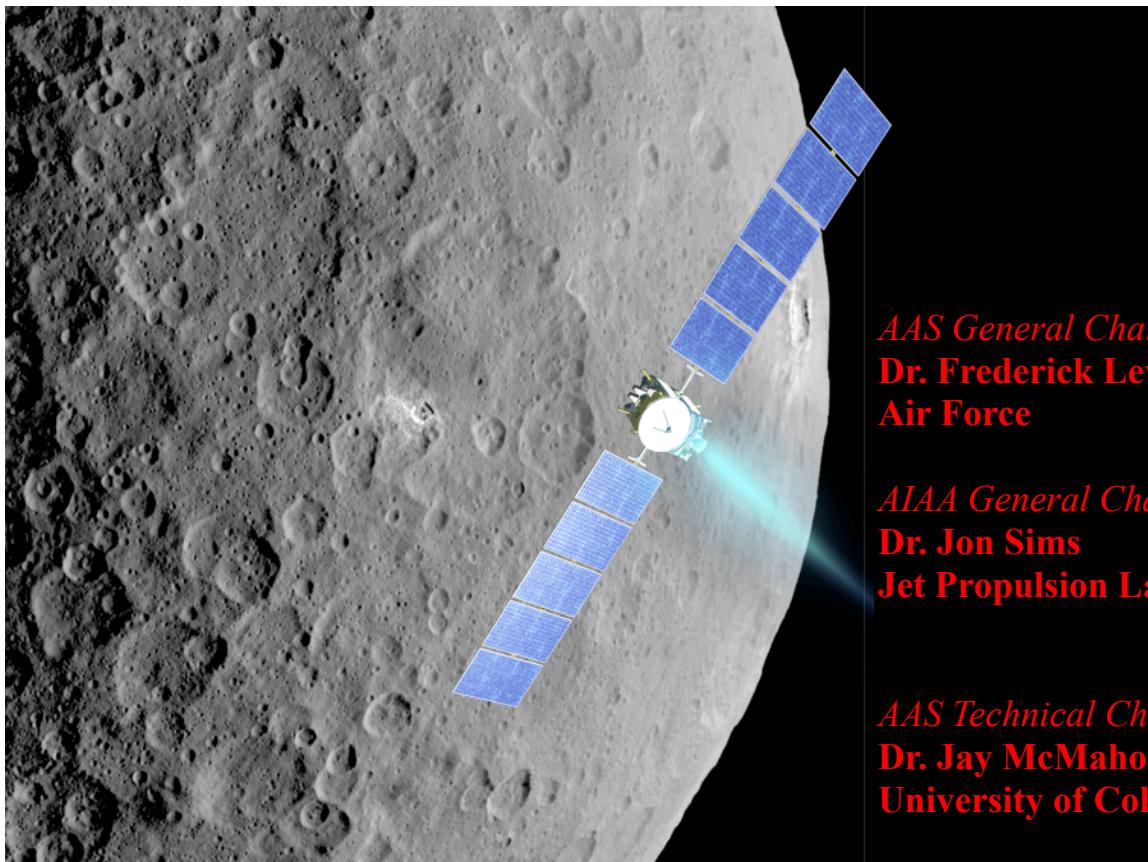


27<sup>th</sup> AAS/AIAA  
Space Flight Mechanics Meeting  
February 5-9, 2017  
San Antonio, Texas



*AAS General Chair*  
**Dr. Frederick Leve**  
**Air Force**

*AIAA General Chair*  
**Dr. Jon Sims**  
**Jet Propulsion Laboratory**

*AAS Technical Chair*  
**Dr. Jay McMahon**  
**University of Colorado**



*AIAA Technical Chair*  
**Dr. Yanping Guo**  
**Johns Hopkins University**  
**Applied Physics Lab**

# 27<sup>TH</sup> AAS/AIAA SPACE FLIGHT MECHANICS MEETING

## GENERAL INFORMATION

Welcome to the 27th Space Flight Mechanics Meeting, hosted by the American Astronautical Society (AAS) and co-hosted by the American Institute of Aeronautics and Astronautics (AIAA), February 5 – 9, 2017. This meeting is organized by the AAS Space Flight Mechanics Committee and the AIAA Astrodynamics Technical Committee, and held at the Marriott Plaza San Antonio, 555 South Alamo Street, San Antonio, TX 78205, (210)-229-1000, <http://www.marriott.com/hotels/travel/satpl-marriott-plaza-san-antonio/>.

