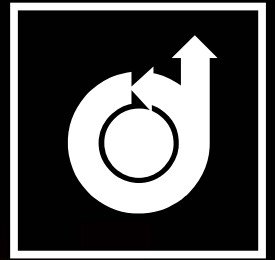


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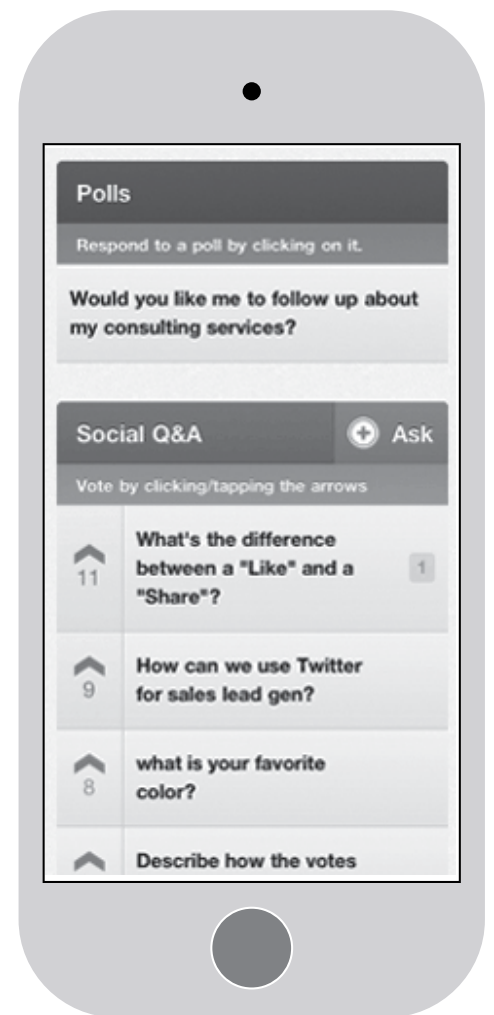
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Welcome

Welcome to Salt Lake City, Utah, and AIAA Propulsion and Energy 2016. We are excited to share the next few days with you as we explore the most pressing issues facing the future of propulsion and energy systems – the true heart of aerospace. With so many insightful and dynamic speakers and panelists, we are confident you will find the information presented here thought-provoking, impactful, and immediately useful to you in your work.

During the forum you will hear from thought leaders, learn about the latest technical breakthroughs, and most importantly collaborate with other attendees from government, industry, and academia. It is these collaborations and opportunities for dialogue that really are the essence of our AIAA forums. The knowledge and insight gained from these interactions can give you an immediate edge in your career development.

Bran Ferren will kick off our plenary program with a keynote address that will set the tone for the days ahead. The rest of our plenary program examines the diverse areas and issues that we must consider if we are to advance the state of the art in propulsion and energy systems and technology. Issues that we will examine include: system needs in propulsion and energy; how technological innovation and invention are changing the game in propulsion; high power systems for aerospace applications; how additive manufacturing is impacting how you design systems and platforms; and the formula for success and longevity in the aerospace business. Pierre Chao will close our program with his insights on the future of our community.

With over 700 presentations our technical program is second-to-none in terms of the scope, breadth, and depth of the cutting-edge research being presented – material that you will not find anywhere but here. We thank the Technical Program Committee for working hard to assemble these tracks.

AIAA Propulsion and Energy 2016 will energize, inspire, and sustain our community's efforts to power the next bold steps in space commercialization and exploration, while improving the efficiency and reliability of terrestrial systems. We thank you for making the choice to be here with us for this forum, and we are confident you will find the experience personally and professionally rewarding.

**AIAA Propulsion and Energy
2016 is proud to feature the
following conferences:**

52nd AIAA/SAE/ASEE Joint
Propulsion Conference

14th International Energy Conversion
Engineering Conference

Organizing Committee

Forum Organizing Committee

Forum General Chair

Daniel “Dan” Dumbacher, Purdue University

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Robert Frederick, University of Alabama, Huntsville

Technical Area Organizers

Additive Manufacturing or Propulsion Systems

Corrine Gatto, NASA Jet Propulsion Laboratory

Advanced Engine Control and Intelligent Systems

Alireza “Al” Behbahani, U.S. Air Force

Advanced Propulsion Concepts

John Robinson, The Boeing Company (Ret.)

Advanced Vehicle Systems

Frank Chandler, The Boeing Company

Air Breathing Propulsion Systems Integration

Eric Loth, University of Virginia

Aircraft Electric Propulsion

Charles Beard, The Boeing Company

Electricity Delivery, Grid and Energy Storage Technologies

Scott Duncan, Georgia Institute of Technology

Carson Vaisden, John Hopkins University Applied Physics Laboratory

Joseph Troutman, EnerSys Advanced Systems

Electric Propulsion

Josh Rovey, Missouri University of Science & Technology

Energetic Components & Systems

John Scott, United Launch Alliance

Energy Conversion Device Technology

Edward Lewandowski, NASA Glenn Research Center

Energy-Efficient and Renewable Energy Technologies

Essam Khalil, Cairo University

Scott Duncan, Georgia Institute of Technology

Fossil-Fuel Power Technologies

Bhupendra Khandelwal, University of Sheffield

Essam Khalil, Cairo University

Gas Turbine Engines

Jayanta Kapat, University of Central Florida

Robert Thacker-Dey, Naval Air Systems Command

Chukwuka Mbagwu, University of Michigan

Green Engineering/Green Energy

Tarek Absel-Salam, East Carolina University

High Speed Air Breathing Propulsion

Faure “Joel” Malo-Molina, Raytheon Missile Systems

Erik Axdahl, NASA Langley Research Center

Hybrid Rockets

Bala (Han) Madhan, SPG

Liquid Rocket Propulsion

William Marshall, NASA Glenn Research Center

Nuclear and Future Flight Propulsion

Greg Meholic, The Aerospace Corporation

Jason Cassibry, University of Alabama, Huntsville

Propellants and Combustion

Oskar Haidn, Technische Universität München

Propulsion and Power Systems of Unmanned Systems

Lea-Der Chen, University of Iowa

Propulsion Education

Robert Frederick, University of Alabama in Huntsville

Small Satellites

Jeremy Straub, University of North Dakota

Solid Rockets

Alana Spurling, U.S. Navy

Spacecraft and Aircraft Power System Technologies

Salim Abbas, Lockheed Martin (Ret.)

Mark Liffring, The Boeing Company

Pavel Tsvetkov, Texas A&M University

Thermal Management Technology

Michael Choi, NASA Goddard Space Flight Center

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Forum Overview

	MONDAY 25 July		TUESDAY 26 July		WEDNESDAY 27 July	
0730 hrs	Speakers' Briefing in Technical Session Rooms (both am & pm sessions)		Speakers' Briefing in Technical Session Rooms (both am & pm sessions)		Speakers' Briefing in Technical Session Rooms (both am & pm sessions)	
0800 hrs	Welcome/Intro		Plenary Panel		Plenary Panel	
0830 hrs	Opening Plenary Session					
0900 hrs	Networking Break in Exposition Hall		Networking Break in Exposition Hall		Networking Break in Exposition Hall	
0930 hrs	Technical Sessions	Forum 360 Session	Exposition Hall Open	Rising Leaders Speed Networking	Technical Sessions & Rising Leaders in Aerospace Panel	Rising Leaders in Aerospace and Forum 360 Session
1000 hrs						
1030 hrs						
1100 hrs						
1130 hrs	Lunch on Own		Lunch in Exposition Hall		Forum Recognition Luncheon	
1200 hrs						
1230 hrs						
1300 hrs	Plenary Panel		Plenary Panel		Closing Plenary	
1330 hrs	Exposition Hall Open		Exposition Hall Open			
1400 hrs						
1430 hrs	Networking Break in Exposition Hall		Networking Break in Exposition Hall			
1500 hrs						
1530 hrs	Technical Sessions	Forum 360 Session	Exposition Hall Open		Technical Sessions	
1600 hrs						
1630 hrs						
1700 hrs						
1730 hrs	Reception in Exposition Hall		Propulsion and Energy Lecture			
1800 hrs						
1830 hrs						
1900 hrs						
1930 hrs	Rising Leaders in Aerospace Reception					
2000 hrs						

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Keynote Speakers and Plenary Sessions

Get the big picture on propulsion and energy from the thought leaders in the field during these high-level discussions and presentations.

Monday, 25 July

0800–0900 hrs

Ballroom A-D

Keynote Address

Innovate or Die! (Note: Dying is Easier)

Bran Ferren, Co-Founder and Chief Creative Officer, Applied Minds, LLC

1330–1500 hrs

Ballroom A-D

System Needs in Propulsion and Energy

Moderator: **Dan Dumbacher**, Professor of Engineering Practice, School of Aeronautics and Astronautics, Purdue University

Panelists:

Doug Blake, Director, Aerospace Systems Directorate, Air Force Research Laboratory

Dennis Andrucyk, Deputy Associate Administrator, Space Technology Mission Directorate, NASA

Tuesday, 26 July

0800–0900 hrs

Ballroom A-D

Game Changing Developments in Propulsion and Energy

Moderator: **Janet Kavandi**, Director, NASA Glenn Research Center

Panelists:

Jay Littles, Director, Advanced Launch Vehicle Propulsion, Aerojet Rocketdyne

Tom Markusic, Co-Founder and Chief Executive Officer, Firefly Space Systems

James Maughan, Technical Director, Aero Thermal and Mechanical Systems, GE Global Research

1300–1430 hrs

Ballroom A-D

High Power Systems for Aerospace Applications

Moderator: **Graham Warwick**, Managing Editor, Technology, Aviation Week and Space Technology

Panelists:

Randy Furnas, Chief, Power Division, NASA Glenn Research Center

John “Rick” Hooker, Design Engineer, Lockheed Martin Aeronautics

John Nairus, Chief Engineer, Power & Control Division, Air Force Research Laboratory

John H. Scott, Chief Technologist, Propulsion and Power Division, NASA Johnson Space Center

1800–1900 hrs

Ballroom A-D

Formula for Success and Longevity in the Aerospace Business

Moderators: **Bonnie Prado Pino**, Graduate Student, School of Aeronautics & Astronautics, Purdue University

Guillermo Jaramillo Pizarro, Ph.D. Candidate in Aeronautical Engineering, School of Aeronautics & Astronautics, Purdue University

Panelists:

David Bowles, Director, NASA Langley Research Center

Duane Cuttrell, Director, Operations Engineering and Technical Operations, Lockheed Martin Corporation

Rickey Shyne, Director, Research and Engineering, NASA Glenn Research Center

Julie Van Kleeck, Vice President, Advanced Space and Launch Business Unit, Aerojet Rocketdyne

Wednesday, 27 July

0800–0900 hrs

Ballroom A-D

Keynote Address

The Impact of Additive Manufacturing on the Design Process

Elizabeth Robertson, Team Lead, Liquid Engine Systems Branch, NASA Marshall Space Flight Center

1330–1500 hrs

Ballroom A-D

The Strategic Challenges and Opportunities in the Power and Propulsion Markets

Pierre Chao, Founding Partner, Renaissance Strategic Advisors

(continued)



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FORUM 360°

These conversations will cover a spectrum of timely topics including programs, systems, policy, operations, applications, platforms and more!

Monday, 25 July

0930–1200 hrs

Ballroom F

NRC Low-Carbon Aviation Report and Recommendations

Moderator: **Marty Bradley**, Technical Fellow, Boeing Commercial Airplanes

Panelists:

Alan Angleman, Senior Program Officer, National Research Council

Mike Benzakein, Wright Brothers Institute Professor, Assistant Vice President for Aerospace and Aviation, Office of Research, The Ohio State University

Steve Csonka, Executive Director, Commercial Aviation Alternative Fuels Initiative

Alan Epstein, Vice President, Technology and Environment, Pratt & Whitney

Karen Thole, Department Head and Professor, Mechanical and Nuclear Engineering, Pennsylvania State University

1530–1800 hrs

Ballroom F

Launch Vehicle Reusability: Holy Grail, Chasing Our Tail, or Somewhere in Between?

Moderator: **Dan Dumbacher**, Professor of Engineering Practice, School of Aeronautics and Astronautics, Purdue University

Panelists:

Ben Goldberg, Senior Director, Science and Engineering, Propulsions Systems Division, Orbital ATK

Tom Markusic, Co-Founder and Chief Executive Officer, Firefly Space Systems

Jim Paulsen, Vice President Program Execution, Advanced Space & Launch Programs, Aerojet Rocketdyne

Gary Payton, Distinguished Visiting Professor, United States Air Force Academy

Tuesday, 26 July

0930–1200 hrs

Ballroom F

Liquid Rocket Propulsion: Lessons Learned

Chair: **T. Kent Pugmire**, Retired

Eric Besnard, Professor of Mechanical and Aerospace Engineering, California State University, Long Beach
“Making Rocket Programs a Success in Universities”

Stephen Heister, Raisbeck Distinguished Professor, Director of the Maurice J. Zucrow Laboratory, Purdue University
“History of the Maurice Zucrow Lab at Purdue University”

John Steinmeyer, Business Development Director, Orbital ATK
“International Cooperation on the Delta, Sea Launch and Antares Programs”

Michael Kelly, Chief Engineer, FAA Office of Commercial Space Transportation, Federal Aviation Administration
“Lessons learned from industry, private venture, and federal government”

Allan McDonald, Aerospace Consultant and Author of Truth, Lies, and O-Rings: Inside the Space Shuttle Challenger Disaster
“30 Years after Challenger - Ethics Lessons Learned but Forgotten”

1500 – 1800 hrs

Ballroom F

Nuclear Power for Distant Solar System Destinations

Moderator: **Lee Mason**, Chief, Thermal Energy Conversions Branch, NASA Glenn Research Center

Panelists:

John Casani, NASA Jet Propulsion Laboratory (ret.)

Leonard Dudzinski, Science Mission Directorate, NASA

Rex Geveden, Chief Operating Officer, BWX Technologies, Inc.

Patrick McClure, Los Alamos National Laboratory

Susan Voss, President, Global Nuclear Network Analysis, LLC

Wednesday, 27 July

0930–1200 hrs

Ballroom F

Rising Leaders in Aerospace — Forum 360 Combined Session

This session will begin with Rex Geveden speaking about “Seven Career Hacks for Professional Success.” After that, there will be a round table of persons talking about their own and colleagues’ professional success. Mr. Geveden will moderate and coordinate the question and answer period.



This multidimensional program features a speed networking session, panel session with Q&A with top industry leaders, and multiple opportunities for networking. These exciting and energetic activities will provide access to top aerospace leaders and their perspectives, with subject matter relevant to your career.

Sponsored by:



Monday, 25 July

1930–2100 hrs

Ballroom H

Dessert Reception

This reception, which kicks off the Rising Leaders in Aerospace events, is a perfect opportunity for young leaders to mingle with others who will be participating at Propulsion and Energy 2016 as an attendee, presenter, or veteran professional. After the Exposition Hall Reception stop by for a little dessert with your fellow young professionals.

Come meet other participants in a casual environment. You're bound to see them again at the Speaker, Networking, Panel Events, or passing by in the hallways.

Tuesday, 26 July

1000–1130 hrs

Ballroom H

Leadership Exchange/Speed Mentoring

Senior members of corporations and AIAA will be taking time to meet with the Rising Leaders in Aerospace participants and share their experiences. This event is a great way to get insight from top-level officials and make some great new contacts. Spend 10 minutes speaking with a mentor, then rotate and spend 10 minutes with another mentor. Repeat until the end of the session.

And who knows, maybe one or more will end up being a mentor for more than just the 10 minutes at this event. Don't miss a terrific opportunity.

Mentors include:

Todd Barber, Jet Propulsion Laboratory

John Casani, Jet Propulsion Laboratory

Janet Convery, GE Aviation

Mary Beth Koelbl, NASA Marshall Space Flight Center

Robert Hancock, United States Air Force

Sandy Magnus, AIAA

Jimmy Tai, Georgia Institute of Technology

Karen Thole, Pennsylvania State University

Wednesday, 27 July

0930–1200 hrs

Ballroom F

Rising Leaders in Aerospace — Forum 360 Combined Session

This session will begin with Rex Geveden speaking about "Seven Career Hacks for Professional Success." After that, there will be a round table of persons talking about their own and colleagues' professional success. Mr. Geveden will moderate and coordinate the question and answer period.

Networking and Special Events

As the old adage says, “It’s not just what you know, it’s who you know.” Connect with those who may become your future colleagues and collaborators, employers or employees. Exchange ideas with the companies you want to partner with, and interact with the leaders who are shaping the future of aerospace.

Networking Coffee Breaks

Networking coffee breaks allow even more time for making new contacts, continuing discussions from sessions, visiting the Exposition Hall, or checking emails and voicemails to keep in touch with the office. Networking coffee breaks will be at the following times and locations:

Monday, 25 July

0730–0800 hrs	Foyer
0845–0930 hrs	Exposition Hall
1500–1530 hrs	Exposition Hall

Tuesday, 26 July

0730–0800 hrs	Foyer
0845–0930 hrs	Exposition Hall
1430–1500 hrs	Exposition Hall

Sponsored by



Wednesday, 27 July

0730–0800 hrs	Exposition Hall
0845–0930 hrs	Exposition Hall

AIAA Undergraduate Engine Design Competition

Wednesday, 27 July, 0930–1200 hrs Room 251B

The AIAA Foundation and the GTE, ABPSI, and HSABP Technical Committees have worked together to sponsor a design competition. Undergraduate students from universities around the world were asked to prepare a design report to respond to a Request for Proposal (RFP). This RFP asked students to design a candidate engine for a next-generation trainer.

All of the reports have been reviewed and scored by technical experts, and this session features the top three proposal winners, who have been invited to AIAA Propulsion and Energy 2016 to make an oral presentation to a panel of judges. These judges will assess the design, presentation, and responses to questions. They will add their scores to those provided by the technical judges to come up with a 1st–3rd place ranking. The final rankings will be announced at the conclusion of the session.

Welcome Reception

A welcome reception will be held on Monday, 25 July, 1800–1900 hrs, in the Exposition Hall. Take this opportunity to engage new contacts and refresh old ones. A ticket for the reception is required, and included in the registration fee where indicated. Additional tickets may be purchased on site, as space is available.

AIAA Student Welcome Reception

Sunday, 24 July 2016, 1730–1900 hrs Ballroom H

Mingle with your peers and hear from AIAA Executive Director Sandy Magnus. This reception provides you with the opportunity to meet your fellow students and learn more about the opportunities available to you as an AIAA student member.

Sponsored by



Generation STEM

Monday, 25 July, 1000–1430 hrs Exposition Hall

Hosted by the AIAA Foundation and Lockheed Martin Corporation, Generation STEM will be a day filled with fun and interactive educational STEM experiences for middle school students.

Generation STEM is designed to engage and stimulate students by allowing them to participate in mini design competitions and challenges, view engaging demonstrations from various aerospace companies, learn more about aerospace careers, and discover aerospace findings that are impacting everyday life.

Conference attendees and exhibitors are encouraged to stop by during the program to inspire and excite the next generation of aerospace professionals. Or just come to observe the activities and take ideas back to your section. Stop in for a few minutes or hang out for the afternoon.

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Recognition Event

AIAA celebrates our industry's discoveries and achievements from the small but brilliantly simple innovations that affect everyday life to the major discoveries and missions that fuel our collective human drive to explore and accomplish amazing things.

