, Robert.Rutledge@noaa.gov, 303-497-3029
Doug Biesecker, NOAA/Space Weather Prediction Center, Doug.Biesecker@noaa.gov, 303-497-4474

Local Chairpersons
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Lee Barker, Lockheed Martin Space Systems, lee.a.barker@lmco.com, 408-742-4679

12-031 **Introduction to Space Weather**, Bob Rutledge (NOAA/NWS Space Weather Prediction Center)

12-032 **Space Weather Considerations for Spacecraft/Instrument Design**, Paul Richards (NASA/GSFC Former NASA Astronaut

12-033 **Space Weather Hazards in the Inner Magnetosphere**, Joseph Koller (Los Alamos National Lab)

12-034 **Addressing the Influence of Space Weather on Airline Navigation**, Lawrence Sparks (Jet Propulsion Laboratory, California Institute of Technology)

12-035 **Neutral Atmosphere and the Satellite Drag Environment**, Geoff Crowley (ASTRA LLC)

Educational Workshop . . .10:30AM-1:30 PM

Using MATLAB & Simulink for Model-Based Design of Control Systems

presented by MathWorks Inc.

This workshop will cover the iterative process of analysis, design, and optimization involved in the development and implementation of a real-world practical application. Learn how to design, simulate, and test the mechanical, electrical and software components of systems. See how you can simulate the controller and the plant together, optimizing the control system, and generating code for HIL testing—all before building a prototype. Integration of simulated and real components to enable Hardware-in-the-Loop (HIL) testing in support of early Verification and Validation (V&V) against top-level requirements will also be demonstrated.

Lunch (pizza) will be provided.

Local Chairperson
Kristen Francis, Lockheed Martin Space Systems, kristen.francis@lmco.com, 303-971-7450

Session IV……2:00-4:00 PM

ADVANCES IN GN&C

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
Brent Robertson, NASA/GSFC,
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Local Chairpersons
David Chart, Lockheed Martin Space Systems,
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Ian Gravseth, Ball Aerospace & Technologies Corp., igravseth@ball.com, 303-939-5421

12-041 **Attitude Determination using a Photon Counting Star Tracker**,
Michael D'Angelo, Richard Linares, and John L. Crassidis (SUNY/Buffalo)

12-042 **Alignment Between an IMU and Star Tracker Camera Using the Night Sky and an On-Board Navigation System**,
Stephen R. Steffes, Malak A. Samaan, Stephan Theil (DLR German Aerospace Center, Institute of Space Systems)

12-043 **Attitude Determination Requirements and Design for an SSA Nanosat Mission**,
Daniel M. Pastuf, Richard Linares, and John L. Crassidis (SUNY/Buffalo)

12-044 **GPS at GEO: A First Look at GPS from SBIRS GEO1**,
Lee Barker (LM/SSC), Chuck Frey (LM/IS&GS)

12-045 **Safe Mode Attitude Determination Design Approach for GPM**,
Keith DeWeese, Henry Fitzpatrick (NASA/GSFC)

MONDAY, FEBRUARY 6th

Session V…….……..…..…7:00-10:00 AM

ADVANCES IN GN&C (Continued)

12-051 **Vision Navigation Sensor (VNS) Results from STORRM Mission**,
Ian Gravseth, Reuben R. Rohrschneider, James Masciarelli (Ball Aerospace & Technologies Corp.)

12-052 **Full Scale Flight Demonstration of Lidar-based Hazard Detection and Avoidance**,
David Neveu et al. (NGC Aerospace Ltd.)

12-053 **Simulation Results of Rendezvous and Docking with the International Space Station Using Only 3D Range Images**,
Reuben R. Rohrschneider, William Tandy, Ian J. Gravseth (Ball Aerospace & Technologies Corp.)

12-054 **SLAM Visual Landmark 3D Mapping System for Autonomous Navigation and Landing on Small Celestial Bodies**,
Cedric Cocaud (University of Tokyo), Takashi Kubota (ISAS-JAXA)

12-055 **EPOXI Fine Guidance**,
Dustin Putnam (Ball Aerospace & Technologies Corp.)

12-056 **GOES-R Magnetometer Mission Design**,
Timothy J. Walsh (NOAA/GSFC)

12-057 **Gimbal Control Algorithms for the Global Precipitation Measurement Core Observatory**,
Gary Welter, Alice Liu (NASA/GSFC), Carl Blaurock (Nightsky Systems)

Session VI…….4:00-6:00 PM

GN&C — THE FUTURE

Advances in technology and engineering capabilities have continued to facilitate increasingly-sophisticated space-based platforms for a variety of purposes. However it is clear that new GN&C concepts, architectures, systems, algorithms, and components, will be required to meet the emerging needs of the more demanding, complex and highly dynamic missions currently envisioned for Earth observation, space science, human exploration beyond low Earth orbit, and national defense. Some of the GN&C functions driven by advanced mission concepts and payload requirements include autonomy, adaptability, high stability, rapid slew and settle times, high-accuracy pointing and precise vehicle position/attitude knowledge. This session considers foreseeable system requirements and their flow to future GN&C requirements.