## REGISTRATION

*Registration Site ( <https://www.xcdsystem.com/aas/index.cfm> )*

In order to encourage early registration, we have implemented the following conference registration rate structure: **Register by December 23, 2016 and save \$70!**

Category	Early Registration (through Dec 23, 2016)	Registration	Walk-up Registration (after Jan 20, 2017)
Full - AAS or AIAA Member	\$550	\$620	\$720
Full - Non-member	\$650	\$720	\$820
Retired or Student* - Member	\$200	\$270	\$370
Retired or Student* - Non-member	\$250	\$320	\$420

*\*does not include proceedings CD*

A 10% fee will be assessed for all refunds. No refunds will be issued after 8:00 am CST February 6, 2017.

One ticket to the Jack Guenther Pavilion at the Brisco Western Art Museum for dinner on Tuesday evening is included with every registration. Please be sure to bring a valid photo ID in order to be served. Guest tickets for the dinner may be purchased for \$75. More information about the dinner is included below.

All registrants and guests are invited to the welcome reception on Sunday evening for food and drinks.

A conference registration and check-in table will be located in the La Villita Foyer of the Marriott Plaza Hotel and will be staffed according to the following schedule:

➤ Sunday February 5: 3pm – 6pm	➤ Wednesday February 8: 8am – 12pm
➤ Monday February 6: 7:30am – 12pm	➤ Thursday February 9: 8am – 10 am
➤ Tuesday February 7: 8am – 12pm	

We will accept registration and payment on-site for those who have not pre-registered online, but we strongly recommend online registration before the conference in order to avoid delays (see URL above). Pre-registration also gives you free access to pre-print technical papers. On-site payment by credit card will be only through the AAS website using a computer at the registration table. Any checks should be made payable to the “American Astronautical Society.”