Wednesday, 27 July

1200–1330 hrs

Ballroom G-J

Recognition Luncheon—Celebrating Achievements in Propulsion and Energy

A ticket for the luncheon is required and included in the registration fee where indicated. Additional tickets for guests may be purchased upon registration or on site, as space is available.

The following awards will be presented:

Aerospace Power Systems Award

Henry Brandhorst

Managing Director
Aliquippa Holdings, LLC and CHZ Technologies, LLC
Auburn, Alabama

“For over 55 years of developing aerospace power systems with both space and terrestrial application, for providing exceptional leadership and innovation to the aerospace power system community and academia, and for significant contributions to AIAA.”

Air Breathing Propulsion Award

Wesley Lord

Technical Fellow, System Architecture Functional Design
Pratt & Whitney
East Hartford, Connecticut

“For 40 years of technical contributions advancing the state-of-the-art propulsors for commercial aircraft engines, reducing noise and improving fuel burn.”

Engineer of the Year Award

Robin J. Osborne

Senior Mechanical Engineer
ERC, Inc./Jacobs-ESSA Group
Combustion Devices Design and Development Branch
NASA Marshall Space Flight Center
Huntsville, Alabama

“For increasing the aerospace industry’s understanding of spark torch ignition systems and building a low-cost ignition test facility.”

Energy Systems Award

Ronald K. Hanson

Clarence J. and Patricia R. Woodard Professor of Mechanical Engineering
Stanford University
Stanford, California

“For pioneering contributions on fundamental data provided from renewable and alternative fuels for applications to combustion engines, gasifiers and fluidized bed combustors for promoting fuel flexibility and performance of terrestrial energy systems.”

Propellants and Combustion Award

Ahmed F. Ghoniem

Ronald C. Crane (1972) Professor, Mechanical Engineering
Massachusetts Institute of Technology
Cambridge, Massachusetts

“For pioneering research and practical contributions to propulsion and power systems in Computational Fluid Dynamics and its application to turbulent combustion and combustion dynamics.”

Sustained Service Award

Sanjay Garg

Chief, Intelligent Control and Autonomy Branch
NASA Glenn Research Center
Cleveland, Ohio

“For three decades of significant and sustained contributions advancing AIAA’s technical activities as an active member of multiple technical committees and standing committees.”

Wyld Propulsion Award

Gary A. Flandro

Boling Chair of Excellence in Mechanical and Aerospace Engineering (Emeritus), University of Tennessee Space Institute
Chief Engineer, Gloyer-Taylor Laboratories
Tullahoma, Tennessee

“For exceptional contributions to the knowledge base and technology implementation of rocket propulsion and astronautics, especially in solid and liquid propellant rocket combustion instability and interior ballistics.”

Recognition Event

Certificates of Merit

Air Breathing Propulsion Systems Integration Best Paper

AIAA 2016-0011, "Turbine Powered Simulator Calibration and Testing for Hybrid Wing Body Powered Airframe Integration," Patrick Shea and Jeffrey Flamm, NASA Langley Research Center; Kurtis Long and Kevin James, NASA Ames Research Center; and Daniel Tompkins and Michael Beyar, The Boeing Company.

Electric Propulsion Best Paper

AIAA 2015-4005, "Non-Invasive Hall Current Distribution Measurement in a Hall Effect Thruster," Carl Mullins, Rafael Martinez, and John Williams, Colorado State University; Casey Farnell and Cody Farnell, Plasma Control LLC; David Liu, Air Force Institute of Technology; and Richard Branam, University of Alabama Tuscaloosa.

Energetic Components and Systems Best Paper

AIAA 2015-3708, "Analysis of Dissipation Induced by Successive Planar Shock Loading of Granular Explosive," Pratap Thamanna Rao and Keith A. Gonthier, Louisiana State University.

Gas Turbine Engines Best Paper

AIAA 2015-4028, "A Composite Cycle Engine Concept with Hecto-Pressure Ratio," Sascha Kaiser, Bauhaus Luftfahrt e.V.; Stefan Donnerhack, MTU Aero Engines AG; Anders Lundblad, GKN Aerospace Engine Systems; and Arne Seitz, Bauhaus Luftfahrt e.V.

Green Engineering Best Paper

AIAA 2016-0267, "Impact of Ultra-High Bypass/Hybrid Wing Body Integration on Propulsion System Performance and Operability," Wesley Lord, Gavin Hendricks, and Michael Kirby, Pratt & Whitney; and Stuart Ochs, Ray-Sing Lin, and Larry Hardin, United Technologies Research Center.

High Speed Air Breathing Propulsion Best Paper

AIAA 2016-0658, "Establishing the Controlling Parameters of Ignition in High-Speed Flow," Timothy Ombrello, Ez A. Hassan, and Campbell D. Carter, Air Force Research Laboratory; Brendan McGann, University of Notre Dame; Hyungrok Do, Seoul National University; David M Peterson, Innovative Scientific Solutions, Inc.; and Philip Ivancic and Edward A Luke, Mississippi State University

Liquid Propulsion Best Paper

AIAA 2015-3769, "CFD Modeling of the Multipurpose Hydrogen Test Bed (MHTB) Self-Pressurization and Spray Bar Mixing Experiments in Normal Gravity: Effect of the Accommodation Coefficient on the Tank Pressure," Olga Kartuzova and Mohammad Kassemi, NASA Glenn Research Center.

Nuclear and Future Flight Propulsion Best Paper

AIAA 2015-3774, "Affordable Development and Demonstration of a Small NTR Engine and Stage: A Preliminary NASA, DOE and Industry Assessment," Stanley K. Borowski and Robert J. Sefcik, NASA Glenn Research Center; James E. Fittje and David R. McCurdy, Vantage Partners LLC; Arthur L. Qualls and Bruce G. Schnitzler, Oak Ridge National Laboratory; James E. Werner, Idaho National Laboratory; Abraham Weitzberg, DOE Consultant; and Claude R. Joyner, Aerojet Rocketdyne.

Propellants and Combustion Best Paper

AIAA 2015-3972, "Multi-Injector Impinging Jet Studies of Ignition Delay for Hydrogen Peroxide and Gelled Hydrocarbon Fuel Containing Reactive or Catalytic Particles," Terrence L. Connell, Grant A. Risha, and Richard A. Yetter, The Pennsylvania State University; and Benveniste Natan, Technion—Israel Institute of Technology.

Solid Rockets Best Papers

AIAA 2014-4016, "Improved Mean Flow Solution for Solid Rocket Motors with a Naturally Developing Swirling Motion," Joseph Majdalani, Auburn University and Andrew Fist, University of Tennessee.

AIAA 2015-4107, "Time-Temperature Superposition Principle Applied to Thermally Aged Composite Propellant," Luciene D. Villar and Luis C. Rezende, Institute of Aeronautics and Space.

Terrestrial Energy Best Paper

AIAA 2016-0990, "Component and System Modeling of a Direct Power Extraction System," Omar D. Vidana, Mariana Chaidez, Brian Lovich, Jad Aboud, Manuel J. Hernandez, Luisa A. Cabrer, Ahsan Choudhuri, and Norman Love, The University of Texas at El Paso.



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ITAR Information

ITAR Information

A limited number of papers will be presented in “U.S. Only” technical sessions during the conference. In addition to your forum registration, a separate registration process is required to attend these restricted sessions. All individuals must bring the required documentation with them to the ITAR registration desk, most important is proof of U.S. Citizenship or Resident Alien Status. **(Please note that a CAC card IS NOT official proof of U.S. Citizenship.)** Please see the detailed information on the ITAR Registration Grid below to determine your individual requirements.

Access to ITAR Sessions: Presenting a Paper, Chairing a Session, or Attending an ITAR-Restricted Presentation

Admittance to the restricted technical program is controlled by the U.S. International Traffic in Arms Regulations (ITAR). All attendees, presenters, and session chairs will need to register for the conference, and then visit the ITAR registration desk to complete the additional processes. Anyone wishing to enter the restricted session room **MUST** abide by the procedures and submission of verified documents mandated by the DoD. No Exceptions! ITAR Badges must be worn during the sessions. Security will be checking photo IDs upon entrance to the ITAR session rooms.

Availability of Manuscripts from ITAR-Restricted Sessions

For those who are registered to attend the ITAR sessions, a DVD containing the papers from the ITAR sessions will be available for purchase on site at the forum for \$25. Those purchasing the DVD must be available to pick it up on Wednesday, 27 July 2016, between 0900–1230 hrs at the ITAR Registration Desk. All DVDs must be picked up in person. There will be no sale or distribution of these papers after the event.

ITAR Electronics Policy

No phones, computers (other than the presenter), iPads, cameras, Fitbits, or other electronic devices with cameras, recording or two-way transmission capabilities will be permitted into the ITAR session room. There will be a check-in desk in front of the room where you can check these devices. Large briefcases and bags will also need to be checked at the desk.

Important session information for all attendees wishing to present or attend ITAR papers

AIAA Restricted Papers – ITAR Regulations Session Admittance Policy

Several papers scheduled to be presented at this conference will be restricted papers governed by ITAR (U.S. International Traffic in Arms Regulations). If you plan to attend any presentations restricted by ITAR, you must bring proof of citizenship PLUS the other verification documents as shown below. Please note that only U.S. Citizens and U.S. Resident Aliens can be considered for attendance at these restricted presentations. Admittance to restricted sessions and access to restricted technical papers is implemented and controlled by ITAR.

All restricted session attendees (including speakers and session chairs for these sessions) **MUST** abide by the procedures and submittal of verification documents as noted below – **NO EXCEPTIONS**:

DD Form 2345 individual certification credentials (required for U.S. & Resident Aliens) **MUST** be from one of the following:

1. Copy of an approved and active DD2345 for the **individual**, **OR**
2. Copy of an approved and active DD2345 for the individual's **employer** PLUS evidence of current employment status with that employer (corporate ID, business card, etc.), **OR**
3. A listing of the individual's employer in the most recent DoD quarterly Qualified U.S. Contractor Access List PLUS evidence of current employment status with that employer (corporate ID, business card, etc.).

DD Form 2345 may be downloaded and completed online in order to apply for approval to be listed on the Qualified U.S. Contractor List, www.dlis.dla.mil/jcp. Allow at least 4–6 weeks (or longer) prior to the AIAA technical conference dates for you to receive the approval and be listed on the Qualified U.S. Contractor List.

How to get your ITAR Clearance:

Bring all of the above listed identification, proof of employment and certification credentials to the AIAA ITAR Registration Desk in the AIAA Registration area.

Your documents will be verified and you will be provided with a stamp indicating your ITAR clearance. Photo ID will be checked against your ITAR badge before admittance is granted to any ITAR presentation.

Please be advised that all policies and procedures MUST be followed or admittance to restricted sessions will not be permitted.

Please see the ITAR Registration Desk with any questions.

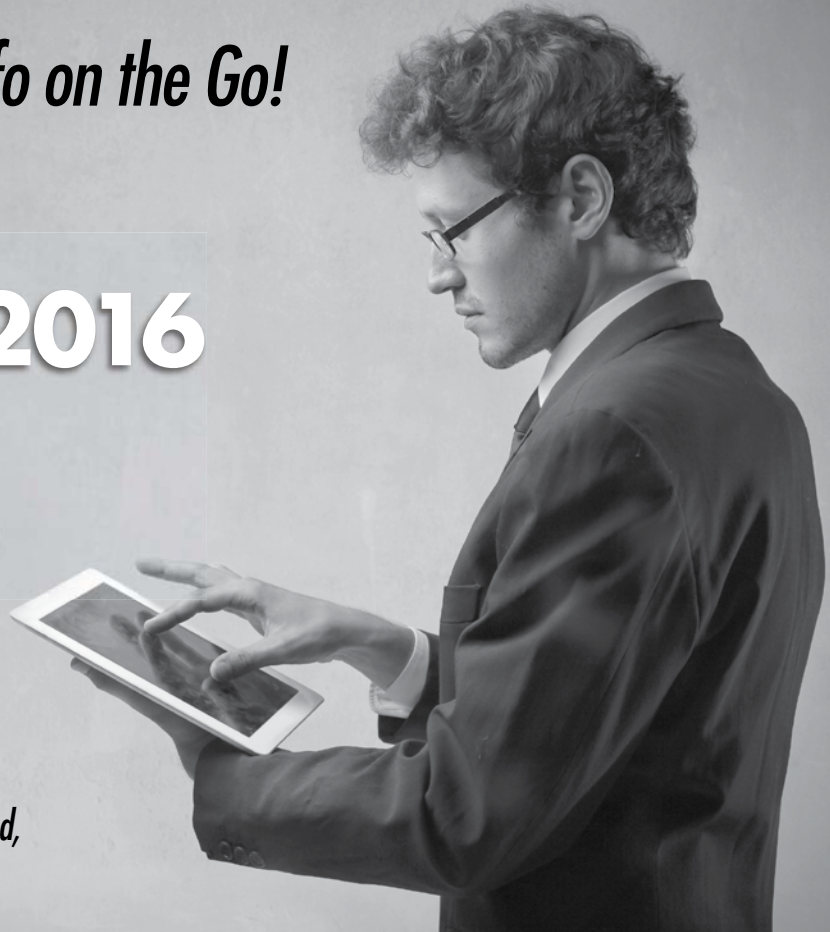
ATTENDEE CLASSIFICATION	IDENTIFICATION & PROOF OF EMPLOYMENT REQUIREMENTS
U.S. Government Employees NOTE: CAC Cards are NOT proof of citizenship.	1. Proof of U.S. Citizenship (for example, passport, birth certificate, naturalization papers), AND 2. Personal photographic identification: U.S. Government/Military Photo ID badge, such as CAC card
U.S. Citizens	1. Proof of U.S. Citizenship (for example, passport, birth certificate, naturalization papers), AND 2. Personal photographic identification (passport, driver's license, etc.), AND 3. Certification credentials based on DD Form 2345 (see below for details)
Resident Aliens (U.S.)	1. Resident Alien Card, AND 2. Personal photographic identification (passport, driver's license, etc.), AND 3. Certification credentials based on DD Form 2345 (see below for details)

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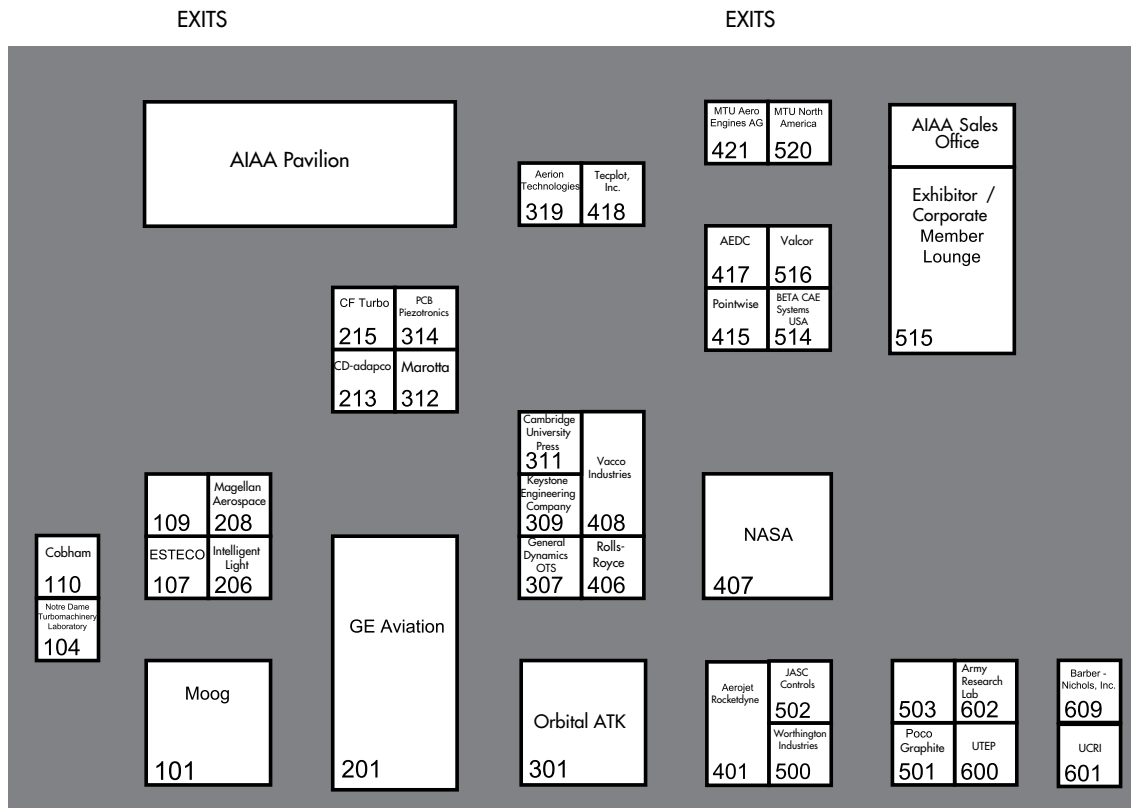
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Exposition Hall



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319	Aerion Technologies ★	421	MTU Aero Engines AG
401	Aerogjet Rocketdyne ★	520	MTU Aero Engines North America Inc.
602	Army Research Lab	407	NASA
417	Arnold Engineering Development Complex (AEDC)	301	Orbital ATK ★
609	Barber-Nichols Inc.	314	PCB Piezotronics
514	BETA CAE Systems	501	Poco Graphite
311	Cambridge University Press	415	Pointwise, Inc. ★
213	CD-adapco	406	Rolls-Royce Corporation ★
215	CF Turbo Software and Engineering GmbH	418	Tecplot, Inc. ★
110	Cobham	601	University of Cincinnati Research Institute (UCRI)
107	ESTECO	104	University of Notre Dame Turbomachinery Laboratory
201	GE Aviation ★	600	University of Texas at El Paso Department of Mechanical Engineering (UTEP)
307	General Dynamics — OTS	408	VACCO Industries
206	Intelligent Light ★	516	Valcor Engineering Corporation
502	Jansens Aircraft Systems Controls	500	Worthington Industries (SCI)
309	Keystone Engineering Company		
208	Magellan Aerospace		
312	Marotta Controls, Inc.		
101	Moog		

Exposition Hall

The Exposition Hall is the hub of activity during this event. Networking coffee breaks, luncheons, receptions, poster sessions, poster presentation sessions, and exhibitor presentations are all held in the Exposition Hall to give attendees and exhibitors an opportunity to connect with partners, industry thought leaders, and collaborators who can help move your business forward.

Exposition Hall Hours

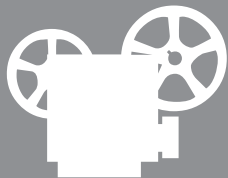
Monday, 25 July	0845–1600 hrs
Networking Coffee Breaks	0845–0930 hrs
	1500–1530 hrs
Generation STEM	1000–1430 hrs
Reception*	1800–1930 hrs
Tuesday, 26 July	0845–1600 hrs
Networking Coffee Breaks	0845–0930 hrs
	1430–1500 hrs
Networking Luncheon*	1200–1300 hrs
Wednesday, 27 July	0845–1200 hrs
Networking Coffee Break	0845–0930 hrs

*A ticket is required to attend the reception and the networking luncheon



Quadcopter Raffle

Enter to win one of two quadcopters! Complete the raffle ticket (behind your registration badge) and drop it in the boxes in the Exposition Hall by 1200 hrs, Wednesday, 27 July. Winner will be notified by email and does not need to be present to win.



Go To The Movies Courtesy of Orbital ATK!