National Chairpersons
Neil Dennehy, NASA/GSFC,
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David Richie, US Air Force Academy,
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Local Chairpersons
Michael Drews, Lockheed Martin Space Systems,
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Bill Frazier, Ball Aerospace & Technologies Corp., wfrazier@ball.com, 303-939-4986

12-061 **Technical Challenges and Future Technological Needs for NASA's Guidance, Navigation and Control Engineering Discipline**,
Cornelius J. Dennehy (NASA / GSFC)

12-062 **Optimal Space Effects: Driving Future Military GNC Technology Needs**,
William Saylor (AFRL Contractor) and David J. Richie (USAF)

12-063 **Emerging Launch Vehicle GN&C Technology Drivers**,
John G. Reed (ULA)

12-064 **Guidance, Navigation and Control Requirements of Future Remote Sensing Space Systems**,
Michael Santina, Bruce C. Chesley, and Gregory R. Johnston (Boeing)

12-065 **Autonomous Rendezvous, Proximity Operations, and Docking (RPOD) Technology Challenges for the Coming Decade**,
Bo J. Naasz (NASA / GSFC)

BANQUET ACTIVITIES

SOCIAL HOUR……..6-7 PM

DINNER……7-9 PM

DINNER SPEAKER…….8-9 PM

Greg Chamitoff, Ph.D.

NASA Astronaut

Speaking on: Completing Construction of the International Space Station — The Last Mission of Space Shuttle Endeavour

TUESDAY, FEBRUARY 7th

Session VII……..……..7:00-10:00 AM

CURRENT & FUTURE ADVANCED EUROPEAN PROGRAMS

This session aims to provide an overview of GN&C developments and direction within Europe. All aspects of GN&C, from system design and new equipment feasibility studies through on-orbit experiences, are covered via the presentation of selected topics representative of the current state of the art in Europe.

National Chairpersons

Stephen P. Airey, European Space Agency, stephen.airey@esa.int, +31 (0) 71 565-5295
Jacques Busseuil, Thales Alenia Space, jacques.busseuil@thalesaleniaspace.com, +33 (0) 4 92 92 30 06

Local Chairpersons

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James McQuerry, Ball Aerospace & Technologies Corp., jmcquerry@ball.com, 303-939-6102

12-071 **Irridium Next Constellation ADCS Design with Centralized Star Tracker Processing**,
D. Forestier, E. Broulliard, F. Zigliara (Thales Alenia Space)

12-072 **The Prisma Formation Flying Demonstrator: Overview and Conclusions from the Nominal Mission**,
P. Bodin, R. Noteborn, R. Larsson, T. Karlsson, S. Dámico, J-S Ardaens, M.Dlpech, J-C Berges (OHB Sweden & CNES)

12-073 **From the Bright Sun to the Faintest Stars: The European Route to State of the Art Miniaturised Attitude Sensors**,
P. Fidanzati, F. Boldrini (Selex Galileo)

12-074 **European Astrix Fiber Optic Gyro: In Orbit Experiences**,
G. Cros (Astrium SAS)

12-075 **Flash Optical Sensors for Guidance Navigation and Control**,
A. Pollini (CSEM)

12-076 **The NPAL Vision Based Landing Sensor Developments**,
E. Kervendal (Astrium SAS)

12-077 **ESA's New Microvibraion Test Facility**,
M. Wagner (ESA)

Session VIII……..……4:00-7:00 PM

INR FROM UAV's

This session will focus on hardware and software systems for the Image Navigation and Registration (INR) from Unmanned Aerial Vehicles (UAV's). Talks will cover UAV systems that can be used for INR of sensors installed on the UAV platform and will also report on instruments with an autonomous INR capability. Applications will include both defense and civilian applications and will apply both to the remote collection of image data and to image guidance systems for the UAV.

National Chairpersons

Gary Bullock, Naval Surface Warfare Center, gary.bullock@navy.mil, 812-854-6744
Matt Fladeland, NASA/Ames, matthew.fladeland@nasa.gov, 650-604-3325

Local Chairpersons

Bill Emery, University of Colorado, William.Emery@colorado.edu, 303-492-8591
Scott Francis, Lockheed Martin Space Systems, scott.francis@lmco.com, 303-977-8253

12-081 **Population of a Range Bearing Map for Local Obstacle Avoidance using Monocular Vision**,
Sean Quinn Marlow and Jack W. Langelaany, (Pennsylvania State University)

12-082 **Cloud Computing on Wings: Applications to Air Quality**,
Raja Sengupta, (University of California Berkeley)

12-083 **Three-Dimensional Point Clouds from UAS Imagery**,
Keith Cunningham, (University of Alaska)

12-084 **From Weather Satellites to Aerial Imaging: Bringing Image Navigation and Registration down to Earth**,
James L. Carr, Nate Allen, Joseph Fox-Rabinovitz, Christopher Miller, and Norman Lo, (Carr Astronautics Corp.)