## SCHEDULE OF EVENTS

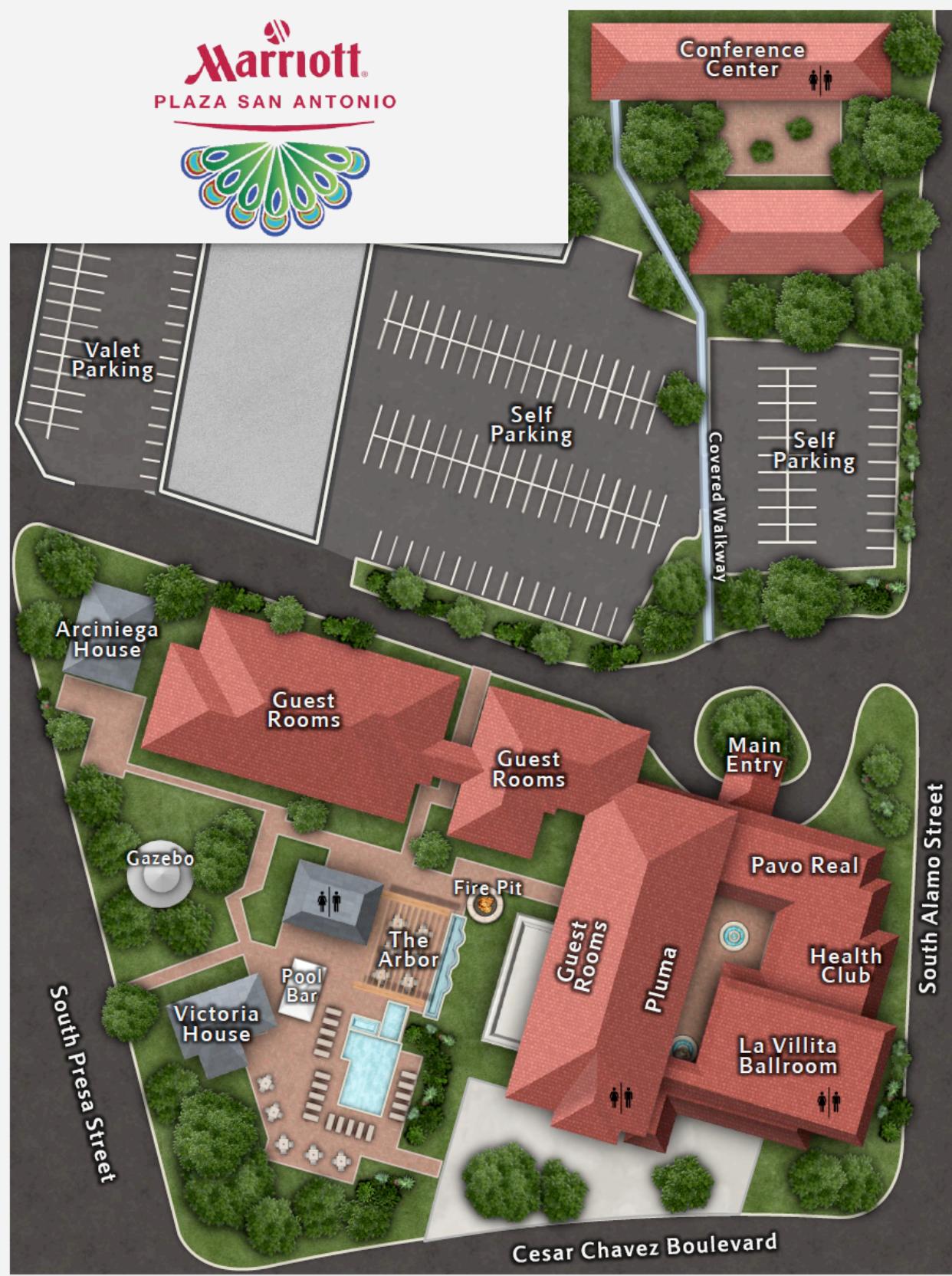
Technical sessions begin on Monday, February 6, at 8 am. The last technical sessions end at 1:00 pm on Thursday, February 9. Presentations are limited to 15 minutes with an additional 5 minutes for questions and answers. Each session has a 20-minute morning or afternoon break. Authors are required to be in their session room 30 minutes prior to the start of their sessions. No speakers' breakfast will be served.