Visit their booth (#301) for a pass to the nearby Clark Planetarium. The pass gets you in to any show at the Orbital ATK IMAX Theatre or the Hansen Dome Theatre, 24–27 July.
<http://clarkplanetarium.org/>

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Stop by the AIAA Pavilion, located in the Exposition Hall, to browse publications and merchandise, learn about your membership benefits, and meet AIAA staff.

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Come visit us in the AIAA Pavilion. Did you know that the AIAA Foundation is celebrating its 20th anniversary? To raise funds for our STEM programming, we are hosting a Silent Auction with some cool aerospace items for bid. Stop by and check it out! With your help and donation, we can reach our goal and continue to inspire and support the next generation of aerospace professionals.



Exhibitors

Aerion Technologies

319

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Aerion Technologies (formerly Desktop Aeronautics) creates tools for aerodynamic design and analysis of aerospace vehicles. Our flagship product, GoCart, is an intuitive aerial vehicle design tool built around NASA's renowned Cartesian Euler CFD solver, Cart3D. Our customer list includes the major players from the aerospace and defense industry.

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Exhibitors

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Exhibitors

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University of Texas at El Paso Department of Mechanical Engineering

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The MIRO Center for Space Exploration and Technology Research (cSETR) was established at The University of Texas at El Paso (UTEP) to promote research and education in the areas of Aerospace and Defense Systems, Energy Engineering, and Crosscutting Technologies. The MIRO cSETR vision is to establish a sustainable minority serving university center of excellence in advanced propulsion research through strategic partnerships and to educate a diverse future aerospace workforce.

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The advertisement banner features a blue background with a white outline of a globe on the left. The text "The Partner You Can Count On™" is in white. The "Orbital ATK" logo is in white, and the "SSC ECAPS" logo is in white. The main headline "A New Age of Green Propulsion is Dawning" is in white. The bottom section has a dark background with a green sunburst effect over a view of Earth from space, and the text "High Propulsion Green Propellant (HPGP) isn't just a safer fuel; it's a more capable fuel with proven benefits over conventional hydrazine-based systems. Greater performance, enhanced volumetric efficiency, reduction of handling hazards and safer launch operations. Orbital ATK and ECAPS are making HPGP available in the United States. Learn more at booth 301." is in white.

General Information

AIAA Registration and Information Center Hours

The AIAA Registration and Information Center will be located at the Salt Palace Convention Center. Hours are as follows:

Sunday, 24 July	1500–1900 hrs
Monday, 25 July	0700–1800 hrs
Tuesday, 26 July	0700–1800 hrs
Wednesday, 27 July	0700–1800 hrs



Wi-Fi Internet Access On Site

AIAA is providing limited Wi-Fi service for attendees to use while on site. To keep this service available and optimized for all attendees, please do not download files larger than 2MB, create multiple sessions across multiple devices, or download multiple files in one session. If you receive an error message that an AIAA server is blocking your current IP address, please inform the AIAA registration desk.

Network Name: AIAA Password: **propenergy**

AIAA Livestream Channel

Visit livestream.com/aiaavideo/PropEnergy2016 to view selected keynotes, plenaries, and Forum 360 sessions. Share the link with colleagues who couldn't attend the forum, so they can watch live or view later.

Social Media Kiosks

Throughout the forum, social media kiosks will display content shared by forum attendees! Look for your tweets or Instagram photos to be displayed on the screens if you've used our hashtag #aiaaPropEnergy. AIAA is also hosting a competition where the user who has posted the most tweets during the forum will win a prize.

ITAR Registration Hours

Monday, 25 July 0700–1800 hrs

Located in Ballroom Foyer

Tuesday, 26 July 0700–1800 hrs

Located outside Room 151 DE

Wednesday, 27 July 0700–1800 hrs

Located outside Room 151 DE

DVD pickup for those ITAR attendees purchasing a DVD is Wednesday, 27 July, 0900–1500 hrs at the ITAR Registration Desk.

Conference Proceedings

Proceedings for the forum will be available online. The cost is included in the registration fee where indicated. Online proceedings will be available on Monday, 25 July. Attendees who register in advance for the online proceedings will be provided with instructions on how to access them. Those registering on site will be provided with instructions at that time.

Proceedings:

- To view proceedings, visit www.aiaa.org >ARC>Meeting Papers.
 - Log in with the link at the top right of the page.
 - Select the appropriate conference from the list.
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 - Use the Search textbox to find papers by author, title, or keyword. The Advanced Search link provides additional search information and options.
- All manuscript files submitted by four days prior to the conference are currently in the proceedings. Files submitted after that date, both original and revised manuscripts, will not be available until the final proceedings update, which may take up to 15 business days after the last day of the conference.
- Direct any questions concerning access to proceedings and/or ARC to arcsupport@aiaa.org.

Manuscript Revisions

- Manuscript revision is open for all presenting authors from 0900 hrs Eastern Time, Monday, 25 July, through 2000 hrs Eastern Time, Friday, 5 August.
- Revisions submitted for manuscripts already online will not refresh until after the proceedings have been updated, which may take up to 15 business days after the last day of the conference.

Certificate of Attendance

Certificates of Attendance are available for attendees who request documentation at the forum itself. The Certificates of Attendance will be available for attendees to print at a self-service station at the registration desk starting Tuesday, 26 July. AIAA offers this service to better serve the needs of the professional community. Claims of hours or applicability toward professional education requirements are the responsibility of the participant.

General Information

Employment Opportunities

AIAA members can post and browse resumes, browse job listings, and access other online employment resources by visiting the AIAA Career Center at <http://careercenter.aiaa.org>. Additionally, a message board will be available for postings in the Exposition Hall.

Membership

AIAA is your vital lifelong link to the collective creativity and brainpower of the aerospace profession and a champion for its achievements – and nonmembers who pay the full conference registration fee will receive their first year's AIAA membership at no additional cost! Students who are not yet members may apply their registration fee toward their first year's student member dues. (Free membership is not included in discounted group-rate registration.)

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In celebration of the AIAA Foundation's 20th anniversary, we have challenged AIAA members to donate at least \$20 to the foundation. To date, we have raised more than \$99,000 on our way to the goal of \$200,000! With your gift, we can continue to enhance and create K-12 STEM programs, including classroom grants and hands-on activities, university design competitions, student conferences and recognition awards. To show support of our programming and goal, the Institute will match individual and corporate donations up to one million dollars of unrestricted funds. Your gift will be matched, doubling the impact of your donation, so please consider donating today. For more information and to make a tax-deductible donation, please visit www.aiaafoundation.org.



Young Professional Guide for Gaining Management Support

Young professionals have the unique opportunity to meet and learn from some of the most important people in the business by attending conferences and participating in AIAA activities. A detailed online guide, published by the AIAA Young Professional Committee, is available to help you gain support and financial backing from your company. The guide explains the benefits of participation, offers recommendations, and provides an example letter for seeking management support and funding, and shows you how to get the most out of your participation. The online guide can be found on the AIAA website at www.aiaa.org/YPGuide.

Nondiscriminatory Practices

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AIAA speakers and attendees are reminded that some topics discussed in the conference could be controlled by the International Traffic in Arms Regulations (ITAR). U.S. nationals (U.S. citizens and permanent residents) are responsible for ensuring that technical data they present in open sessions to non-U.S. nationals in attendance or in conference proceedings are not export restricted by the ITAR. U.S. nationals are likewise responsible for ensuring that they do not discuss ITAR export-restricted information with non-U.S. nationals in attendance.

General Information

Author and Session Chair Information

Speakers' Briefings in Session Rooms

Authors who are presenting papers will meet with session chairs and co-chairs in their session rooms for a short 30-minute briefing on the day of their sessions to exchange bios and review final details prior to the session. Please attend on the day of your session(s). Laptops preloaded with the Speaker Briefing preparation slides will be provided in each session room.

Speakers' Briefing schedule is as follows:
Monday, 25 July – Wednesday, 27 July: 0730 hrs

Speakers' Practice Room

Speakers who wish to practice their presentations may do so in the Convention Office #4 room located at the Salt Palace Convention Center. A sign-up sheet will be posted on the door. In consideration of others, please limit practice time to 30-minute increments.

Session Chair Reports

All session chairs are asked to complete a session chair report to evaluate their session for future planning. AIAA has partnered with Canvas Solutions to provide an electronic Session Chair Report form. You can download the FREE mobile app in your App Store, AppWorld, or Marketplace by searching for "Canvas Solutions, Inc." The mobile app is free, so please be sure to download it. Detailed instructions will be provided in the session rooms. If you do not have a tablet or a smartphone, simply use the report form as a guide and enter your session chair report information at the session chair reporting computer station located on site near the AIAA registration area. Report data will be collected and used for future planning purposes, including session topics and room allocations. Please submit your session chair report **electronically** by Wednesday, 27 July 2016.

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Each session room will be preset with the following: one LCD projector, one screen, one microphone and sound system (if necessitated by room size), and one laser pointer. Laptop computers will also be provided. You may also use your own computer. Any additional audiovisual equipment requested onsite will be at cost to the presenter. Please note that AIAA does not provide security in the session rooms and recommends that items of value not be left unattended.

"No Paper, No Podium" and "No Podium, No Paper" Policy

If a written paper is not submitted by the final manuscript deadline, authors will not be permitted to present the paper at the forum. Also, if the paper is not presented at the forum, it will be withdrawn from the proceedings. It is the responsibility of those authors whose papers or presentations are accepted to ensure that a representative attends the conference to present the paper. These policies are intended to improve the quality of the program for attendees.

Journal Publication

Authors of appropriate papers are encouraged to submit them for possible publication in one of the Institute's archival journals: *AIAA Journal*; *Journal of Aerospace Information Systems*; *Journal of Air Transportation*; *Journal of Aircraft*; *Journal of Guidance, Control, and Dynamics*; *Journal of Propulsion and Power*; *Journal of Spacecraft and Rockets*; or *Journal of Thermophysics and Heat Transfer*. You may now submit your paper online at <http://mc.manuscriptcentral.com/aiaa>.

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Committee Meetings

Time	Title	Location
Saturday, 23 July 2016		
0800-1700 hrs	Advanced High-Speed Air-Breathing Propulsion Technology Course	Room 254B
0800-1700 hrs	Electric Propulsion for Space Systems Course	Room 254A
0800-1700 hrs	Hybrid Rocket Propulsion Course	Room 254C
0800-1700 hrs	Fundamentals of Liquid Chemical Propellants	Room 255A
0800-1700 hrs	Propulsion Aerodynamics Workshop	Room 255E/F
Sunday, 24 July 2016		
0800-1700 hrs	Advanced High-Speed Air-Breathing Propulsion Technology Course	Room 254B
0800-1700 hrs	Electric Propulsion for Space Systems Course	Room 254A
0800-1700 hrs	Hybrid Rocket Propulsion Course	Room 254C
0800-1700 hrs	Fundamentals of Liquid Chemical Propellants	Room 255A
0800-1700 hrs	Propulsion Aerodynamics Workshop	Room 255E/F
1400-1900 hrs	Electric Propulsion Discussion	Room 150DE
1700-2000 hrs	TAC Propulsion and Energy Group Meeting	Room 255B
1730-1900 hrs	AIAA Student Welcome Reception	East Lobby
Monday, 25 July 2016		
0800-0900 hrs	HSABPTC Prep Committee	Room 355A
0900-1000 hrs	ABPTCs Steering Committee	Room 355A
1000-1100 hrs	HSABPTC Steering Committee	Room 355A
1000-1030 hrs	ABPTCs New Member Orientation	Room 355D
1030-1100 hrs	GTETC Membership Upgrade	Room 355D
1100-1200 hrs	ABPSI TC Meeting	Room 355A
1100-1200 hrs	GTE TC Meeting	Room 355D
1100-1200 hrs	HSABP TC Meeting	Room 355C
1200-1500 hrs	Nuclear and Future Flight Propulsion TC	Room 355E
1300-1400 hrs	HyTASP PC Steering Committee Meeting	Room 355A
1300-1400 hrs	ABPTCs Conference Subcommittee	Room 355C
1400-1600 hrs	HyTASP PC	Room 355F
1400-1500 hrs	ABPTCs Honors and Awards Subcommittee	Room 355A
1500-1600 hrs	TAC P&E Group Coordination	Room 355A
1500-1600 Hrs	ABP Student Engine Design Competitiion	Room 355C
1600-1700 hrs	ABPTCs Communications Subcommittee	Room 355A
1700-1800 hrs	ABP Working Groups	Room 355E
1700-1900 hrs	GEPC Leadership & Conference Team	Room 355D
1900-2200 hrs	Terrestrial Energy Systems TC	Room 355A
1900-2130 hrs	Propellants and Combustion TC	Room 355B
1900-2200 hrs	Energetic Components and Systems TC	Room 355C
1900-2200 hrs	Solid Rockets TC	Room 355E
1900-2200 hrs	ABPTCs Group Meeting	Room 355F
1930-2100 hrs	RLA Dessert Reception	Ballroom H

continued

Committee Meetings

Time	Title	Location
Tuesday, 26 July 2016		
0900-1100 hrs	TAC Rocket, Space and Advanced Propulsion Group	Room 355A
1000-1130 hrs	2017 Technical Program Committee	Room 355F
1500-1600 hrs	TAC P&E Group Tag-up	Room 355A
1700-1930 hrs	Green Engineering PC	Room 355A
1800-2000 hrs	Pressure Gain Combustion PC	Room 355D
1830-2100 hrs	Electric Propulsion TC	Room 355E
1800-2200 hrs	Aerospace Power Systems TC	Room 355C
1900-2200 hrs	Hybrid Rockets TC	Room 355F
Wednesday, 27 July 2016		
1400-1500 hrs	TAC P&E Energy TC Leadership Group	Room 150C
1900-2200 hrs	Liquid Propulsion TC	Room 355F

Sessions at a Glance

Sessions at a Glance Overview

Energy-Focused Topic Areas

Advanced Power Systems (APS)
 Energy Conversion Device Technology (ECD)
 Electricity Delivery, Grid and Energy Storage Technologies (EDES)
 Energy Efficiency (EE)
 Energy Optimized Aircraft and Equipment Systems (EOA)
 Fossil-Fuel Power (FFP)
 Green Engineering (GEPC)
 Thermal Managent (TM)
 Thermal Management Technology (TM)

Propulsion-Focused Topic Areas

Air Breathing Propulsion Systems Integration (ABPSI)
 Additive Manufacturing (ADP)
 Advanced Engine Control (AEC)
 Aircraft Electric Propulsion (AEP)
 Energetic Components and Systems (ECS)
 Propulsion Education (EDU)
 Energy Optimized Aircraft and Equipment Systems (EOA)
 Electric Propulsion (EP)
 Gas Turbine Engines (GTE)
 Green Engineering (GEPC)
 Hybrid Rockets (HR)
 High Speed Air Breathing Propulsion (HSABP)
 Liquid Propulsion (LP)
 Nuclear and Future Flight (NFF)
 Propellants and Combustion (PC)
 Propulsion and Power Systems (PP)
 Satellites (SATS)
 Solid Rockets (SR)
 Vehicle Systems (VS)

Abbreviation	Title	Date	Start Time	Location
Air Breathing Propulsion Systems Integration (ABPSI)				
3-ABPSI-1	Nozzles and Exhaust	25-Jul	0930 hrs	255 F
32-ABPSI-2	High-Speed Inlets	25-Jul	1530 hrs	255 F
64-ABPSI-3	Supersonic and Hypersonic Inlets	26-Jul	0930 hrs	255 F
93-ABPSI-4	Subsonic Inlets & Aerodynamic Interaction	26-Jul	1500 hrs	255 F
150-ABPSI-5	Propulsion Systems Integration	27-Jul	1500 hrs	255 F
137-GTE-15/ ABPSI-6/HSABP-11	Undergraduate Engine Design Competition	27-Jul	0930 hrs	251 B
Additive Manufacturing (ADP)				
4-ADP-1	Additive Manufacturing for Propulsion Systems	25-Jul	0930 hrs	255 E
124-ADP-2	Seal Material Advancements and Advanced Seal Technology	27-Jul	0930 hrs	255 E
Advanced Engine Control (AEC)				
5-AEC-1	Advanced Engine Control & Intelligent Systems I	25-Jul	0930 hrs	150 G
94-AEC-2	Advanced Engine Control & Intelligent Systems II	26-Jul	1500 hrs	150 DE
Aircraft Electric Propulsion (AEP)				
33-AEP-1	Aircraft Electric Propulsion I	25-Jul	1530 hrs	250 E
65-AEP-2	Aircraft Electric Propulsion II	26-Jul	0930 hrs	150 DE
Advanced Propulsion Concepts (APC)				
6-APC-1	Advanced In-Space Concepts	25-Jul	0930 hrs	251 C
95-APC-2	Advanced Propulsion Concepts I	26-Jul	1500 hrs	251 D
125-APC-3	Advanced Propulsion Concepts II	27-Jul	0930 hrs	251 C

Sessions at a Glance

Abbreviation	Title	Date	Start Time	Location
Advanced Power Systems (APS)				
7-APS-1	Space Power Generation, Processing and Performance	25-Jul	0930 hrs	150 DE
34-APS-2	Space Transportation Development and Progress	25-Jul	1530 hrs	151 G
96-APS-3	Space Nuclear Power Generation	26-Jul	1500 hrs	151 G
126-APS-4	Space and Aircraft Power Generation, Processing and Performance	27-Jul	0930 hrs	151 G
Energy Conversion Device Technology (ECD)				
8-ECD-1	Magnetohydrodynamic, Brayton, and CO2 Cycle Systems	25-Jul	0930 hrs	151 DE
66-ECD-2	Thermoelectric, Fuel Cell, and Photovoltaic Conversion Systems	26-Jul	0930 hrs	151 G
151-ECD-3	Stirling Components and Systems	27-Jul	1500 hrs	151 AB
Energetic Components and Systems (ECS)				
35-ECS-1	Energetic Material, Detonation Transition and Ignition of Components	25-Jul	1530 hrs	251 C
67-ECS-2	Updates to Acceptance Methodologies for Energetic Components	26-Jul	0930 hrs	251 C
127-ECS-3	Energetic Systems and Component Developments	27-Jul	0930 hrs	254 C
152-ECS-4	Young Professionals and Energetic Components & Systems - An Educational Series Panel Session	27-Jul	1500 hrs	254 B
Electricity Delivery, Grid and Energy Storage Technologies (EDES)				
9-EDES-1	Waste Heat Recovery and Submerged Offshore Nuclear Power Stations: Technology, Opportunities and Challenges	25-Jul	0930 hrs	151 G
36-EDES-2	Energy Technologies for Aerospace and Terrestrial Applications	25-Jul	1530 hrs	151 DE
Energy Optimized Aircraft and Equipment Systems (EOS)				
135-GEPC-2/EOA-1	Low Carbon Aviation- Electric Propulsion and Technologies	27-Jul	0930 hrs	254 B
Propulsion Education (EDU)				
10-EDU-1	Propulsion Education I	25-Jul	0930 hrs	253 AB
68-EDU-2	Propulsion Education II	26-Jul	0930 hrs	251 B
128-EDU-3	Propulsion Education III	27-Jul	0930 hrs	253 AB
Energy Efficiency (EE)				
97-EE-1	Systems-Level Analysis of Energy Efficiency and Renewable Energy	26-Jul	1500 hrs	150 G
153-EE-2	Renewable Fuel Generation And Processing	27-Jul	1500 hrs	150 G
Electric Propulsion (EP)				
11-EP-1	Hall Thruster Physics & Modeling I	25-Jul	0930 hrs	250 A
12-EP-2	Lorentz Force Accelerators	25-Jul	0930 hrs	250 B
13-EP-3	EP Flight Programs & Missions	25-Jul	0930 hrs	250 C
14-EP-4	Ion Thruster Development	25-Jul	0930 hrs	250 D
15-EP-5	Electrospray I	25-Jul	0930 hrs	250 E
37-EP-6	Hall Thruster Physics & Modeling II	25-Jul	1530 hrs	250 A
38-EP-7	Hall Thruster Development	25-Jul	1530 hrs	250 B
39-EP-8	Hollow Cathode Physics & Modeling	25-Jul	1530 hrs	250 C
40-EP-9	NEXT Ion Thruster Development	25-Jul	1530 hrs	250 D
69-EP-10	Hall Thruster Physics & Modeling III	26-Jul	0930 hrs	250 A
70-EP-11	Hall Thruster Alternative Propellants	26-Jul	0930 hrs	250 B
71-EP-12	Hollow Cathode Development	26-Jul	0930 hrs	250 C