12-085 **Costal Survey Using Unmanned Aerial Systems**,
Greg Walker, (University of Alaska)

12-086 **Platform Position Estimation via Geo-registration**,
Alan Vannevel and Scott Merritt, (Naval Air Warfare Center, AD)

12-087 **Vision-Based Absolute Navigation for Pinpoint Planetary Landing: Design and Preliminary Hardware Validation**,
Jeff Delaune (ONERA-DCSD), Guy Le Besnerais (ONERA-DTIM), Thomas Voirin (ESA-ESTEC),
Martial Sanfourche (ONERA-DTIM), Jean-Loup Farges (ONERA-DCSD) and Clément Bourdarias, (Astrium ST)

WEDNESDAY, FEBRUARY 8th

Session IX……..……7:00-10:00 AM

RECENT EXPERIENCES

Lessons learned through experience prove most valuable when shared with others in the GN&C community. This session, which is a traditional part of the conference, provides a forum for candid sharing of insights gained through successes and failures. Past conferences have shown this session to be most interesting and informative.

National Chairpersons
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Larry Germann, Left Hand Design,
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12-091 **Implementing the Mars Science Laboratory Terminal Descent Sensor Field Test Campaign**,
James F. Montgomery, James H. Bodie, Joseph D. Brown, Allen Chen, Curtis W. Chen, John C. Essmiller, Charles D. Fisher, Hannah R. Goldberg, Steven W. Lee, Scott J. Shaffer (Jet Propulsion Laboratory, California Institute of Technology)

12-092 **Orion Multi-Purpose Crew Module Pad Abort Flight Test Overview and Summary**,
Michael E. Begley, William D. Pratt, Richard R. Burt (LM/SSC)

12-093 **NigeriaSat-2 AOCS: Results from the First 90 Days In Orbit**,
Andrew Carrel, Tony Holt, Gokhan Yuksel, Allon Jameson, Yoshi Hashida, Andrew Cawthorne, Guy Richardson (Surrey Satellite Technology Ltd. UK)

12-094 **DEMETER – In Orbit Results of Deorbitation**,
Christine Fallet, Jérôme Maureau (CentreNational d'Etudes Spatiales, France)

12-095 **Initial GN&C Performance on the Juno Spacecraft**,
Jay A. St. Pierre, et al. (LM/SSC)

12-096 **Guidance and Control Challenges to the MESSENGER Spacecraft in Achieving and Operating from Orbit at Mercury**,
Sarah H. Flanigan, Daniel J. O'Shaughnessy, Eric J. Finnegan, Robin M. Vaughan (The Johns Hopkins University Applied Physics Laboratory)

12-097 **Guidance and Control Challenges with Low Thrust Orbit Transfers: Experience from the Dawn Mission to Vesta**,
Brett Smith (Jet Propulsion Laboratory, California Institute of Technology)

12-098 **Stardust-NExT: Lessons Learned from a Comet**,
Aron Wolf, Tim Larson, Paul Thompson, Tim McElrath, Shyam Bhaskaran, Steven Chesley, Ken Klaasen, (Jet Propulsion Laboratory, California Institute of Technology), Allan Cheuvront (LM/SSC)

POSTER SESSION
Daily in the Breakfast Room

Local Chairperson
Kyle Miller, Ball Aerospace & Technologies Corp., kbmiller@ball.com, 303-939-5505

12-001 **In-Situ Sub-Millimeter Space Debris Detection Using CubeSats**,
Katharine Brumbaugh, Henri Kjellberg, Glenn Lightsey (University of Texas, Austin)

12-002 **Paper Withdrawn**

12-003 **Heliogyro Solar Sail Blade Twist Control**,
Daniel Guerrant, Dale Lawrence (University of Colorado), W. Keats Wilkie (NASA/Langley)

12-004 **Multiobjective Genetic Algorithm for Stability Analysis of Flexible Articulated Plants**,
Ashley Moore, Marcus R. George, Davin K. Swanson (Aerospace)

12-005 **Analysis of the Touch-and-Go Surface Sampling Concept for Comet Sample Return Missions**,
Milan Mandic, David Bayard, Behcet Acikmese, Lars Blackmore, Laureano Cangahuala (NASA/JPL)

12-006 **Smart GN&C Components for Smart Satellites**,
Anja Nicolai (Astro-und Feinwerktechnik Adlershof)

12-007 **GNC Design & Validation for Precision Landing at Mars and the Moon**,
Jean-François Hamel, David Beaudette, Vincent Simard-Bilodeau, Jean de Lafontaine (NGC Aerospace), Emanuele Di Sotto, Nuno Paulino, Joao Branco (GMV), Guy Johns (SciSys), Diego de Rosa (ESA/ESTEC)

12-008 **Spacecraft Attitude and Body Rate Estimation with Multi-Head Star Sensor: Concept, Design and On-Orbit Results**, Shoji Yoshikawa, Katsumasa Miyatake, Hiroyuki Kawano, Takeshi Suzuki, Yoshinori Kunii (MELCO), Kazumori Hama, Noriaki Oka (USEF)

The 2013 Annual AAS
Rocky Mountain Section
Guidance and Control Conference

will be held at Breckenridge, CO
February 1 – 6, 2013

Chairperson: Lisa Hardaway
Ball Aerospace & Technologies
(303) 939-4335

Conference Committee 2012

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