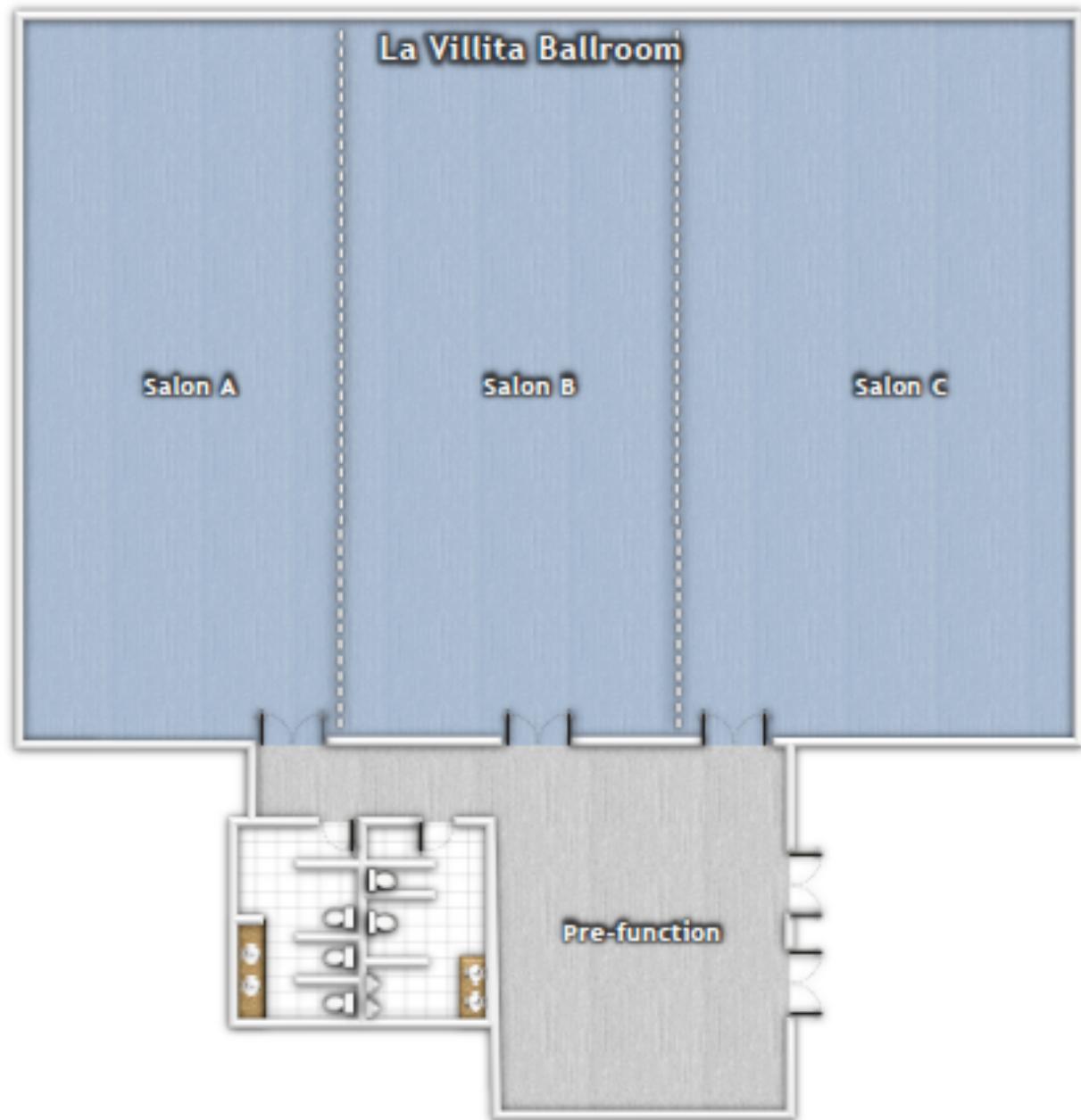
Day	Start	End	Function	Room
Sunday 5 February	3pm	6pm	Registration	La Villita Foyer
	6pm	9pm	Early Bird Reception (Food and Bar)	La Villita C
Monday 6 February	7:30am	12pm	Registration	La Villita Foyer
	8am	12pm	Session 1: Asteroid Missions 1	La Villita A
	8am	12pm	Session 2: Trajectory Optimization 1	La Villita B
	8am	12pm	Session 3: Rendezvous and Proximity Operations 1	La Villita C
	8am	12pm	Session 4: Space Situational Awareness 1	Pavo Real
	10am	10:20am	Morning Break	
	Noon	1:30pm	Joint Technical Committee Lunch	Cavalier
	1:30pm	4:50pm	Session 5: Launch and Landing Operations	La Villita A
	1:30pm	4:50pm	Session 6: Trajectory Design	La Villita B
	1:30pm	4:50pm	Session 7: Dynamical Systems Theory Applied to Space Flight	La Villita C
	1:30pm	4:50pm	Session 8: Satellite Constellations	Pavo Real
	3:30pm	3:50pm	Afternoon Break	
	5pm	6pm	Dirk Brouwer Award Plenary and Breakwell Student Travel Award Presentation	La Villita