Sessions at a Glance

Abbreviation	Title	Date	Start Time	Location
Electric Propulsion (EP) (continued)				
72-EP-13	Helicon Thruster	26-Jul	0930 hrs	250 D
73-EP-14	Electrospray II	26-Jul	0930 hrs	250 E
98-EP-15	HERMeS Hall Thruster I	26-Jul	1500 hrs	250 A
99-EP-16	Low Power Hall Thruster Development	26-Jul	1500 hrs	250 B
100-EP-17	LaB6 Hollow Cathodes	26-Jul	1500 hrs	250 C
101-EP-18	Sputtering & Erosion Physics	26-Jul	1500 hrs	250 D
102-EP-19	Pulsed Plasma Thruster	26-Jul	1500 hrs	250 E
129-EP-20	Plasma Plume Modeling	27-Jul	0930 hrs	250 A
130-EP-21	Mid Power Hall Thruster Development	27-Jul	0930 hrs	250 B
131-EP-22	Cathodes & Neutralizers	27-Jul	0930 hrs	250 C
132-EP-23	Advanced EP Concepts	27-Jul	0930 hrs	250 D
154-EP-24	HERMeS Hall Thruster II	27-Jul	1500 hrs	250 A
155-EP-25	High Power Hall Thruster & PPU Development	27-Jul	1500 hrs	250 B
156-EP-26	Magnetoplasmdynamics and EP Diagnostics	27-Jul	1500 hrs	250 C
157-EP-28	Micropropulsion	27-Jul	1500 hrs	250 E
Forum 360 (F360)				
16-F360-1	NRC Low-Carbon Aviation Report and Recommendations	25-Jul	0930 hrs	Ballroom F
41-F360-2	Launch Vehicle Reusability: Holy Grail, Chasing Our Tail, or Somewhere in Between	25-Jul	1530 hrs	Ballroom F
74-F360-3/LP-11	Liquid Propulsion History Session Lessons Learned	26-Jul	0930 hrs	Ballroom F
103-F360-4	Nuclear Power for Distant Solar System Destinations	26-Jul	1500 hrs	Ballroom F
133-F360-5	Seven Career Hacks for Professional Success	27-Jul	0930 hrs	Ballroom F
Fossil-Fuel Power (FFP)				
42-FFP-1	Fossil-Fuel Power Technologies I	25-Jul	1530 hrs	150 DE
134-FFP-2	Fossil-Fuel Power Technologies II	27-Jul	0930 hrs	150 DE
Green Energy (GEPC)				
75-GEPC-1	Low Carbon Aviation-Propulsion Integration, Gas Turbines, and Fuels	26-Jul	0930 hrs	254 B
135-GEPC-2/EOA-1	Low Carbon Aviation- Electric Propulsion and Technologies	27-Jul	0930 hrs	254 B
Gas Turbine Engines (GTE)				
17-GTE-1	Turbines I	25-Jul	0930 hrs	250 F
18-GTE-2	Air-Breathing Combustors I	25-Jul	0930 hrs	251 A
43-GTE-4	Thermodynamic Topics of Gas Turbine Engines	25-Jul	1530 hrs	250 F
44-GTE-5	Compressors I	25-Jul	1530 hrs	251 A
45-GTE-6	Air-Breathing Combustors II	25-Jul	1530 hrs	251 B
76-GTE-7	Turbines II	26-Jul	0930 hrs	250 F
77-GTE-8	Compressors II	26-Jul	0930 hrs	251 A
46-GTE-9	Engine Control Systems	25-Jul	1530 hrs	254 B
104-GTE-10	Advanced Materials and Technology for Gas Turbine Engines	26-Jul	1500 hrs	251 A
105-GTE-11	Turbines III	26-Jul	1500 hrs	251 B
106-GTE-12	Gas Turbine Engine Testing Techniques	26-Jul	1500 hrs	251 C

continued

Sessions at a Glance

Abbreviation	Title	Date	Start Time	Location	
Gas Turbine Engines (GTE) (continued)					
136-GTE-14	Compressors III	27-Jul	0930 hrs	251 A	
137-GTE-15/ ABPSI-6/HSABP-11	Undergraduate Engine Design Competition	27-Jul	0930 hrs	251 B	
158-GTE-16	Turbines IV	27-Jul	1500 hrs	250 F	
159-GTE-17	Aerodynamic Flows in Gas Turbine Engines	27-Jul	1500 hrs	251 A	
160-GTE-18	Gas Turbine Inlets	27-Jul	1500 hrs	251 B	
161-GTE-19	Gas Turbine Engine Modeling	27-Jul	1500 hrs	251 C	
Hybrid Rockets (HR)					
19-HR-1	Combustion Dynamics and Mixing Efficiencies I	25-Jul	0930 hrs	255 B	
47-HR-2	Design and Development of Novel Hybrid Rocket Motor Concepts I	25-Jul	1530 hrs	255 B	
78-HR-3	Internal Ballistics Modeling I	26-Jul	0930 hrs	253 AB	
79-HR-4	Combustion Dynamics and Mixing Efficiencies II	26-Jul	0930 hrs	255 B	
107-HR-5	Development and Evaluation of Novel O/F Formulations and Combinations	26-Jul	1500 hrs	253 AB	
108-HR-6	Combustion Stability, Motor Performance, and Related Issues	26-Jul	1500 hrs	255 B	
138-HR-7	Design and Development of Novel Hybrid Rocket Motor Concepts II	27-Jul	0930 hrs	255 B	
162-HR-8	Internal Ballistics Modeling II	27-Jul	1500 hrs	255 B	
High Speed Air Breathing Propulsion (HSABP)					
20-HSABP-1	Special/Invited Panel on HSABP: Special Session: Persistence Issues In CFD of Hypersonic Air-Breathing Propulsion	25-Jul	0930 hrs	254 B	
21-HSABP-2	Computational Analysis of Supersonic Combustion Flow Paths, Components, and Processes	25-Jul	0930 hrs	255 A	
22-HSABP-3	Design and Optimization of High Speed Propulsion Flow Paths	25-Jul	0930 hrs	254 C	
48-HSABP-4	Advances in Hypersonic Air-Breathing Propulsion Systems	25-Jul	1530 hrs	255 A	
80-HSABP-5	Numerical Analysis of Supersonic Combustion Flow Paths, Components, and Processes	26-Jul	0930 hrs	254 C	
81-HSABP-6	High Fidelity Simulations of High-Speed Air-Breathing Systems	26-Jul	0930 hrs	255 A	
109-HSABP-7	Numerical Analysis of High-Speed Air-Breathing Propulsion and Their Integration	26-Jul	1500 hrs	254 C	
110-HSABP-8	Pulse Detonation Physics, and/or Combined Cycle with Other Utility to High-Speed Propulsion	26-Jul	1500 hrs	255 A	
139-HSABP-9	Experimental and Numerical Analysis of High Speed Propulsion Systems	27-Jul	0930 hrs	255 A	
163-HSABP-10	Experimental Developments in High-Speed Air-Breathing Systems	27-Jul	1500 hrs	255 A	
137-GTE-15/ ABPSI-6/HSABP-11	Undergraduate Engine Design Competition	27-Jul	0930 hrs	251 B	
ITAR					
82-ITAR-1	Gas Turbines and Associated Equipment (CAT-XIX)		26-Jul	0930 hrs	151 DE
111-ITAR-2	Launch Vehicles I (CAT-IV)		26-Jul	1500 hrs	151 DE
140-ITAR-3	Explosives and Energetic Materials (CAT-V)		27-Jul	0930 hrs	151 DE
164-ITAR-4	Launch Vehicles II (CAT-IV)		27-Jul	1500 hrs	151 DE

Sessions at a Glance

Abbreviation	Title	Date	Start Time	Location
Liquid Propulsion (LP)				
23-LP-1	Green Propellants I	25-Jul	0930 hrs	251 D
24-LP-2	Combustors I	25-Jul	0930 hrs	251 E
25-LP-3	Propellant Storage & Transfer I	25-Jul	0930 hrs	251 F
49-LP-4	Green Propellants II	25-Jul	1530 hrs	251 D
50-LP-5	Nozzles I	25-Jul	1530 hrs	251 E
51-LP-6	Propellant Storage & Transfer II	25-Jul	1530 hrs	251 F
52-LP-7	Propulsion Systems - Design & Test I	25-Jul	1530 hrs	253 AB
74-F360-3/LP-11	Liquid Propulsion History Session: Lessons Learned	26-Jul	0930 hrs	Ballroom F
83-LP-8	Nozzles II	26-Jul	0930 hrs	251 D
84-LP-9	Propellant Storage & Transfer III	26-Jul	0930 hrs	251 E
141-LP-12	Rocket Engine Components	27-Jul	0930 hrs	251 D
142-LP-13	Propulsion Systems - Design & Test II	27-Jul	0930 hrs	251 E
143-LP-14	Turbomachinery	27-Jul	0930 hrs	251 F
165-LP-15	Injectors	27-Jul	1500 hrs	251 D
166-LP-16	Combustion Stability	27-Jul	1500 hrs	251 E
167-LP-17	Combustors II	27-Jul	1500 hrs	251 F
168-LP-18	Green Propellants III	27-Jul	1500 hrs	253 AB
Nuclear and Future Flight (NFF)				
53-NFF-1	Fusion and Alternative Nuclear Concepts I	25-Jul	1530 hrs	150 G
61-NFF-2	Open Forum: Nuclear Propulsion in the 21st Century	25-Jul	1930 hrs	150 G
85-NFF-3	Fusion and Alternative Nuclear Concepts II	26-Jul	0930 hrs	150 G
113-NFF-4	Nuclear Thermal Propulsion: Engines and Missions	26-Jul	1500 hrs	251 E
121-NFF-5	Future Flight Propulsion Systems I	26-Jul	1900 hrs	150 G
144-NFF-6	Future Flight Propulsion Systems II	27-Jul	0930 hrs	150 G
Propellants and Combustion (PC)				
26-PC-1	Combustion Dynamics I	25-Jul	0930 hrs	255 C
27-PC-2	Propellant Development - Solid Fuel	25-Jul	0930 hrs	255 D
54-PC-3	Ignition	25-Jul	1530 hrs	255 C
55-PC-4	Spray Combustion	25-Jul	1530 hrs	255 D
56-PC-5	Advanced Concepts	25-Jul	1530 hrs	255 E
86-PC-6	Combustion Chemistry	26-Jul	0930 hrs	255 C
87-PC-7	Air-Breathing Combustion Modeling	26-Jul	0930 hrs	255 D
88-PC-8	Cryogenic Sprays	26-Jul	0930 hrs	255 E
114-PC-9	Advanced Combustor Concepts	26-Jul	1500 hrs	255 C
115-PC-10	Combustion Instability	26-Jul	1500 hrs	255 D
116-PC-11	Combustion Diagnostics	26-Jul	1500 hrs	255 E
145-PC-12	Green Propulsion	27-Jul	0930 hrs	255 C
146-PC-13	Single Injector Test Case Modeling	27-Jul	0930 hrs	255 D
169-PC-14	Combustion Modeling	27-Jul	1500 hrs	255 C
170-PC-15	Rotating Detonation Concepts	27-Jul	1500 hrs	255 D
171-PC-16	Combustion Dynamics II	27-Jul	1500 hrs	255 E

Sessions at a Glance

Abbreviation	Title	Date	Start Time	Location
Plenary Sessions (PLNRY)				
1-PLNRY-1	Innovate Or Die! (Note: Dying Is Easier)	25-Jul	0800 hrs	Ballroom A-D
30-PLNRY-2	System Needs in Propulsion and Energy	25-Jul	1330 hrs	Ballroom A-D
62-PLNRY-3	Game Changing Developments in Propulsion and Energy	26-Jul	0800 hrs	Ballroom A-D
91-PLNRY-4	High Power Systems for Aerospace Applications	26-Jul	1300 hrs	Ballroom A-D
120-PLNRY-5	Formula for Success and Longevity in the Aerospace Business	26-Jul	1800 hrs	Ballroom A-D
122-PLNRY-6	The Impact of Additive Manufacturing on the Design Process	27-Jul	0800 hrs	Ballroom A-D
149-PLNRY-7	The Strategic Challenges and Opportunities in the Power and Propulsion Markets	27-Jul	1330 hrs	Ballroom A-D
Propulsion and Power Systems (PP)				
172-PP-1	Propulsion and Power Systems of Unmanned Systems	27-Jul	1500 hrs	150 DE
Satellites (SATS)				
117-SATS-1	Small Satellites I	26-Jul	1500 hrs	251 F
173-SATS-2	Small Satellites II	27-Jul	1500 hrs	254 C
Solid Rockets (SR)				
28-SR-1	Solid Rocket Grain Design and Ballistics	25-Jul	0930 hrs	254 A
57-SR-2	Solid Rocket Modeling and Simulation	25-Jul	1530 hrs	254 A
89-SR-3	Solid Rocket Combustion Instability	26-Jul	0930 hrs	254 A
118-SR-4	Advanced Solid Rockets (Nozzles, Cases, and Controllable)	26-Jul	1500 hrs	254 A
147-SR-5	Solid Rocket Developments Past and Present	27-Jul	0930 hrs	254 A
174-SR-6	Solid Propellant Developments	27-Jul	1500 hrs	254 A
Thermal Management (TM)				
29-TM-1	Thermal System Applications and Unique Environments I	25-Jul	0930 hrs	151 AB
58-TM-2	Thermal System Applications and Unique Environments II	25-Jul	1530 hrs	151 AB
90-TM-3	Thermal System Applications and Unique Environments III	26-Jul	0930 hrs	151 AB
119-TM-4	Heat Transfer and Transport Modeling and Analysis I	26-Jul	1500 hrs	151 AB
148-TM-5	Heat Transfer and Transport Modeling and Analysis II	27-Jul	0930 hrs	151 AB
175-TM-6	Nano-Technology for Thermal Management (Panel)	27-Jul	1500 hrs	151 G
176-TM-7	Heat Transfer and Transport Modeling and Analysis III	27-Jul	1500 hrs	151 G
Vehicle Systems (VS)				
59-VS-1	Advanced Vehicle Systems Concepts	25-Jul	1530 hrs	254 C

Monday

Monday, 25 July 2016		Ballroom A-D
1-PLNRY-1	INNOVATE OR DIE! (Note: Dying is easier)	
0800 - 0900 hrs	<p>Bran Ferren Co-Founder & Chief Creative Officer Applied Minds, LLC</p>	

Monday, 25 July 2016		Exhibit Hall C
2-NW-1	Networking Coffee Break	
0845 - 0930 hrs		

Monday, 25 July 2016		255 F
3-ABPSI-1		
Chaired by: C. CHUCK, Boeing Commercial Airplanes and D. SANDERS, Air Force Research Laboratory		
0930 hrs AIAA-2016-4500	1000 hrs AIAA-2016-4501	1030 hrs AIAA-2016-4502
Reducing residue in aluminized fuel-rich propellant for Ramjets. N. Rathi, P. Ramakrishna, Indian Institute of Technology Madras, Chennai, India	Prediction of NO _x Emissions Using a Stirred Reactor Modelling Approach for an Aero-Engine with RQL Combustor A. Prakash, Teesside University, Middlesbrough, United Kingdom	Hot Streak Characterization in Serpentine Exhaust Nozzles D. Crowe, Air Force Institute of Technology, Wright-Patterson AFB, OH; C. Martin, Air Force Research Laboratory, Eglin AFB, FL
1100 hrs AIAA-2016-4503	1130 hrs AIAA-2016-4504	
Propulsion Aerodynamic Workshop II, Summary of Participant Results for a Dual Separate Flow Reference Nozzle, Including Some Experimental Results R. Thomack, Self, Seattle, WA	Open and Closed-Loop Responses of a Dual-Throat Nozzle during Fluidic Thrust Vectoring M. Ferlauto, R. Masilo, Technical University of Turin, Turin, Italy	

Monday, 25 July 2016		255 E
4-ADP-1		
Chaired by: E. JENS, Stanford Univ and C. GATTO, Jet Propulsion Laboratory		
0930 hrs AIAA-2016-4505	1000 hrs AIAA-2016-4506	1030 hrs AIAA-2016-4507
Thin film deposition using rarefied gas jet S. Pradhan, Indian Institute of Science, Bengaluru, India	Use of Additive Manufacturing to Develop Advanced Hybrid Rocket Designs J. Carino, B. Nellis, D. Grigsby, K. Castonguay, U.S. Naval Academy, Annapolis, MD	Additive Manufacturing of Small Scale Rocket Grain Cartridges with Uniformly Distributed Aluminum Particles T. Elliott, B. Jenkins, R. Zeineldin, J. Johnson, M. Simons, J. Godfrey, University of Tennessee, Chattanooga, Chattanooga, TN, et al.
1100 hrs AIAA-2016-4508	1130 hrs AIAA-2016-4509	
Design of an Additive Manufactured Compressor Vane with Multi-Hole Pressure Probes for the Application in a Twin-Spool Turbofan Engine F. Kern, University of the German Federal Armed Forces, Neubiberg, Germany; S. Bindl, Electro-Optical Systems, Xrailling, Germany; M. Strasser, R. Niehuis, University of the German Federal Armed Forces, Neubiberg, Germany	Additively Manufactured Low NO _x Multipoint Lean Direct Injection Fuel Atomizer Concepts G. Zink, S. Pack, J. Ryan, J. Short, United Technologies Corporation, West Des Moines, IA	

Monday, 25 July 2016		150 G
5-AEC-1		
Chaired by: A. BEHBAHANI, AFRL/RQT and R. MILLAR, Naval Postgraduate School		
0930 hrs AIAA-2016-4510	1000 hrs AIAA-2016-4511	1030 hrs AIAA-2016-4512
G2 ISHM Autonomous Control System for Cryogenics Operation J. Toro Medina, NASA Kennedy Space Center, Cape Canaveral, FL	Heat Transfer Analysis for Servo Valve in Hydraulic Servo Actuator of Aero Engine Vectoring Nozzle Y. Ding, Y. Liu, Y. Luo, L. Du, Beihang University, Beijing, China	Technical Opportunities for High Temperature Smart P3 Sensors and Electronics for Distributed Engine Control O. Watts, Watts International, LLC, Indianapolis, IN; L. Frediani, M. Usey, Spartan Microsystems, Inc., Lafayette, CO