Day	Start	End	Function	Room
<b>Tuesday</b> <i>7 February</i>	8am	12pm	Registration	La Villita Foyer
	8am	12pm	Session 9: Planetary Missions	La Villita A
	8am	12pm	Session 10: Trajectory Optimization 2	La Villita B
	8am	10am	Session 11: Space Situational Awareness 2	La Villita C
	8am	12pm	Session 12: Dynamics and Control of Large Space Structures and Tethers	Pavo Real
	10am	10:20am	Morning Break	
	10:20am	12pm	Session 25: Special Session: Interdisciplinary Challenges in Space Situational Awareness	La Villita C
	Noon	1:30pm	AIAA Technical Committee Lunch	Cavalier
	1:30pm	6:10pm	Session 13: Asteroid Missions 2	La Villita A
	1:30pm	6:10pm	Session 14: Orbital Dynamics 1	La Villita B
	1:30pm	6:10pm	Session 15: Orbit Determination and Space-Surveillance Tracking	La Villita C
	1:30pm	6:10pm	Session 16: Attitude Dynamics and Control 1	Pavo Real
	3:30pm	3:50pm	Afternoon Break	
	6pm	10pm	Offsite Event: Dinner at the Brisco Western Art Museum	Jack Guenther Pavilion
<b>Wednesday</b> <i>8 February</i>	8am	12pm	Registration	La Villita Foyer
	8am	12pm	Session 17: Earth and Lunar Missions	La Villita A
	8am	12pm	Session 18: Navigation	La Villita B
	8am	12pm	Session 19: Rendezvous and Proximity Operations 2	La Villita C
	8am	12pm	Session 20: Attitude Dynamics and Control 2	Pavo Real
	10am	10:20am	Morning Break	
	Noon	1:30pm	AAS Technical Committee Lunch	Cavalier

Day	Start	End	Function	Room
<i>Wednesday 8 February</i>	1:30pm	5:10pm	Session 21: Asteroid Missions 3	La Villita A
	1:30pm	6:10pm	Session 22: Orbital Debris	La Villita B
	1:30pm	6:10pm	Session 23: Formation Flying and Relative Motion	La Villita C
	1:30pm	6:10pm	Session 24: Guidance and Control	Pavo Real
	3:30pm	3:50pm	Afternoon Break	
	7:00pm	8:00pm	Conference Administration Subcommittee	La Villita A
	7:00pm	8:00pm	Technical Administration Subcommittee	La Villita B
	7:00pm	8:00pm	Website Administration Subcommittee	La Villita C
<i>Thursday 9 February</i>	8am	10am	Registration	La Villita Foyer
	8am	12pm	Session 26: Trajectory Design and Optimization	La Villita A
	8am	12:20pm	Session 27: Orbital Dynamics 2	La Villita B
	8am	11:40am	Session 28: Orbit and Attitude Determination	La Villita C
	8am	12pm	Session 29: Attitude Dynamics and Control 3	Pavo Real
	10am	10:20am	Morning Break	

Maps of the Marriott Plaza Hotel and the relevant meeting rooms appear on the following pages.





## **SPECIAL EVENTS**

### ***EARLY BIRD RECEPTION***

Sunday, February 5 6:00 – 9:00 pm

Location: La Villita C

#### Menu

Grilled Vegetables & Mozzarella on Rosemary Skewer

Seared Asparagus and Prosciutto Wraps

Top Round Beef

Turkey

Vegetable Spring Rolls

### ***DIRK BROUWER AWARD PLENARY AND BREAKWELL TRAVEL AWARD PRESENTATION***

Monday, February 6 5:00 – 6:00 pm (Ceremony and Lecture)

Location: La Villita (Ceremony and Lecture)

There will also be presentations for the best paper award from the 2016 Space Flight Mechanics conference and for an AAS Fellow.

### **Analytic Exploration in Astrodynamics**

There are very few problems in astrodynamics that yield to an exact analytical solution. However, hope should not be lost. It is possible to gain analytical insight into the general behavior of the solution. A well-known example is the effect of Earth oblateness on the movement of the orbit right ascension and the stability of argument of perigee at the critical inclination. This talk will take a look at a variety of problems and techniques for achieving some level of analytical insight into their behavior. We will find that sometimes it is useful to find a problem you can solve that is sufficiently close to the problem that you can't solve. Even if the problem must be solved numerically, analytical insights may provide improved efficiency in guiding the numerical investigation.

## *DIRK BROUWER AWARD HONOREE*

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Felix R. Hoots is an Aerospace Fellow in the Systems Analysis and Simulation Subdivision of The Aerospace Corporation and is based in Colorado Springs, Colorado. He is responsible for providing direct support to a variety of DoD and other agency customers as well as providing integration and cross-customer synergy advice to Aerospace management.

With over 40 years of experience in space surveillance, Hoots is widely recognized for his contributions to both the theoretical as well as the operational side of the Space Surveillance Network and association processing centers.

Prior to joining Aerospace, he worked as an astrodynamist for the 14<sup>th</sup> AF and NORAD/ADCOM (later Air Force Space Command) and then as a Chief Scientist for GRC International (later AT&T Government Solutions). As a civil servant he was instrumental in developing satellite orbital prediction models and close approach algorithms used to maintain the catalog of satellites. A particular highlight was his work performed jointly with the Navy to develop algorithms to remove incompatibility between data products from Air Force Space Command and those from Naval Space Command. His work as a contractor supported the Air Force and Navy as well as other agency customers in their space and surveillance activities. During this time he worked with the Naval Research Lab to do the first proof of concept demonstration of an all Special Perturbations satellite catalog.

His stature in the community has been recognized with 24 publications in international professional journals including two commissioned encyclopedia articles and eight proceedings. He has been an invited speaker at NATO and International Astronomical Union (IAU) conferences and was technical organizer and speaker at a series of US/Russian Space Surveillance Workshops beginning in 1994 and continuing to the present.

Hoots earned a bachelor's degree in physics and a master's degree in mathematics from Tennessee Technological University. He earned a PhD in mathematics with an emphasis in astrodynamics from Auburn University.

Hoots is a Fellow of the American Astronautical Society and an Associate Fellow of the American Institute of Aeronautics and Astronautics. He has previously served on the board of directors of the American Astronautical Society and as an Associate Editor of the AIAA Journal of Guidance, Control, and Dynamics.

## **DINNER AT THE BRISCO WESTERN ART MUSEUM**

Tuesday, February 7 6:00 – 8:00 pm (Hosted Call Bar)

7:30 – 9:00 pm (Dinner)

8:00 – 10:00 pm (Cash Bar)

Location Jack Guenther Pavilion at the Brisco Western Art Museum



The Briscoe Western Art Museum, named in honor of the late Texas Governor, Dolph Briscoe, Jr. and his wife, Janey, preserves and interprets the art, history, and culture of the American West through engaging exhibitions, educational programs, and public events reflective of the region's rich traditions and shared heritage.

Located on San Antonio's famed River Walk, the institution is housed in San Antonio's first Public Library and newly constructed pavilion designed by the nationally recognized architecture firm Lake|Flato. The Briscoe Campus consists of the historic Museum building, the Jack Guenther Pavilion and the adjacent McNutt Sculpture Garden spread across one-and-a-quarter acres in downtown San Antonio.

The Briscoe Western Art Museum presents art and artifacts from across the history and cultures of the American West. Over five centuries, from the Spanish conquest to the present day, the collections of the Briscoe tell the story of the West in all its drama. It is a story of global dimension, played out in a timeless landscape. It is a story that continues today. What does the West mean to you? What future are we pioneering for the generations who will follow us?

The Briscoe Western Art Museum is located in downtown San Antonio along the River Walk at 210 West Market Street. It is less than half mile walk from the Marriott Plaza San Antonio.

The museum will be open with free admission until 9 pm on the day of our event.

Conference registration fees include admission for one person to the dinner. Guest tickets are available for \$75 each on the conference registration site.

A map from the conference hotel to the Briscoe Western Art Museum is on the next page.



## CONFERENCE LOCATION

### MARRIOTT PLAZA SAN ANTONIO

555 South Alamo Street

San Antonio, Texas 78205

[marriott.com/hotels/travel/satpl-marriott-plaza-san-antonio/](http://marriott.com/hotels/travel/satpl-marriott-plaza-san-antonio/)

(210) 229-1000



You'll remember much more than The Alamo when enjoying the well-appointed amenities at Marriott Plaza San Antonio. Sitting on 6 acres of natural, lush Texas landscape, the hotel boasts plenty of shade from cypress and palm trees for a casual stroll. Dine at Anaqua Restaurant & Grille, overlooking the courtyard with Asian pheasants and colorful peacocks. Just 2 blocks from the famous River Walk, the hotel offers guests convenient access to the "Cradle of Texas Liberty." La Villita Historic Art Village, Hemisfair Park and Tower of Americas are also nearby. Shopping at Rivercenter Mall is convenient in downtime. Visitors will enjoy everything the hotel offers, including well-appointed guest rooms, a quiet landscaped pool, 17,000 square feet of event space, a state-of-the-art fitness center and close proximity to the Henry B. Gonzales Convention Center.