Monday, 25 July 2016		Advanced In-Space Concepts		251 C
Chaired by: A. REISZ, Reisz Engineers and J. ROBINSON, Retired f/Boeing				
0930 hrs AIAA-2016-4513 Roadmap for Long Term Sustainable Space Exploration and Habitation Alternate Basing Concepts J. Robinson, Propellant Supply Technology, Seal Beach, CA; R. Rhoades, Self, Cape Canaveral, FL; E. Henderson, Self, Houston, TX	1000 hrs AIAA-2016-4514 Performance of a High Power Hall Thruster for a Manned Mission to Mars M. Gonzalez, San Jose State University, San Jose, CA	1030 hrs AIAA-2016-4515 Proposed Lunar Mission to Commemorate Apollo 11 Moon Landing D. Thorpe, Space Propulsion Synergy Team, Seal Beach, CA; E. Henderson, NASA Johnson Space Center, Houston, TX	1100 hrs AIAA-2016-4516 Space Tug Propellant Options J. Robinson, Propellant Supply Technology, Seal Beach, CA	
Monday, 25 July 2016				
7-APS-1				
Chaired by: M. PATEL, US Merchant Marine Academy and A. BAISDEN, Johns Hopkins University Applied Physics Laboratory				
0930 hrs AIAA-2016-4517 The Van Allen Probes Power System Mission Performance M. Butler, Johns Hopkins University Applied Physics Laboratory, Laurel, MD	1000 hrs AIAA-2016-4518 Stability Analysis of Spacecraft Power Systems and Power Processing Units J. Lee, The Aerospace Corporation, El Segundo, CA	1030 hrs AIAA-2016-4519 Status of the Development of Flight Power Processing Units for the NASA's Evolutionary Xenon Thruster - Commercial (NEXT-C) Project M. Aulizio, NASA Glenn Research Center, Cleveland, OH; J. Bonitempo, ZIN Technologies, Inc., Cleveland, OH; L. Pinero, NASA Glenn Research Center, Cleveland, OH; A. Birchenough, Vantage Partners, LLC, Cleveland, OH; T. Hietel, Aerjet Rocketry, Canoga Park, CA; B. White, NASA Glenn Research Center, Cleveland, OH; et al.	1100 hrs AIAA-2016-4520 Solar Array Design For The Mars InSight Lander Mission G. Lam, S. Billals, T. Norick, R. Warwick, Lockheed Martin Corporation, Sunnyvale, CA	1130 hrs AIAA-2016-4521 Planetary Object Geophysical Observer (POGO) and Its Unique Power System E. Adams, E. Hohlfield, J. Neville, C. Vigil Lopez, B. Wilhelm, Johns Hopkins University Applied Physics Laboratory, Laurel, MD
Monday, 25 July 2016				
8-ECD-1				
Chaired by: M. PISZCZOR, NASA Glenn Research Center and S. GENG, NASA Glenn Research Center				
0930 hrs AIAA-2016-4522 Fundamental Studies of Radio-Frequency Preionization for Frozen Inert Gas Plasma Magnetohydrodynamic Electrical Power Generation M. Tamaka, Y. Hirosubashi, Y. Okuno, Tokyo Institute of Technology, Yokohama, Japan	1000 hrs AIAA-2016-4523 Numerical Simulation of Frozen Inert Gas Plasma MHD Generator with Collisional-Radiative Model R. Takahashi, F. Takayasu, University of Tsukuba, Tsukuba, Japan; Y. Okuno, Tokyo Institute of Technology, Yokohama, Japan	1030 hrs AIAA-2016-4524 Numerical Analysis of Non-equilibrium Disk MHD Generator with Swirl Vanes D. Ichimokiyama, F. Takayasu, University of Tsukuba, Tsukuba, Japan	1100 hrs AIAA-2016-4525 Sensitivity Study of a VHTR Powered Brayton Cycle as a Topping Unit for a Steam Cycle W. Freitas, D. Wilson, University of Texas, Arlington, Arlington, TX	1130 hrs AIAA-2016-4526 Two Types of Analytical Methods for a Centrifugal Compressor Impeller for Supercritical CO₂ Power Cycles L. Blanchette, A. Knudse, M. Moiraghoghi, J. Kaput, University of Central Florida, Orlando, FL
Monday, 25 July 2016				
9-EDES-1				
0930 - 1200 hrs				
This is a discussion panel where the panel members will talk about technologies for waste heat recovery and modular submerged offshore nuclear power stations for power generation and energy conversion, and with emphasis on challenges and opportunities. Each panel member will also make a short presentation to highlight his/her scope of involvement in and view of the future demands for these technologies.				
Panelists:				
Stephen Heister Raisbeck Engineering Distinguished Professor for Engineering and Technology Integration Director, Maurice J. Zucrow Laboratories Purdue University		Terry J. Hendricks Technical Group Supervisor, Thermal Energy Conversion Applications & Systems, MMRTG Pyroshock Project Manager/JPL MATRIX Technical Manager NASA Jet Propulsion Laboratory, California Institute of Technology		J. Stephen Herring Director Center for Space Nuclear Research
Waste Heat Recovery and Submerged Offshore Nuclear Power Stations: Technology, Opportunities and Challenges				
151 G				

Monday, 25 July 2016		Propulsion Education I		253 AB	
Chaired by: E. FLEEMAN and M. HITT, The University of Alabama in Huntsville					
0930 hrs AIAA-2016-4527 Practical Techniques for Modeling Gas Turbine Engine Performance J. Chapman, T. Lovelle, J. Litt, NASA Glenn Research Center, Cleveland, OH	1100 hrs AIAA-2016-4528 Teaching Risk Analysis for Use in an Aircraft Gas Turbine Engine Capstone Design Course A. Byrley, C. Cooper, D. O'Dowd, U.S. Air Force Academy, Colorado Springs, CO	1030 hrs AIAA-2016-4529 The Gas Dynamic Brayton Cycle Power Conversion Test Bed as an Educational Device for Workforce Development J. Hearty, Government Energy Solutions, Huntsville, AL	1100 hrs AIAA-2016-4530 Overview of Vortex Injected Hybrid Rocket Engines-Regression Rate Modeling B. Roy, R. Frederick, University of Alabama, Huntsville, AL	1130 hrs AIAA-2016-4531 Development of a Vortex Hybrid Upper Stage Engine A. Parlett, University of Alabama, Huntsville, AL	
Monday, 25 July 2016					
11-EP-1					
Chaired by: H. KAMHAWI, NASA Glenn Research Center and M. PATINO, University of California, Los Angeles					
0930 hrs AIAA-2016-4532 Measurements and theory of driven breathing oscillations in a Hall effect thruster K. Haro, S. Keller, Y. Roitman, Princeton Plasma Physics Laboratory, Princeton, NJ	1000 hrs AIAA-2016-4533 PRINCE: A Software Tool for Characterizing Waves and Instabilities in Plasma Thrusters S. Rojas/Maria, E. Choueiri, Princeton University, Princeton, NJ; B. Jones, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; R. Spektor, The Aerospace Corporation, El Segundo, CA	1030 hrs AIAA-2016-4534 Growth and Saturation of Ion Acoustic Waves in Hall Thrusters I. Katz, A. Lopez Ortega, B. Jones, I. Mikellides, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1100 hrs AIAA-2016-4535 Hall Thruster Thermal Modeling and Test Data Correlation J. Myers, Vantage Partners, LLC, Cleveland, OH; H. Kamhawi, J. Yim, L. Clayman, NASA Glenn Research Center, Cleveland, OH		250 A
Monday, 25 July 2016					
12-EP-2					
Chaired by: M. KEIDAR, The George Washington University and N. YANES					
0930 hrs AIAA-2016-4536 Liquid Metal Mass Flow Measurement Using a Jx8 Pump for a Lithium Lorentz Force Accelerator M. Hepler, W. Coogan, B. Ilardi, E. Choueiri, Princeton University, Princeton, NJ	1000 hrs AIAA-2016-4537 Measurement of the Applied-Field Component of the Thrust of a Lithium Lorentz Force Accelerator W. Coogan, M. Hepler, E. Choueiri, Princeton University, Princeton, NJ	1030 hrs AIAA-2016-4538 Parametric Optimization of the Fusion Driven Rocket Liner Compression Driver A. Shimazu, University of Washington, Seattle, WA; A. Pincotti, B. Cornella, J. Slough, MSNW, LLC, Redmond, WA			250 B
Monday, 25 July 2016					
13-EP-3					
Chaired by: T. SWANSON, AEDC and B. JORNS					
0930 hrs AIAA-2016-4539 In-Flight Operation of the Dawn Ion Propulsion System Through Operations in the LAMO Orbit at Ceres C. Garner, M. Raymon, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1000 hrs AIAA-2016-4540 The Iodine Satellite (iSat) Project Development through Critical Design Review (CDR) J. Dankanich, NASA Marshall Space Flight Center, Huntsville, AL; H. Kamhawi, NASA Glenn Research Center, Cleveland, OH; M. Selby, NASA Marshall Space Flight Center, Huntsville, AL; L. Byrne, Busek Company, Inc., Norick, IA	1030 hrs AIAA-2016-4541 Psyche: Journey to a Metal World D. Oh, D. Goebel, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; L. Elkins-Tanton, Arizona State University, Tempe, AZ; C. Polansky, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; P. Lord, S. Tilley, Space Systems/Loral, LLC, Palo Alto, CA; et al.	1100 hrs AIAA-2016-4542 Adaptability of the SSL SPT-140 Subsystem for use on a NASA Discovery Class Missions: Psyche J. Delgado, P. Lord, L. Rotlisberger, Space Systems/Loral, LLC, Palo Alto, CA	1130 hrs AIAA-2016-4543 Performance and Plume Characterization of the PPS 1350-G Hall Thruster K. Diamant, The Aerospace Corporation, El Segundo, CA; T. Lee, R. Liang, J. Noland, Space Systems/Loral, LLC, Palo Alto, CA; V. Vidal, N. Cornu, Safran Group, Vernon, France	250 C

Monday, 25 July 2016		Ion Thruster Development		250 D
14-EP-4	Chaired by: R. WIRZ, UCLA and J. FOSTER, University of Michigan 0930 hrs AIAA-2016-4544 Maturation of Iodine Fueled BIT-3 RF Ion Thruster and RF Neutralizer M. Tsay, J. Frangillo, J. Zwalten, Busek Company, Inc., Natick, MA			
Monday, 25 July 2016	Electrospray I			250 E
15-EP-5	Chaired by: B. PRINCE, Air Force Research Laboratory and S. BERG, Missouri University of Science and Technology 0930 hrs AIAA-2016-4547 Silicon Emitter Needle and Array Design for Indium Electro Spray Arrays for Spacecraft Propulsion C. Marrese-Reading, J. Anderson, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1100 hrs AIAA-2016-4550 Species Measurements in the Beam of an Ionic Liquid Ferrofluid Capillary Electro Spray Source K. Terhune, L. King, Michigan Technological University, Houghton, MI; B. Prince, Air Force Research Laboratory, Kirtland AFB, NM; B. Hawkeitt, University of Sydney, Sydney, Australia	1130 hrs AIAA-2016-4551 Measurement of the Fragmentation Rates of Solvated Ions in Ion Electro Spray Thrusters C. Miller, P. Lozano, Massachusetts Institute of Technology, Cambridge, MA	
Monday, 25 July 2016	NRC Low-Carbon Aviation Report and Recommendations			Ballroom F
16-F360-1	Moderator: Marty Bradley, Technical Fellow, Boeing Commercial Airplanes Panelists: Alan Angleton Senior Program Officer National Research Council	Alan Epstein Vice President, Technology and Environment Pratt & Whitney	Mike Benzakein Wright Brothers Institute Professor Assistant Vice President for Aerospace and Aviation, Office of Research The Ohio State University	Steve Conka Executive Director Commercial Aviation Alternative Fuels Initiative
Monday, 25 July 2016	Turbines I			250 F
17-GTE-1	Chaired by: G. PANIAGUA, Purdue University 0930 hrs AIAA-2016-4552 Influence of Laminar-Turbulent Transition on 3D Flow Pattern in Subsonic Turbine Cascade S. Yershov, V. Yakovlev, National Academy of Sciences of Ukraine, Kharkiv, Ukraine	1030 hrs AIAA-2016-4554 Secondary Loss Production Mechanisms in a Low Pressure Turbine Cascade P. Bear, M. Wolff, Wright State University, Dayton, OH; A. Gross, New Mexico State University, Las Cruces, NM; C. Marks, R. Sondergaard, Air Force Research Laboratory, Wright-Patterson AFB, OH	1100 hrs AIAA-2016-4555 Probabilistic CFD-Analysis of Regeneration-Induced Geometry Variances in a Low-Pressure Turbine B. Ernst, J. Seume, F. Heibst, Leibniz University, Hannover, Germany	1130 hrs AIAA-2016-4556 Integration of a Turbine Stage Optimizer into Engine Simulation Utilizing Numerical Propulsion System Simulation C. Thom, R. Harfield, Auburn University, Auburn, AL

Monday, 25 July 2016		Air-Breathing Combustors I		251 A
Chaired by: M. WALLIM, Indiana University Purdue University Indianapolis				
0930 hrs AIAA-2016-4557	1100 hrs AIAA-2016-4558	1030 hrs AIAA-2016-4559	1100 hrs AIAA-2016-4560	1130 hrs AIAA-2016-4561
Assessment of the Boundary Layer within a Rotating Detonation Combustor J. Braun, J. Souse, G. Paniagua, Purdue University, West Lafayette, IN	Computational Analysis of Flame Stabilization Using Strong Swirl for Afterburner Applications K. Parammasivam, D. D. S. Gunasekar, A. Basidi, Anna University, Chennai, India	Numerical Evaluation of an Ejector-Enhanced Resonant Pulse Combustor with a Poppet Inlet Valve and a Converging Exhaust Nozzle S. Yungster, Ohio Aerospace Institute, Cleveland, OH; D. Passon, H. Peikras, NASA Glenn Research Center, Cleveland, OH	Optical Diagnostics in a High-g Combustion Cavity A. Corlie, N. Gilbert, M. Polonka, Air Force Institute of Technology, Wright-Patterson AFB, OH; L. Goss, C. Goss, Innovative Scientific Solutions, Inc., Dayton, OH	A CFD Investigation of Multiple Burner Ignition and Flame Propagation with Detailed Chemistry and Automatic Meshing G. Kumar, S. Drennon, Convergent Science, Inc., Madison, WI
Monday, 25 July 2016				
19-HR-1				
Chaired by: S. CLAFLIN, Aerojet Rocketdyne and D. PASTRONE, Politecnico di Torino				
0930 hrs AIAA-2016-4562	1000 hrs AIAA-2016-4563	1030 hrs AIAA-2016-4564	1100 hrs AIAA-2016-4565	
Vortex Combustion in a Lab-Scale Hybrid Rocket Motor C. Parivan, J. Glowacki, S. Carloti, F. Maggi, L. Galferri, Technical University of Milan, Milan, Italy	Thermal Cycling for Development of Hybrid Fuel for a National Mars Ascent Vehicle E. Fornas, M. Redmond, A. Kemp, R. Stohrweil, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; F. Mecheniel, Stanford University, Palo Alto, CA; G. Story, NASA Marshall Space Flight Center, Huntsville, AL	Flame Emission Spectroscopy in a Paraffin-Based Hybrid Rocket K. Stober, P. Narsai, K. Venkataraman, A. Thomas, B. Cantwell, Stanford University, Stanford, CA	Bipolar Combustion Response Model for Hybrid Rocket Internal Ballistic Simulation D. Grechm, Ryerson University, Toronto, Canada	
Monday, 25 July 2016				
20-HSABP-1				
Chaired by: F. MALO-MOLINA, Raytheon Missile Systems and S. BECKEL				
0930 hrs Panel Discussion	Special/Invited Panel on HSABP: Special Session: Persistence Issues in CFD of Hypersonic Air-Breathing Propulsion			254 B
				1130 hrs AIAA-2016-4567
				Scaling for Flamelet Calculation of Turbulent Supersonic Combustion F. Ladeinde, Z. Lou, Stony Brook University, Stony Brook, NY
				1100 hrs AIAA-2016-4566
				Reacting Hybrid Reynolds-Averaged Navier-Stokes/Large-Eddy Simulation of a Supersonic Cavity Flameholder E. Hassan, D. Peterson, M. Hagenmaier, Air Force Research Laboratory, Wright-Patterson AFB, OH
Monday, 25 July 2016				
21-HSABP-2				
Chaired by: C. BRUNO, United Technologies Research Center and R. MOEHLKAMP, Aerojet Rocketdyne				
0930 hrs AIAA-2016-4568	1000 hrs AIAA-2016-4569	1030 hrs AIAA-2016-4570	1100 hrs AIAA-2016-4571	
Performance comparisons, RAM and SCRAM J. Iegner, Swedish Defense Research Agency (FOI), Stockholm, Sweden	A Quasi-One-Dimensional Analysis of Hydrogen-Fueled Scramjet Combustors R. Saleznev, S. Surzhikov, Russian Academy of Sciences, Moscow, Russia	Quasi-One-Dimensional Analysis of Supersonic Combustor Performance Y. Zhao, Q. Shen, F. Guan, China Academy of Aerospace Aerodynamics, Beijing, China	A computational and experimental study of injection structure effect on H ₂ -air rotating detonation engine C. Yang, H. Ma, X. Wu, X. Xu, Nanjing University of Science and Technology, Nanjing, China	
Monday, 25 July 2016				
255 A				
Computational Analysis of Supersonic Combustion Flow Paths, Components, and Processes				

Monday, 25 July 2016		Design and Optimization of High Speed Propulsion Flow Paths		254 C
Chaired by: R. HARTFIELD, Auburn University and D. PAXSON, NASA Glenn Research Center				
0930 hrs AIAA-2016-4572	1100 hrs AIAA-2016-4573	1030 hrs AIAA-2016-4574	1100 hrs AIAA-2016-4575	
Investigation of a variable geometry 2D inlet for combined cycle engine. X. Liu, L. Shi, P. Liu, G. He, Northwestern Polytechnical University, Xi'an, China	Analysis of Mode Transition Performance for a Tandem TBCC Engine M. Zhang, Z. Wang, Z. Liu, X. Zhang, Northwestern Polytechnical University, Xi'an, China	Analyzing the flow pattern of inward turning inlet combined with variable-geometry Z. Feiyuan, G. Huang, H. Huihui, C. Xia, Nanjing University of Aeronautics and Astronautics, Nanjing, China	Research on a Novel Internal waverider TBCC Inlet for Ramjet Mode H. Huihui, G. Huang, Z. Feiyuan, C. Xia, Nanjing University of Aeronautics and Astronautics, Nanjing, China	
Monday, 25 July 2016				
23-LP-1				
Chaired by: M. DEANS, NASA Glenn Research Ctr and J. MOORE				
0930 hrs AIAA-2016-4576	1000 hrs AIAA-2016-4577	1030 hrs AIAA-2016-4578	1100 hrs AIAA-2016-4579	
Green Propellant Loading Demonstration at U.S. Range H. Mulkey, J. Miller, C. Bocho, NASA Goddard Space Flight Center, Greenbelt, MD	AF-M31 SE Propulsion System Advances and Improvements R. Masse, M. Allen, R. Spores, E. Driscoll, Aerojet Rocketdyne, Redmond, WA	Decomposition of a Double Salt Ionic Liquid Monopropellant on Heated Metallic Surfaces S. Berg, J. Rovey, Missouri University of Science and Technology, Rolla, MO	Linear Burn Rates of Monopropellants for Multi-Mode Micropropulsion A. Muntahl, S. Berg, J. Rovey, Missouri University of Science and Technology, Rolla, MO	251 D
Monday, 25 July 2016				
24-LP-2				
Chaired by: D. LINEBERRY, UAH Propulsion Research Center and M. MASQUELET, GE Global Research Center				
0930 hrs AIAA-2016-4580	1000 hrs AIAA-2016-4581	1030 hrs AIAA-2016-4582	1100 hrs AIAA-2016-4583	
Exact Euler Solution of the Beltraman and Trkalian Bidirectional Vortex in a Cylindrical Annulus T. Barber, J. Maglioli, Auburn University, Auburn, AL	Effect of Injector Variation on the Bidirectional Vortex B. Maicke, G. Talamones, Pennsylvania State University, Middletown, PA	Experimental Investigation of Continuous Detonation Rocket Engines for In-Space Propulsion R. Smith, GHK Engineering, LLC, Redmond, WA; S. Stanley, Aerojet Rocketdyne, Redmond, WA	Validation of Damage Parameter Based Finite Element Fatigue Life Analysis Results to Combustion Chamber Type TMF Panel Test Results G. Thiede, J. Riccius, German Aerospace Center (DLR), Lampoldshausen, Germany; S. Reese, RWTH Aachen University, Aachen, Germany	251 E
Monday, 25 July 2016				
25-LP-3				
Chaired by: J. MOLINSKY, Orbital ATK and M. MEYER, NASA Glenn Research Center				
0930 hrs AIAA-2016-4584	1000 hrs AIAA-2016-4585	1030 hrs AIAA-2016-4586	1100 hrs AIAA-2016-4587	1130 hrs AIAA-2016-4588
Experimental, Numerical and Analytical Study of Cryogenic Slosh Dynamics in a Spherical Tank J. Storey, J. Poothokaran, D. Kirk, H. Gutierrez, Florida Institute of Technology, Melbourne, FL; M. de Natis, Avans University of Applied Sciences, Heerlen, The Netherlands; B. Marsell, NASA Kennedy Space Center, Cape Canaveral, FL; et al.	New CFD Method for Simulation of Slosh & Microgravity Fluid Dynamics R. Manning, I. Bollinger, M. Dowdy, Keystone Engineering Company, Long Beach, CA	Coupling sloshing, GNC and rigid body motions during ballistic flight phases P. Behruzi, F. De Rose, F. Cirillo, M. Konopka, Airbus, Bremen, Germany	Validation of High-Resolution CFD Method for Slosh Damping Extraction of Baffled Tanks H. Yang, CFD Research Corporation, Huntsville, AL; J. West, NASA Marshall Spaceflight Center, Huntsville, AL	Numerical calculation and reduced gravity experiment for dynamic wetting behavior in liquid container R. Inai, Muroran Institute of Technology, Muroran, Japan

Monday, 25 July 2016		Combustion Dynamics I		255 C
Chaired by: W. ANDERSON, Purdue University				
0930 hrs AIAA-2016-4589	1000 hrs AIAA-2016-4590	1030 hrs AIAA-2016-4591	1100 hrs AIAA-2016-4592	
Experimental Combustion Dynamics Behavior Of A Multi-Element Lean Direct Injection (LDI) Gas Turbine Combustor W. Acosta, Army Research Laboratory, Cleveland, OH; C. Chang, NASA Glenn Research Center, Cleveland, OH	Computation of Combustion Noise from a Premixed and Pressurized Propane Flame Using Statistical Noise Modeling W. Ulrich, C. Hirsch, T. Seitzlmayer, Technical University of Munich, Garching, Germany	Assessing Computational Fluid Dynamics Turbulence Models for Rocket Exhaust Plume Simulation D. Watts, QinetiQ, Sevenoaks, United Kingdom	A structural variation of the methane-air premixed flame affected by an ultrasonic standing wave J. Kim, M. Kim, S. Bae, D. Bae, Pukyong National University, Busan, South Korea; H. Seo, Hanwita Corporation, Daejeon, South Korea	
Monday, 25 July 2016				
27-PC-2				
Chaired by: T. NGUYEN, Aerojet Rocketdyne and C. PARAVAN, Politecnico di Milano				
0930 hrs AIAA-2016-4593	1000 hrs AIAA-2016-4594	1030 hrs AIAA-2016-4595	1100 hrs AIAA-2016-4596	1130 hrs AIAA-2016-4597
Measurements of Dielectric Properties of Condensed Phase Aluminized Composite Propellants S. Barkley, K. Zhu, M. Ballester, J. Michael, T. Sippel, Iowa State University, Ames, IA	Modern Scanning Electron Microscopy in the Study of Solid Propellant Combustion: Surface Structure and Elemental Identification Via EDS G. Morrow, A. Denko, E. Petersen, Texas A&M University, College Station, TX	Pyrotechnic Dispersion and Ignition of Boron Particles in Gels Y. Solomon, Israel Military Industries, Ramat Husharon, Israel; D. Grinstein, B. Natan, Technion-Israel Institute of Technology, Haifa, Israel	Novel Activated Metal Powders for Improved Hybrid Fuels and Green Solid Propellants S. Dassi, C. Paravan, F. Maggi, M. Di Lorenzo, J. Ardicic, L. Gallati, Technical University of Milan, Milan, Italy	Numerical Method to Estimate Thermal Conductivity of a Model Composite Propellant G. Rajniya, C. Vijay, P. Ramakrishna, Indian Institute of Technology Madras, Chennai, India
Monday, 25 July 2016				
28-SR-1				
Chaired by: M. BERDOYES, Herakles and S. MCHEENRY, Orbital ATK				
0930 hrs AIAA-2016-4598	1000 hrs AIAA-2016-4599	1030 hrs AIAA-2016-4600		
3D Flame Spread and Starting Transient in Dual-thrust Solid Propellant Rocket Motors S. Aithi, S. Vignesh, Kumaraguru College of Technology, Coimbatore, India; S. Miani, Georgia Institute of Technology, Atlanta, GA; T. Ramesh Kumar, Auburn University, Auburn, AL; V. Sanal Kumar, Kumaraguru College of Technology, Coimbatore, India	Burning Rate and Temperature Measurements of HTPB/AP/Al Propellants at Standard Rocket Motor Tests R. de Araujo, P. Lacava, Technological Institute of Aeronautics (ITA), São José dos Campos, Brazil; L. de Almeida, F. Cunha, AVBRAS aeroespacial, São José dos Campos, Brazil	Application of the Universal Expression for Erosive Burning to Nozzleless Solid Propellant Rocket Motors A. Ozer, TUBITAK, Ankara, Turkey; Y. Özyörek, Middle East Technical University, Ankara, Turkey		
Monday, 25 July 2016				
29-TM-1				
Chaired by: M. CHOI, NASA/Goddard Space Flight Center and C. TARAU, Advanced Cooling Technologies				
0930 hrs AIAA-2016-4601	1000 hrs AIAA-2016-4602	1030 hrs AIAA-2016-4603	1100 hrs AIAA-2016-4604	1130 hrs AIAA-2016-4605
Using Paraffin PCM to Make Optical Communication Type of Payloads Thermally Self-Sufficient for Operation in Orion Crew Module M. Choi, NASA/Goddard Space Flight Center, Greenbelt, MD	Novel Multiphase Change Materials for Energy Storage Application in Buildings J. Darkwa, W. Su, University of Nottingham, Nottingham, United Kingdom	Alkali Metal Heat Pipes for Kilopower C. Tarau, W. Anderson, D. Beard, Advanced Cooling Technologies, Inc., Lancaster, PA	Computational Investigation of Impingement Cooling for Regeneratively Cooled Rocket Nozzles B. De Angelo, M. Ricklick, Embry-Riddle Aeronautical University, Daytona Beach, FL	Heat Pipe Embedded Thermoelectric Generator for Diesel Generator Set Waste Heat Recovery J. Schmidt, M. Ababneh, Advanced Cooling Technologies, Inc., Lancaster, PA

Monday, 25 July 2016		System Needs in Propulsion and Energy		Ballroom A-D
30-PLNRY-2 1330 - 1500 hrs	<p>Moderator: Dan Dumbacher, Professor Engineering Practice, School of Aeronautics and Astronautics, Purdue University</p> <p>Panelists:</p> <p>Doug Blake Director, Aerospace Systems Directorate Air Force Research Laboratory</p> <p>Dennis Andrucyk Deputy Associate Administrator, Space Technology Mission Directorate NASA</p>			
Monday, 25 July 2016		Networking Coffee Break		Exhibit Hall C
31-NW-2 1500 - 1530 hrs				
Monday, 25 July 2016		High-Speed Inlets		255 F
32-ABPSI-2	Chaired by: M. HASSAN, Georgia Institute of Technology			
1530 hrs AIAA-2016-4606	1600 hrs AIAA-2016-4607	1630 hrs AIAA-2016-4608	1700 hrs AIAA-2016-4609	
Optimizing Probe Placement to Determine Inlet Distortion S. Walter, J. Nobury, R. Stankey, University of Colorado, Boulder, Boulder, CO	Design of Wave Derived Inlet for High Curvature Fuselage E. Sahely, G. Huang, Nanjing University of Aeronautics and Astronautics, Nanjing, China; A. Hays, California State University, Long Beach, CA	Effects of Ridge Configuration on the Performance of Integrated Inlets G. Huang, E. Sahely, Nanjing University of Aeronautics and Astronautics, Nanjing, China; M. Akhlaghi, University of Québec, Montréal, Canada; Z. Yu, Nanjing University of Aeronautics and Astronautics, Nanjing, China	Vortex Generators in a Two-Dimensional, External-Compression Supersonic Inlet E. Boydar, F. Lu, University of Texas, Arlington, Arlington, TX; J. Slater, NASA Glenn Research Center, Cleveland, OH	
Monday, 25 July 2016		Aircraft Electric Propulsion I		250 E
33-AEP-1	Chaired by: L. GEA, Boeing Engineering Operations & Technology and C. CHUCK, Boeing Commercial Airplanes			
1530 hrs AIAA-2016-4610	1600 hrs AIAA-2016-4611	1630 hrs AIAA-2016-4612	1700 hrs AIAA-2016-4613	
Parallel Hybrid Gas-Electric Geared Turbofan Engine Conceptual Design and Benefits Analysis C. Lewis, L. Hardin, J. Rheunme, United Technologies Corporation, East Hartford, CT; L. Kallman, NASA Glenn Research Center, Cleveland, OH	MASA Turbo-electric Distributed Propulsion Bench K. Papanthakis, K. Kloesel, Y. Lin, S. Clarke, J. Ediger, S. Ginn, NASA Armstrong Flight Research Center, Edwards, CA	Hybrid Regional Aircraft: A Comparative Review of New Potentials Enabled by Electric Power J. Thuvin, G. Barraud, Airbus, Toulouse, France; M. Buidinger, Clement Ader Institute, Toulouse, France; X. Robom, University of Toulouse, Toulouse, France; D. Leray, Clement Ader Institute, Toulouse, France; B. Sereni, University of Toulouse, Toulouse, France	Airbus Group Electrical Aircraft Program, The E-Fan Project L. Juvé, J. Fosse, E. Joubert, N. Fouquet, Airbus, Suresnes, France	
Monday, 25 July 2016		Space Transportation Development and Progress		151 G
34-APS-2 1530 - 1800 hrs	This panel will focus on future Mars exploration architectures and their transformation from vision to reality.			
Monday, 25 July 2016		Energetic Material, Detonation Transition and Ignition of Components		251 C
35-ECS-1	Chaired by: J. BAGLINI, Exodymics Technology Incorporated and S. SAWHILL, Systima Technologies, Inc.			
1530 hrs AIAA-2016-4614	1600 hrs AIAA-2016-4615			
The Evolution of Retention During DDT of Low Density HMX K. Gonther, P. Rao, Louisiana State University, Baton Rouge, LA	Multiscale Simulation of Shock to Detonation E. Fahrenthold, University of Texas, Austin, Austin, TX			

Monday, 25 July 2016		Energy Technologies for Aerospace and Terrestrial Applications		151 DE
Chaired by: S. DUNCAN, Aerospace Systems Design Laboratory, Georgia Tech and L. MASON, NASA Glenn Research Center				
1530 hrs AIAA-2016-4616 Improving the Simple Gas Turbine Cycle with Compressed Air Energy Storage (CAES) P. Lemieux, California Polytechnic State University, San Luis Obispo, CA	1600 hrs AIAA-2016-4617 Efficient Liquid Fuel Consumption in Household Cooking Appliances without Back-flow Tendencies F. Ajibade, E. Ogedengbe, University of Lagos, Akoka-Tabo, Nigeria			
Monday, 25 July 2016				
37-EP-6				
Chaired by: J. KOO and C. HUERTA				
1530 hrs AIAA-2016-4618 Hall/De Simulations with a First-principles Electron Transport Model Based on the Electron Cyclotron Drift Instability I. Mikellides, B. Jorns, I. Katz, A. Lopez Ortega, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1600 hrs AIAA-2016-4619 Continuum Kinetic Study of Magnetized Sheaths for Use in Hall Thrusters P. Cagas, B. Srinivasan, Virginia Polytechnic Institute and State University, Blacksburg, VA, A. Hakim, Princeton Plasma Physics Laboratory, Princeton, NJ	1630 hrs AIAA-2016-4620 Comparing Two-Dimensional, Axisymmetric, Hybrid-Direct Kinetic and Hybrid-Particle-in-Cell Simulations of the Discharge Plasma in a Hall Thruster A. Roisänen, University of Michigan, Ann Arbor, Ann Arbor, MI; K. Hara, Princeton Plasma Physics Laboratory, Princeton, NJ; I. Boyd, University of Michigan, Ann Arbor, Ann Arbor, MI	1700 hrs AIAA-2016-4621 Development of a hybrid particle-continuum kinetic method for Hall thruster discharge plasmas K. Hara, Princeton Plasma Physics Laboratory, Princeton, NJ; S. Cho, Japan Aerospace Exploration Agency (JAXA), Chofu, Japan	250 A
Monday, 25 July 2016				
38-EP-7				
Chaired by: W. HARGUS, USAF/AERL/RQRC and G. LI				
1530 hrs AIAA-2016-4622 Parametric studies of velocity distribution functions for Xenon ions and neutrals in cylindrical Hall thruster by laser-induced fluorescence I. Romanov, University of Saskatchewan, Saskatoon, Canada; P. Siamus, University of Patras, Patras, Greece; A. Drelho, Y. Raïsses, Princeton Plasma Physics Laboratory, Princeton, NJ; A. Smolyakov, University of Saskatchewan, Saskatoon, Canada	1600 hrs AIAA-2016-4623 Annular Hall Thruster with High Anode Efficiency S. Lee, H. Kim, J. Kim, Y. Lim, W. Choe, Korea Advanced Institute of Science and Technology, Daejeon, South Korea	1630 hrs AIAA-2016-4624 Laser Induced Fluorescence Measurements in a Hall Thruster as a Function of Background Pressure R. Spector, W. Tighe, The Aerospace Corporation, El Segundo, CA	1700 hrs AIAA-2016-4625 Operational Properties of UT-58 Anode Layer Hall Thruster with Modified Magnetic Field and Guard-ring Material J. Bok, Y. Hamada, Y. Hirano, K. Komurasaki, T. Schönher, H. Koizumi, University of Tokyo, Tokyo, Japan	250 B
Monday, 25 July 2016				
39-EP-8				
Chaired by: W. HUANG, NASA Glenn Research Center and J. FRIEMAN				
1530 hrs AIAA-2016-4626 First-principles Modeling of the IAT-driven Anomalous Resistivity in Hollow Cathode Discharges I: Theory B. Jorns, A. Lopez Ortega, I. Mikellides, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1600 hrs AIAA-2016-4627 First-principles modeling of the IAT-driven anomalous resistivity in hollow cathode discharges II: Numerical simulations and comparison with measurements A. Lopez Ortega, I. Mikellides, B. Jorns, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1630 hrs AIAA-2016-4628 Numerical and Experimental Study on Discharge Characteristics of High-Current Hollow Cathode K. Kubota, Japan Aerospace Exploration Agency (JAXA), Chofu, Japan; Y. Oshio, Tokyo University of Agriculture and Technology, Kagamei, Japan; H. Watanabe, Tokyo Metropolitan University, Hino, Japan; S. Cho, Y. Ohkawa, I. Funaki, Japan Aerospace Exploration Agency (JAXA), Chofu, Japan	1700 hrs AIAA-2016-4629 The High Frequency Potential Oscillations Near the Hollow Cathode in Ion Thrusters Y. Qin, K. Xie, Q. Xia, J. Qiyang, Beijing Institute of Technology, Beijing, China	250 C