A room block with the Government Per Diem Rate (\$121/night) will be held through **January 13, 2017**. Reservations requested after this date will be accepted based upon availability and subject to the hotel's prevailing rate. We encourage all conference attendees to make your hotel reservation early!

Attendees may register at the personal group web page listed below or they may call the reservations department at 1-800-228-9290. Please be sure to mention the group name "American Astronautical Society – Flight Mechanics Feb 2017" when making reservations in order to receive the group rate of \$121 (or prevailing government per diem). Group arrival is 2/5/2017 and Group Departure is 2/9/2017. A limited number of rooms are available at the group rate 3 days pre/post group arrival and departure.

Group Reservation Page:

[http://www.marriott.com/meeting-event-hotels/group-corporate-travel/groupCorp.mi?resLinkData=American%20Astronautical%20Society%20-%20Flight%20Mechanics%20Feb.%202017%5Esatpl%60fmafmaa%60120.00%60USD%60false%604%602/5/17%602/9/17%601/13/17&app=resvlink&stop\\_mobi=yes](http://www.marriott.com/meeting-event-hotels/group-corporate-travel/groupCorp.mi?resLinkData=American%20Astronautical%20Society%20-%20Flight%20Mechanics%20Feb.%202017%5Esatpl%60fmafmaa%60120.00%60USD%60false%604%602/5/17%602/9/17%601/13/17&app=resvlink&stop_mobi=yes)

Cancellations must be made 2 days in advance of intended arrival.

Complimentary internet access in guest rooms and meeting space is available to all conference attendees.

## *ARRIVAL INFORMATION*

### ***Check-In and Checkout***

- Check-in: 4:00 PM
- Check-out: 11:00 AM

### ***Parking***

Valet: \$30/night

Self-parking is available on surface lots surrounding the hotel.

## *HOTEL SERVICES AND AMENITIES*

- All public areas non-smoking
- Beauty shop, nearby (referral at front desk)
- Buffet breakfast (fee)
- Cash machine/ATM
- Concierge Lounge
- Continental breakfast (fee)
- Foreign exchange, nearby
- Housekeeping service daily
- Laundry on-site, coin operated
- Local restaurant dinner delivery
- Mobility accessible rooms
- Newspaper delivered to room, on request
- Newspaper in lobby
- Room service, 6:00 AM-11:00 PM
- Safe deposit boxes, front desk
- Valet dry-cleaning
- Virtual Concierge Available

## *TRANSPORTATION INFO*

### **AREA AIRPORT**

San Antonio International Airport – SAT

Hotel direction: 9 miles South

The hotel does not provide shuttle service.

Estimated taxi fare (one way): \$28

Driving directions from airport to hotel: Take Hwy. 281 (I-37) South. Take the Cesar Chavez exit. Go right on Cesar Chavez to Alamo. Take a right on Alamo. Take an immediate left on Arciniega. Hotel is on the corner of Alamo and Cesar Chavez streets.

### *AREA ATTRACTIONS*

- [The Alamo](#)
- [Alamodome](#)
- [El Mercado Mexican Market](#)
- [Arnesan River Theater/La Villita](#)
- [Hemisfair](#)
- [The Buckhorn Museum and the Texas Ranger Museum](#)
- [Fiesta Texas Amusement Park](#)
- [Sea World San Antonio](#)
- [Institute of Texan Cultures](#)
- [Brackenridge Park/Japanese Tea Gardens](#)

For a more comprehensive Visitor's Guide, you can start at

<http://www.marriott.com/hotels/local-things-to-do/satpl-marriott-plaza-san-antonio/>

## ADDITIONAL INFORMATION

### SPEAKERS

Authors should have submitted a brief (approximately 50 words or 3 sentences) speaker's bio with their abstract submission. Author presentations (preferably in PDF format) will be submitted through a web-based system and are due by **Thursday February 2, 2017, 23:59:59 Eastern Time**. Authors are required to be in their session room 30 minutes prior to the start of their sessions. No speakers' breakfast will be served.