Monday, 25 July 2016		NEXT Ion Thruster Development		250 D
Chaired by: E. CARDIFF, NASA and D. HERMAN, NASA Glenn Research Ctr				
1530 hrs AIAA-2016-4630 Post-test Examination of NASA's Evolutionary Xenon Thruster Long-Duration Test Hardware: Discharge Chamber	1630 hrs AIAA-2016-4631 Post-test Examination of NASA's Evolutionary Xenon Thruster Long-Duration Test Hardware: Discharge and Neutralizer Cathodes	1630 hrs AIAA-2016-4632 Evolutionary Xenon Thruster Long-Duration Test Hardware: Ion Optics	1700 hrs AIAA-2016-4633 NEXT Thruster Performance Curve Analysis And Validation	
R. Shashy, G. Soutis, NASA Glenn Research Center, Cleveland, OH	R. Shashy, G. Soutis, NASA Glenn Research Center, Cleveland, OH	G. Soutis, R. Shashy, NASA Glenn Research Center, Cleveland, OH	P. Scrippelli, University of Maryland, College Park, College Park, MD; E. Cardiff, J. Englander, NASA Goddard Space Flight Center, Greenbelt, MD	
Monday, 25 July 2016		Launch Vehicle Reusability: Holy Grail, Chasing Our Tail, or Somewhere in Between		Ballroom F
41-F360-2 1530 - 1800 hrs				
Moderator: Dan Dumbacher, Professor Engineering Practice, School of Aeronautics and Astronautics, Purdue University				
Panelists:				
Gary Payton Distinguished Visiting Professor United States Air Force Academy	Jim Paulsen Vice President Program Execution, Advanced Space & Launch Programs Aerojet Rocketdyne	Ben Goldberg Vice President, Science and Engineering, Propulsions Systems Division Orbital ATK	Tom Markusic Co-Founder and Chief Executive Officer Firefly Space Systems	
Monday, 25 July 2016		Fossil-Fuel Power Technologies I		150 DE
Chaired by: B. KHANDREWAL, The University of Sheffield and A. CHOUDHURI, University of Texas at El Paso				
1530 hrs AIAA-2016-4634 Investigation on Flow-Flame Front Characteristics in a Backward Facing Step Combustor Using Laser Diagnostics	1600 hrs AIAA-2016-4635 Conceptual Study of Oxy-Methane Flows in a Constant-Velocity Faraday Magnetohydrodynamic Generator	1630 hrs AIAA-2016-4636 Conceptual Design of a Supercritical Oxyluel Combustor Based on LOX/Methane Rocket Engine Technologies	1700 hrs AIAA-2016-4637 High Intensity Combustion of Methane and Propane using Oxygen Enhanced Air	
A. Acosta-Zamora, M. de la Torre, N. Love, A. Choudhuri, University of Texas, El Paso, TX	M. Hernandez, L. Cabrera, A. Choudhuri, N. Love, University of Texas, El Paso, TX	A. Choudhuri, A. Badhian, L. Cabrera, A. Choudhuri, N. Love, University of Texas, El Paso, TX	A. Said, A. Gupta, University of Maryland, College Park, College Park, MD	
Monday, 25 July 2016		Thermodynamic Topics of Gas Turbine Engines		250 F
Chaired by: X. GAO, Colorado State Univ				
1530 hrs AIAA-2016-4638 Exergy-Based Performance Analysis of a Turbojet Engine	1600 hrs AIAA-2016-4639 Gas Turbine Transient Response to Subsystem Architecture Secondary Power Off-Takes	1630 hrs AIAA-2016-4640 Environmental Assessment of a Micro Turbojet Engine with the Aid of Exergy	1700 hrs AIAA-2016-4641 Aerothermodynamic Benefits of Mixed Exhaust Turbofans	
M. Abbas, D. Riggins, Missouri University of Science and Technology, Rolla, MO	M. Ozcan, I. Chakraborty, J. Tai, D. Mavris, Georgia Institute of Technology, Atlanta, GA	K. Cabon, Anadolu University, Eskisehir, Turkey, Y. Sahret, Suleyman Demirel University, Isparta, Turkey, T. Karakoc, Anadolu University, Eskisehir, Turkey, C. Colgan, Dokuz Eylul University, Izmir, Turkey	S. Khalid, Gas Turbine Systems Solutions, LLC, Palm Beach Gardens, FL	
Monday, 25 July 2016		Compressors I		251 A
Chaired by: M. ATTIA, Embry-Riddle Aeronautical University				
1530 hrs AIAA-2016-4642 Rotor Blade Fault Detection Through Statistical Analysis of Stationary Component Vibration	1600 hrs AIAA-2016-4643 Stationary Simulation of the Fluid-Structure Interaction to Determine the Operating Geometry of a Blade in a Transonic Axial Compressor	1630 hrs AIAA-2016-4644 A Hybrid Vortex Solution for Surge Margin Enhancement in Axial Compressors	1700 hrs AIAA-2016-4645 Stall and Surge Characteristics of a Two-Volume Compression System	1730 hrs AIAA-2016-4646 Computational Study of the Effects of Protuding Studs Casing Treatment on the Performance of an Axial Transonic Turbofan
J. Cox, S. Arnold, P. Anusonti-Inthra, University of Tennessee, Tullahoma, TN	S. Ahlele, R. Niehuis, University of the German Federal Armed Forces, Neubiberg, Germany	M. Attia, D. Port, A. Rozendal, Embry-Riddle Aeronautical University, Daytona Beach, FL	A. Hickman, S. Morris, University of Notre Dame, Notre Dame, IN	M. Colloa, R. Webster, K. Sreenivas, W. Lin, University of Tennessee, Chattanooga, Chattanooga, TN

Monday, 25 July 2016		Air-Breathing Combustors II		251 B
Chaired by: M. LIU, NASA Glenn Research Center and A. CASWELL, USAF AFRL/RQTC				
1530 hrs AIAA-2016-4647	1600 hrs AIAA-2016-4648	1630 hrs AIAA-2016-4649	1700 hrs AIAA-2016-4650	1730 hrs AIAA-2016-4651
Investigation of differences in lean blowout of liquid single-component fuels in a gas turbine model combustor J. Grohmann, B. Rausch, T. Katharina, W. Meier, M. Aigner, German Aerospace Center (DLR), Stuttgart, Germany	The Effect of Axial Spacing of Constant and Variable Blockages on the Deflagration to Detonation Transition in a Pulse Detonation Engine N. Gagnon, M. Afra, Embry-Riddle Aeronautical University, Daytona Beach, FL	Precursors to blowout in a turbulent combustor based on recurrence quantification V. Ujni, R. Sujith, Indian Institute of Technology Madras, Chennai, India	The Impact of Venturi Geometry on Reacting Flows in a Swirl-Venturi Lean Direct Injection Airblast Injector X. Ren, X. Xue, C. Sung, University of Connecticut, Storrs, CT; K. Brady, Innovative Scientific Solutions, Inc., Dayton, OH; H. Mongioi, CSTI Associates, LLC, Yardley, PA; P. Lee, Woodward FSI, Inc., Zeeland, MI	Enhancement of the Open National Combustor Code (Open NCC) and Initial Simulation of Energy Efficient Engine K. Miki, J. Mader, M. Liu, NASA Glenn Research Center, Cleveland, OH
Monday, 25 July 2016				
46-GTE-9				
Chaired by: D. FOUITCH, The Boeing Company				
1530 hrs AIAA-2016-4652	1600 hrs AIAA-2016-4653	1630 hrs AIAA-2016-4654	1700 hrs AIAA-2016-4655	254 B
A Network Scheduling Model for Distributed Control Simulation D. Cully, E. Aretskin-Hanton, G. Thomas, NASA Glenn Research Center, Cleveland, OH	Advanced Control Considerations for Turbofan Engine Design J. Connolly, J. Csank, NASA Glenn Research Center, Cleveland, OH; A. Chicarelli, Vantage Partners, LLC, Brook Park, OH	The Application of Hardware in the Loop Testing for Distributed Engine Control G. Thomas, N&E Engineering, Parma Heights, OH; D. Cully, NASA Glenn Research Center, Cleveland, OH; A. Brand, Spontix Microsystems, Inc., Lafayette, CO	Aircraft Engine Advanced Controls Research under NASA Aeronautics Research Mission Programs S. Gang, NASA Glenn Research Center, Cleveland, OH	
Monday, 25 July 2016				
47-HR-2				
Chaired by: M. KOBALD, DLR/German Aerospace Center and S. COOGAN, Southwest Research Institute				
1530 hrs AIAA-2016-4656	1600 hrs AIAA-2016-4657	1630 hrs AIAA-2016-4658	1700 hrs AIAA-2016-4659	255 B
Hybrid Propulsion In-Situ Resource Utilization Test Facility Results for Performance Characterization F. Mechenal, Stanford University, Stanford, CA; A. Kemp, B. Nakazono, M. Parker, D. Vaughan, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	Experimental Evaluation of a Polyethylene/Nitrous Oxide Axial-Injection, End-Burning Hybrid M. Hirt, R. Frederick, University of Alabama, Huntsville, Huntsville, AL	Throttled Launch-Assist Hybrid Rocket Motor for an Airborne NanoSat Launch Platform. S. Whitmore, Z. Spurrier, S. Walker, S. Metkley, Utah State University, Logan, UT	Investigation on Tri-propellant Hybrid Rocket Performance Y. Chen, National Space Organization, Hsinchu Science Park, Taiwan; A. Lai, J. Lin, S. Wei, T. Chou, J. Wu, National Chiao Tung University, Hsinchu, Taiwan	
Monday, 25 July 2016				
48-HSABP-4				
Chaired by: E. AXDAHL, NASA Langley Research Center and G. PANIAGUA, Purdue University				
1530 hrs AIAA-2016-4660	1600 hrs AIAA-2016-4661	1630 hrs AIAA-2016-4662		255 A
Experimental and Numerical Studies of Kerosene Fueled Scramjet Control Technology Q. Fu, Northwestern Polytechnical University, Xi'an, China	Characterization of the time-resolved starting process of supersonic diffusers N. Thiry, University of Strathclyde, Glasgow, United Kingdom; G. Paniagua, Purdue University, West Lafayette, IN	Prediction of Mixing Efficiency between Incoming Air and Embedded Rocket Exhaust within an RBCC Engine T. Isono, R. Nakano, Tohoku University, Sendai, Japan; S. Tomioka, K. Kudo, A. Murakami, S. Ueda, Japan Aerospace Exploration Agency (JAXA), Kakuda, Japan		

Monday, 25 July 2016		Green Propellants II		251 D
Chaired by: E. BESNARD, California State University—Long Beach and C. KIRCHBERGER, German Aerospace Center (DLR)				
1530 hrs AIAA-2016-4663 Predicting Flashing Phenomena: A Combined Approach of Numerical Simulation and Experiments C. Hendrich, German Aerospace Center (DLR), Hardthausen, Germany; L. Gury, University of Applied Sciences, Wiener Neustadt, Austria; S. Schlechtriem, German Aerospace Center (DLR), Hardthausen, Germany	1600 hrs AIAA-2016-4664 Combustion Characteristics of GAP for the Liquid Monopropellant - Effects of the Spray Droplet Diameters- K. Hayashi, T. Kawaihara, Nihon University, Funabashi, Japan	1630 hrs AIAA-2016-4665 Overview on the Gelled Propellants Activities of DLR Lampoldshausen C. Kirchberger, P. Kröger, M. Negri, H. Ciezki, German Aerospace Center (DLR), Lampoldshausen, Germany	1700 hrs AIAA-2016-4666 Long Duration Test Runs of a Highly Throrifiable Gelled Propellant Rocket Motor P. Pinto, J. Ramsel, K. Bauer, S. Risse, K. Naumann, A. Thumann, Bayern-Chemie, Aschau am Inn, Germany, et al.	1730 hrs AIAA-2016-4667 Green Gelled Propellant Gas Generator for High-Performance Divert- and Attitude Control Systems K. Naumann, G. Tussiwand, Bayern-Chemie, Aschau am Inn, Germany
Monday, 25 July 2016				
50-LP-5				
Chaired by: K. LOHNER, Stanford University				
1530 hrs AIAA-2016-4668 Experimental investigation of cold flow TIC nozzles, a spectral analysis C. Geinin, R. Stark, German Aerospace Center (DLR), Lampoldshausen, Germany	1600 hrs AIAA-2016-4669 Scaling Effects on Side Load Generation in Subscale Rocket Nozzles R. Stark, C. Geinin, German Aerospace Center (DLR), Lampoldshausen, Germany	1630 hrs AIAA-2016-4670 Hybrid RANS-LES Simulation of Separated Nozzle Flow R. Larsson, N. Andersson, Chalmers University of Technology, Göteborg, Sweden; J. Östlund, GKN Aerospace Engine Systems, Trollhättan, Sweden	1700 hrs AIAA-2016-4671 A Numerical Model for Nozzle Flow Application under LOX/CH4 Hot Flow Conditions D. Schneider, C. Geinin, German Aerospace Center (DLR), Lampoldshausen, Germany; S. Karl, V. Hommenam, German Aerospace Center (DLR), Göttingen, Germany	1730 hrs AIAA-2016-4672 CFD Analysis of Film Cooling and Heat Transfer in a Bipropellant Rocket Nozzle, Incorporating Chemically Reacting Flow N. Amato, J. Lylegjan, M. Nanghi, Manhattan College, Riverdale, NY
Monday, 25 July 2016				
51-LP-6				
Chaired by: P. BEHRUZI, Airbus Defence & Space and S. BUSHMAN, Johns Hopkins University Applied Physics Laboratory				
1530 hrs AIAA-2016-4673 Modeling Droplet Heat and Mass Transfer during Spray Bar Pressure Control of the Multipurpose Hydrogen Test Bed (MHTB) Tank in Normal Gravity O. Karuzova, M. Kassemi, NASA Glenn Research Center, Cleveland, OH	1600 hrs AIAA-2016-4674 Self-Pressurization of a Flightweight, Liquid Hydrogen Tank: Simulation and Comparison with Experiments M. Stewart, Vantage Partners, LLC, Cleveland, OH; J. Mader, NASA Glenn Research Center, Cleveland, OH	1630 hrs AIAA-2016-4675 Numerical Approach to Measure Accommodation Coefficients for Long-Duration Spaceflight Cryogenic Propellants S. Alberts, P. Srikanth, S. Collicott, S. Heister, Purdue University, West Lafayette, IN	1700 hrs AIAA-2016-4676 Numerical Modeling of Pressurization of Cryogenic Propellant Tank for Integrated Vehicle Fluid System A. Miquimbar, A. LeClair, A. Hedayat, NASA Marshall Space Flight Center, Huntsville, AL	1730 hrs AIAA-2016-4677 Modeling Ullage Dynamics of Tank Pressure Control Experiment during Jet Mixing in Microgravity O. Karuzova, M. Kassemi, NASA Glenn Research Center, Cleveland, OH
Monday, 25 July 2016				
52-LP-7				
Chaired by: C. GATTO, Jet Propulsion Laboratory and R. BELL, Sierra Nevada				
1530 hrs AIAA-2016-4678 Vinci® propulsion system: Transition from Ariane 5 ME to Ariane 6 J. Sannino, J. Delange, V. De Kover, Airbus, Paris, France; A. Lekaix, B. Vieille, French Space Agency (CNES), Paris, France	1600 hrs AIAA-2016-4679 Extending MESSENGER's Low-Altitude Hover Campaign by Using Helium Pressurant as Cold-Gas Propellant S. Bushman, C. Engelbrecht, S. Flanigan, M. Kirk, J. McAdams, D. Moessner, Johns Hopkins University Applied Physics Laboratory, Laurel, MD	1630 hrs AIAA-2016-4680 Primary Mission Flight Performance of the Van Allen Probes Propulsion Systems J. John, S. Bushman, Johns Hopkins University Applied Physics Laboratory, Laurel, MD	1700 hrs AIAA-2016-4681 Integrated Pressure-Fed Liquid Oxygen / Methane Propulsion Systems – Morphheus Experience, MARE, and Future Applications E. Hurlbert, M. Anwell, J. Meicher, R. Morehead, NASA Johnson Space Center, Houston, TX	1730 hrs AIAA-2016-4682 Cold Helium Pressurization for Liquid Oxygen / Liquid Methane Propulsion Systems: Fully-Integrated Initial Hot-Fire Test Results R. Morehead, M. Anwell, J. Meicher, E. Hurlbert, NASA Johnson Space Center, Houston, TX
Monday, 25 July 2016				
253 AB				

Monday, 25 July 2016		Fusion and Alternative Nuclear Concepts I		150 G
Chaired by: J. CASSIBRY and G. WILLIAMS, Ohio Aerospace Institute				
1530 hrs AIAA-2016-4683 Progress on Computational Modeling of Z-Pinch Nuclear Fusion Reactor Components for Spacecraft Propulsion M. Rodriguez, J. Cassibry, University of Alabama, Huntsville, AL	1600 hrs AIAA-2016-4684 Development of a magnetic thrust chamber for a laser fusion rocket M. Edamoto, N. Saito, T. Morita, N. Yamamoto, (Kyushu University, Kasuga, Japan; A. Sunahara, Osaka University, Suita, Japan; R. Kawashima, Kyushu University, Kasuga, Japan; et al.	1630 hrs AIAA-2016-4685 On the Use of a Pulsed Nuclear Thermal Rocket for Interplanetary Travel. F. Arias, University of Catalonia, Barcelona, Spain	1700 hrs AIAA-2016-4686 Test Suite for Hydrodynamic Modeling for Plasma Driven Magneto-Inertial Fusion K. Schillo, J. Cassibry, M. Rodriguez, University of Alabama, Huntsville, Huntsville, AL	
Monday, 25 July 2016				
54-PC-3				
Chaired by: B. CHEHROUDHI, Advanced Technology Consultants and S. VASU, University of Central Florida				
1530 hrs AIAA-2016-4687 Ignition and Flame Propagation in a Liquid-Fueled Swirling Combustor M. Masquelet, S. Cao, M. Poi, General Electric Company, Niskayuna, NY	1600 hrs AIAA-2016-4689 Alternative Jet Fuel Spray and Combustion at Intermittent-Combustion Engine Conditions J. Temme, M. Jess, C. Kweon, Army Research Laboratory, Aberdeen Proving Ground, MD; V. Coburn, Engility, Aberdeen Proving Ground, MD	1630 hrs AIAA-2016-4690 Burning Rate and Ignition Delay Times of AP/HTPB-Based Solid Rocket Propellants Containing Graphene C. Diller, A. Demko, T. Sammet, Texas A&M University, College Station, TX; K. Grossman, S. Seal, University of Central Florida, Orlando, FL; E. Petersen, Texas A&M University, College Station, TX	1730 hrs AIAA-2016-4688 Design and Test of a Resonance Ignition System for Green In-Orbit Propulsion S. Beyer, O. Haidn, Technical University of Munich, Munich, Germany	255 C
Monday, 25 July 2016				
55-PC-4				
Chaired by: W. ANDERSON, Purdue University and G. LAMANNA, Universitat Stuttgart				
1530 hrs AIAA-2016-4692 Experimental Combustion Investigations from Like-Impingement Sprays of Green Propellants C. Indiana, M. Bellenoue, B. Boust, National Center for Scientific Research (CNRS), Futuroscope, France; S. Peiffer, French Space Agency (CNES), Paris, France	1600 hrs AIAA-2016-4693 Influence of Sleeve Angle on the LBO Performance of TeLESS-II Combustor B. Wang, C. Zhang, X. Hui, Y. Lin, Beihang University, Beijing, China; J. Li, AWC Commercial Aircraft Engine Co., Ltd, Beijing, China	1630 hrs AIAA-2016-4694 A Hybrid Eulerian-Eulerian/Eulerian-Lagrangian Method for Dense-to-Dilute Dispersed Multiphase Reacting Flows A. Panchal, G. Hannebique, M. Akiki, R. Ranjan, S. Menon, Georgia Institute of Technology, Atlanta, GA	1700 hrs AIAA-2016-4695 Crosswise Distribution of Kerosene Spray in Crossflow Y. Zhao, C. Zhang, Y. Lin, Y. Cheng, Beihang University, Beijing, China	255 D
Monday, 25 July 2016				
56-PC-5				
Chaired by: R. HAUSEN, Honeywell and A. STEINBERG, University of Toronto				
1530 hrs AIAA-2016-4696 Analysis of MHD Generators for use with solid rocket motors Y. Metzker, J. Kugele, Technical University of Munich, Munich, Germany; S. Nobbe, Ludwig Maximilian University of Munich, Munich, Germany; O. Haidn, Technical University of Munich, Munich, Germany	1600 hrs AIAA-2016-4697 Application of Additive manufacturing in Solid and Hybrid Grain Design C. Bauer, Y. Metzker, C. von Seehe, M. Mutschler, M. Bombauer, P. Lürge, Technical University of Munich, Munich, Germany; et al.	1630 hrs AIAA-2016-4698 Experimental and numerical investigation of spray characteristics in a new FLOX[®] based combustor for liquid fuels for Micro Gas Turbine Range Extender (MGTREX) J. Gounder, A. Zzin, L. Oliver, M. Rächner, German Aerospace Center (DLR), Stuttgart, Germany; S. Kulkarni, Delft University of Technology, Delft, The Netherlands; M. Aigner, German Aerospace Center (DLR), Stuttgart, Germany	1730 hrs AIAA-2016-4700 Performance and Thermal Characteristics of Low-Power DC Arcjet Thrusters with Radiation-Cooled Anodes for Green Propellants S. Shiraki, H. Tahara, Osaka Institute of Technology, Osaka, Japan	255 E