Authors are reminded that the deadline to upload pre-prints to the <https://www.xcdsystem.com/aas/> website is before **January 25, 2017, 23:59:59 Eastern Time**.

### VOLUNTEERS

Volunteers that would like to staff the registration table may sign up at the registration table.

### PRESENTATIONS

Each presentation is limited to 15 minutes. An additional five minutes is allotted between presentations for audience participation and transition. Session chairs shall maintain the posted schedule to allow attendees the option of joining a parallel session. Each room is equipped with a laser pointer, an electrical outlet, and a video projector that can be driven by a computer. Presenters shall coordinate with their Session Chairs regarding the computing equipment, software, and media requirements for the session; however, *each presenter is ultimately responsible for having the necessary computer and software available to drive the presentation*. Microsoft PowerPoint and PDF are the most common formats.

**"No-Paper, No-Podium" Policy:** Completed manuscripts shall be electronically uploaded to the submission site before the conference, limited to 20 pages in length, and conform to the AAS conference paper format. If the completed manuscript is not contributed on time, it will not be presented at the conference. If there is no conference presentation by an author, the contributed manuscript shall be withdrawn.

Each author also acknowledges that he or she is releasing technical information to the general public and that respective papers and presentations have been cleared for public release. If any author of a paper is a US person (citizen or permanent resident), he or she acknowledges that the release of these data and content of the paper and presentation conforms to ITAR and are not on the USML. The information contained in these documents is neither classified, SBU, FOUO, nor proprietary to any sponsoring organization.

### PREPRINTED MANUSCRIPTS

Physical copies of preprinted manuscripts are no longer available or required for the Space Flight Mechanics Meetings or the Astrodynamics Specialist Conferences. Electronic preprints are available for download at least 72 hours before the conference at <https://www.xcdsystem.com/aas/> for registrants who use the online registration system. The hotel provides conference guests with complimentary wireless internet access in guest rooms and the conference meeting space. Registrants without an internet-capable portable computer, or those desiring traditional paper copies should download and print preprint manuscripts before arriving at the conference.

## *CONFERENCE PROCEEDINGS*

All full registrants will receive a CD of the proceedings mailed to them after the conference (extra copies are available for \$60 during the conference). However, the hardbound volume of *Advances in the Astronautical Sciences* covering this conference will be available to attendees at a reduced pre-publication cost, if ordered at the registration desk. After the conference, the hardbound proceedings will more than double in price, although authors will still receive a special 50% discount off the post-conference rate even if they delay their order until after the conference. Cost of Proceedings:

- Conference Rate \$290 domestic (\$380 international)
- Post-Conference Rate \$600 (approx.)
- Authors (post-conference) \$300 (approx.)

Although the availability of hardcopy proceedings enhances the longevity of your work and elevates the importance of your conference contribution, please note that conference proceedings are not considered an archival publication. Authors are encouraged to submit their manuscripts after the meeting to one of the relevant journals, such as:

Journal of the Astronautical Sciences  
Editor-in-Chief: Kathleen C. Howell  
School of Aeronautics and Astronautics  
3233 Armstrong Hall  
Purdue University  
West Lafayette, IN 47907  
(765) 494-5786  
[howell@purdue.edu](mailto:howell@purdue.edu)

Journal of Guidance, Control and Dynamics  
Editor-in-Chief: Dr. Ping Lu, Iowa State University  
Manuscripts can be submitted via: <https://mc.manuscriptcentral.com/aiaa>

Journal of Spacecraft and Rockets  
Editor-in-Chief: Dr. Hanspeter Schaub, University of Colorado Boulder  
Manuscripts can be submitted via: <https://mc.manuscriptcentral.com/aiaa>

## *COMMITTEE MEETINGS*

Committee seating is limited to committee members and invited guests. Committee and subcommittee meetings will be held according to the schedule at the beginning of the program.