Monday, 25 July 2016		Solid Rocket Modeling and Simulation		254 A
Chaired by: E. CAVALLINI, University of Roma "La Sapienza" and J. MADALANI, Auburn University				
1530 hrs AIAA-2016-4701	1600 hrs AIAA-2016-4702	1630 hrs AIAA-2016-4703		
Local Linear Stability Analysis of Non-Circular Injection-Driven Channel Flows M. Bouyges, F. Chedevergne, G. Casalis, ONERA, Toulouse, France	Random Vibration Environment Standard Rocket Motors R. Ott, Orbital ATK, Corning, UT	VEGA Launch Vehicle Dynamic Loads due to Solid Propulsion Ignition Transients and Pressure Oscillations E. Cavallini, B. Favini, University of Rome "La Sapienza", Rome, Italy; M. Castelli, A. Neri, ESA, Rome, Italy		
Monday, 25 July 2016				
58-TM-2				
Chaired by: C. TARAU, Advanced Cooling Technologies and M. CHOI, NASA-Goddard Space Flight Center				
1530 hrs Oral Presentation	1600 hrs AIAA-2016-4704	1630 hrs AIAA-2016-4705		151 AB
High Temperature Titanium-Water Heat Pipes for Kilopower Fission Power Systems M. Ababneh, W. Anderson, D. Beard, C. Tarau, Advanced Cooling Technologies, Inc., Lancaster, PA	SwiftBAT Thermal Recovery After Loop Heat Pipe #0 Secondary Heater Controller Failure in October 2015 M. Choi, NASA Goddard Space Flight Center, Greenbelt, MD	Status of the Development of Low Cost Radiator for Surface Fission Power - III C. Tarau, T. Maxwell, W. Anderson, C. Wagner, Advanced Cooling Technologies, Inc., Lancaster, PA; M. Wrosch, Vanguard Space Technologies, Inc., San Diego, CA; M. Briggs, NASA Glenn Research Center, Cleveland, OH		
Monday, 25 July 2016				
59-V5-1				
Chaired by: F. CHANDLER, Boeing Defense, Space & Security and T. CHEN, NASA				
1530 hrs AIAA-2016-4706	1600 hrs AIAA-2016-4707			254 C
Hypersonic Waverider Stream Surface Actuation for Variable Design Point Operation J. Maxwell, University of Maryland, College Park, College Park, MD	Enabling Propulsion Technology Makes Endo/Exoatmospheric Operating Commercial Aircraft Possible B. Ponde, iPropulsion, North Salt Lake, UT			
Monday, 25 July 2016				
60-NW-3				
1800 - 1930 hrs				
Welcome Reception			Exhibit Hall C	
Monday, 25 July 2016				
61-NFF-2				
1930 - 2130 hrs				
Open Forum: Nuclear Propulsion in the 21st Century			150 G	

Tuesday

<p>Tuesday, 26 July 2016</p> <p>62-PLNRY-3 0800 - 0900 hrs</p> <p>Moderator: Janet Kavandi, Director, NASA Glenn Research Center</p> <p>Panelists: Jay Little Director, Advanced Launch Vehicle Propulsion Aerojet Rocketdyne</p> <p>James Maughan Global Technology Director GE Global Research</p> <p>Tom Markusic Co-Founder and Chief Executive Officer Firefly Space Systems</p> <p>Game Changing Developments in Propulsion and Energy</p>		<p>Ballroom A-D</p>	
<p>Tuesday, 26 July 2016</p> <p>63-NW-4 0845- 0930 hrs</p> <p>Networking Coffee Break</p>		<p>Exhibit Hall C</p>	
<p>Tuesday, 26 July 2016</p> <p>64-ABPSI-3</p> <p>Chaired by: J. SLATER, NASA Glenn Research Center and R. STARKEY, University of Colorado Boulder</p> <p>0930 hrs AIAA-2016-4708 Role of wall temperature on shock train in a rectangular isolator H. Lu, D. Wang, Z. Liu, China Academy of Aerospace Aerodynamics, Beijing, China; L. Yue, X. Zhang, Institute of Mechanics, Chinese Academy of Sciences, Beijing, China</p> <p>1000 hrs AIAA-2016-4709 Computational experiments for improving the performance of Engine based on supermulti-jets colliding working for a wide range of speeds from startup to hypersonic condition K. Tsuji, K. Naitoh, Waseda University, Tokyo, Japan</p> <p>1030 hrs AIAA-2016-4710 Investigation on Strut-based RBCC Engine Configuration to Improve Performance in M3-6 D. Yan, G. He, F. Qin, X. Wei, L. Shi, Northwestern Polytechnical University, Xi'an, China</p> <p>Supersonic and Hypersonic Inlets</p>			<p>255 F</p>
<p>Tuesday, 26 July 2016</p> <p>65-AEP-2</p> <p>Chaired by: L. GEA, Boeing Engineering Operations & Technology and C. CHUCK, Boeing Commercial Airplanes</p> <p>0930 hrs AIAA-2016-4711 Principles of High-efficiency Electric Flight J. Barnes, Pelican Aero Group, San Pedro, CA</p> <p>1000 hrs AIAA-2016-4712 Optimizing Power Density and Efficiency of a Double-Halbach Permanent-Magnet Ironless Axial Flux Motor K. Duffy, University of Toledo, Toledo, OH</p> <p>1030 hrs AIAA-2016-4713 Potential of Aircraft Electric Propulsion with SOFC/GT Hybrid Core K. Okai, T. Himeno, T. Watanabe, University of Tokyo, Bunkyo, Japan; H. Nomura, Nihon University, Narashino, Japan; T. Tagashira, A. Nishizawa, Japan Aerospace Exploration Agency (JAXA), Chofu, Japan</p> <p>Aircraft Electric Propulsion II</p>			<p>150 DE</p>
<p>Tuesday, 26 July 2016</p> <p>66-ECD-2</p> <p>Chaired by: C. SANDIFER, NASA Glenn Research Center and S. WILSON, NASA Glenn Research Center</p> <p>0930 hrs AIAA-2016-4714 Development of Filled-Skutterudite Based Thermopile for High Temperature Sensors for Space and Terrestrial Applications K. Smith, B. Li, S. Fridasy, S. Sujitkosol, M. Erico, G. Nakatsukasa, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; et al.</p> <p>1000 hrs AIAA-2016-4715 Development of High Temperature Thermoelectric Device Technologies to Validated Materials Performance and Reliability for Advanced Thermoelectric Couple (ATEC) Program B. Li, S. Fridasy, Y. Ravi, K. Smith, D. Uhl, J. Ni, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; et al.</p> <p>1100 hrs AIAA-2016-4717 Optimal Thickness Analysis of the Microporous Layer in an <i>M. pudica</i> Based Photovoltaic Solar Cell M. Shitta, E. Ogedengbe, I. Feyinbola, University of Lagos, Akoka-Yaba, Nigeria</p> <p>1130 hrs AIAA-2016-4718 Dynamic Model of Solid Oxide Fuel Cell Integrated with Fan and Exhaust Nozzle V. Chakravarthula, R. Roberts, M. Wolff, Wright State University, Dayton, OH</p> <p>Thermoelectric, Fuel Cell, and Photovoltaic Conversion Systems</p>		<p>151 G</p>	

Tuesday, 26 July 2016		Updates to Acceptance Methodologies for Energetic Components		251 C
Chaired by: J. SCOTT, United Launch Alliance, LLC				
0930 hrs AIAA-2016-4719 Variations in the use of dynamics environments in the screening of ordnance components in LAT	1100 hrs AIAA-2016-4720 Methodology for Analyzing Non-Steady-State Thermal Transient Test (T ³) Data	1030 hrs AIAA-2016-4721 Technical Evaluation and Proposed Modifications for Ordnance Component Shock and Random Vibration Test Requirements		
J. Scott, K. Kostelka, United Launch Alliance, Centennial, CO	L. Yang, Self, La Canada Flintridge, CA	J. Niehues, United Launch Alliance, Centennial, CO		
Tuesday, 26 July 2016				
68-EDU-2				
Chaired by: M. HITT, The University of Alabama in Huntsville and R. REZENDE				
0930 hrs AIAA-2016-4722 UAH Propulsion Research Center - 25th Anniversary Highlights	1000 hrs AIAA-2016-4723 K-12 Minority STEM Education Program: MAA Southwest	1030 hrs AIAA-2016-4724 An Overview of Combustion Instabilities and Rocket Engine Injector Design	1100 hrs AIAA-2016-4725 Overview of X-Ray Techniques for Solid Rocket Propellant Regression Measurements	251 B
R. Frederick, University of Alabama, Huntsville, Huntsville, AL	H. Keerthi, P. Uptergrove, M. Everett, N. Love, A. Choudhuri, University of Texas, El Paso, El Paso, TX	C. Straschus, R. Frederick, University of Alabama, Huntsville, Huntsville, AL	D. Jones, R. Frederick, University of Alabama, Huntsville, Huntsville, AL	
Tuesday, 26 July 2016				
69-EP-10				
Chaired by: J. POLK, Jet Propulsion Laboratory and S. SAMPLES				
0930 hrs AIAA-2016-4726 A Unified Model for Axial-Radial and Axial-Azimuthal Hall Thruster Simulations	1000 hrs AIAA-2016-4727 Influence of multiple factors on electron behavior and transport process in a miniaturized hall thruster	1030 hrs AIAA-2016-4728 The Effects of Cathode Boundary Condition on Particle Simulation of a SPT-100-like Hall Thruster		250 A
R. Kawashima, University of Tokyo, Tokyo, Japan; K. Haru, Princeton Plasma Physics Laboratory, Princeton, NJ; K. Komurasaki, H. Koizumi, University of Tokyo, Tokyo, Japan	Q. Liu, H. Tang, J. Ren, X. Shi, X. Lu, Beihang University, Beijing, China	S. Cho, Japan Aerospace Exploration Agency (JAXA), Tokyo, Japan; H. Watanabe, Tokyo Metropolitan University, Tokyo, Japan; K. Kubota, I. Funaki, Japan Aerospace Exploration Agency (JAXA), Tokyo, Japan		
Tuesday, 26 July 2016				
70-EP-11				
Chaired by: L. KING, Michigan Technological University and B. DANKONGKAKUL				
0930 hrs AIAA-2016-4729 Overview of Iodine Propellant Hall Thruster Development Activities at NASA Glenn Research Center	1000 hrs AIAA-2016-4730 Engineering Model Propellant Feed System Development for an Iodine Hall Thruster Demonstration Mission	1030 hrs AIAA-2016-4731 Condensable Propellant Hall Thruster for Metallic Thin Film Deposition		250 B
H. Kamitani, T. Haog, G. Benavides, T. Hickman, T. Smith, NASA Glenn Research Center, Cleveland, OH; G. Williams, Ohio Aerospace Institute, Cleveland, OH; et al.	K. Polzin, S. Peoples, A. Martinez, J. Seixal, S. Mauro, A. Burt, NASA Marshall Space Flight Center, Huntsville, AL; et al.	M. Hopkins, Riverside Research, Beaver Creek, OH; L. King, J. Drelich, J. Goldman, Michigan Technological University, Houghton, MI; K. Baker, William Beaumont Hospital, Royal Oak, MI		

Tuesday, 26 July 2016		Hollow Cathode Development		250 C
Chaired by: I. MIKELIDES, Jet Propulsion Laboratory and C. DODSON				
0930 hrs AIAA-2016-4732 Characterization and Qualification of a Low Current Heaterless Hollow Cathode D. Lev, G. Alon, D. Mikitchuk, L. Appel, Rafael, Haifa, Israel	1000 hrs AIAA-2016-4733 Advanced Dispenser-Type Cathode Development for Electric Propulsion W. Ohlinger, Self, Babson Park, FL; B. Vancil, eBeam, Inc., Beaverton, OR; J. Polk, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA			
Tuesday, 26 July 2016				
72-EP-13 Helicon Thruster				
Chaired by: E. PENCIL, NASA Glenn Research Center and N. ARTHUR				
0930 hrs AIAA-2016-4734 Current Status of the Helicon Injected Inertial Plasma Electrostatic Rocket D. Ahern, G. Wiley, University of Illinois, Urbana-Champaign, Urbana, IL	1000 hrs AIAA-2016-4735 Effects of Water Vapor Propellant on Helicon Thruster Performance E. Petro, R. Sedwick, University of Maryland, College Park, College Park, MD	1030 hrs AIAA-2016-4736 A Solid Propellant High Power Helicon Thruster I. Johnson, B. Roberson, R. Winglee, University of Washington, Seattle, WA; I. Slobodov, J. Prager, T. Ziemba, Eagle Harbor Technologies, Inc., Seattle, WA	1100 hrs AIAA-2016-4737 Downstream Antenna to the High Power Helicon Thruster B. Roberson, I. Johnson, I. Slobodov, R. Winglee, University of Washington, Seattle, WA; J. Prager, T. Ziemba, Eagle Harbor Technologies, Inc., Seattle, WA	250 D
Tuesday, 26 July 2016				
73-EP-14 Electrospray II				
Chaired by: J. DAMKANICH, NASA Marshall Space Flight Center and C. MILLER				
0930 hrs AIAA-2016-4738 Microfluidic Electrospray Propulsion (MEP) Thruster Performance with Microfabricated Emitter Arrays for Indium Propellant C. Marrese-Reading, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1000 hrs AIAA-2016-4739 Electrospray Thruster Propellant Feedsystem for a Gravity Wave Observatory Mission N. Demmans, N. Lamine, Busek Company, Inc., Natick, MA; J. Ziemer, M. Parker, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; D. Spence, Busek Company, Inc., Natick, MA	1030 hrs AIAA-2016-4740 Mass Spectrometry of Selected Ionic Liquids in Capillary Electrospray at Nanoliter Volumetric Flow Rates S. Miller, Boston College, Chestnut Hill, MA; B. Prince, R. Bemish, Air Force Research Laboratory, Kirtland AFB, NM; J. Rovey, Missouri University of Science and Technology, Rolla, MO		250 E
Tuesday, 26 July 2016				
74-F360-3/1P-11 Liquid Propulsion History Session: Lessons Learned				
0930 - 1200 hrs Chaired by: T. Kent Pugmire (ret.)				
Ballroom F				
Leaders in the liquid propulsion community share their personal experiences from working in academia, small and large aerospace companies, and government institutions. Topics covered range from dealing with technical and programmatic difficulties in system and organization evolutions to personal challenges encountered.				
Making Rocket Programs a Success in Universities? Eric Besnard Professor of Mechanical and Aerospace Engineering California State University, Long Beach		History of the Maurice Zucrow Lab at Purdue University Stephen Heister Raisbeck Distinguished Professor, Director of the Maurice J. Zucrow Laboratory Purdue University		International Cooperation on the Delta, Sea Launch and Antares Programs John Steinmeyer Business Development Director Orbital ATK
Lessons Learned from Industry, Private Venture, and Federal Government Michael Kelly Chief Engineer, FAA Office of Commercial Space Transportation Federal Aviation Administration		30 Years after Challenger - Ethics Lessons Learned but Forgotten Allan McDonald Aerospace Consultant and Author of <i>Truth, Lies, and O-Rings: Inside the Space Shuttle Challenger Disaster</i>		

Tuesday, 26 July 2016		Low Carbon Aviation-Propulsion Integration, Gas Turbines, and Fuels		254 B
Chaired by: M. BRADLEY, Boeing Commercial Airplanes and T. ABDEL-SALAM, East Carolina University				
0930 hrs Oral Presentation National Research Council - Low Carbon Aviation: Study Background and Expectations B. Esker, NASA Headquarters, Washington DC, D.C.	1100 hrs Oral Presentation Sustainable Alternative Jet Fuel Deployment for Low Carbon Aviation: Goals, Progress, and Research Needs Remaining S. Conka, Commercial Aviation Alternative Fuels Initiative (CAAFI), Washington, D.C.	1030 hrs Oral Presentation The Role and Future of Gas Turbine Propulsion in Low Carbon Aviation A. Epstein, Pratt & Whitney, Palm Beach, FL	1130 hrs Oral Presentation Low Carbon Aviation: Fleet Level System Studies D. Delarentis, Purdue University, West Lafayette, IN	
Tuesday, 26 July 2016				
76-G1E-7				
Chaired by: M. RICKLICK, Embry Riddle Aeronautical University				
0930 hrs AIAA-2016-4741 Validation of Magnetic Resonance Thermometry through Experimental and Computational Approaches J. Spinaak, M. Samland, B. Tremont, A. McQuarrier, E. Williams, M. Benson, U.S. Military Academy, West Point, NY, et al.	1030 hrs AIAA-2016-4742 Experimental Analysis of an Axial Turbine Driven by Periodic Pressure Pulses M. Fernelius, S. Gorrell, Brigham Young University, Provo, UT	1030 hrs AIAA-2016-4743 A Detailed Experimental and Numerical Investigation of Flow and Heat Transfer in a Single Row Narrow Impingement Channel Using PIV and LES J. Hossain, E. Fernandez, J. Kopat, University of Central Florida, Orlando, FL		250 F
Tuesday, 26 July 2016				
77-G1E-8				
Chaired by: K. MANI, Rolls-Royce Corporation				
0930 hrs AIAA-2016-4744 Design and Analysis of a High Pressure Ratio Mixed Flow Compressor Stage A. Nassar, G. Gni, SofrinWay, Inc., Bengaluru, India; L. Maroz, A. Sheybina, I. Klimov, SofrinWay, Inc., Burlington, MA	1000 hrs AIAA-2016-4745 Validation of a Two-Equation VLES Turbulence Model Using a Transonic Axial Compressor Stage R. Kelly, A. Hickman, K. Shj, S. Morris, A. Jemcov, University of Notre Dame, Notre Dame, IN	1030 hrs AIAA-2016-4746 Implementation of Fourier methods in CFD to analyze distortion transfer and generation through a transonic fan M. Peterson, S. Gorrell, Brigham Young University, Provo, UT; M. List, Air Force Research Laboratory, Wright-Patterson AFB, OH; C. Custer, CD-adapco, Northville, MI		251 A
Tuesday, 26 July 2016				
78-HR-3				
Chaired by: B. EVANS, Stanford University and S. CLAFLIN, Aerojet Rocketdyne				
0930 hrs AIAA-2016-4747 Method for Determining Nozzle Throat Erosion History in Hybrid Rockets L. Kamys, Y. Saito, R. Kawabata, Y. Takahashi, H. Nogeita, Hokkaido University, Sapporo, Japan	1000 hrs AIAA-2016-4748 Numerical analysis of grain port scale and firing test of long-time working hybrid motor X. Sun, H. Tian, Y. Zhang, H. Zhu, Beihang University, Beijing, China	1030 hrs AIAA-2016-4749 Optimization of Hybrid Sounding Rockets Through Coupled Motor-Trajectory Simulation M. Ghilardi, F. Barato, D. Pavarin, University of Padua, Padua, Italy	1130 hrs AIAA-2016-4750 Scaling of Hybrid Rocket Motors with Swirling Oxidizer Injection - Part 2 E. Paccagnella, F. Barato, D. Pavarin, University of Padua, Padua, Italy; A. Karabeyoglu, Space Propulsion Group, Inc., Palo Alto, CA	253 AB
1130 hrs AIAA-2016-4751 Quasi 1-D Numerical Analysis of Combustion Instability in Hybrid Rocket Motor Incorporating Boundary Layer Lags G. Karthikeyan, T. Shimada, Japan Aerospace Exploration Agency (JAXA), Sagamihara, Japan				

Tuesday, 26 July 2016		Combustion Dynamics and Mixing Efficiencies II		255 B
Chaired by: B. CANTWELL, Stanford University and Y. CHEN, National Space Organization Taiwan				
0930 hrs AIAA-2016-4752 Experimental and Analytical Investigation of Effect of Pressure on Regression Rate of Axial-Injection End-Burning Hybrid Rockets Y. Saito, T. Yokoi, H. Magata, Hokkaido University, Sapporo, Japan; H. Yasukochi, K. Soeda, University of Tokyo, Tokyo, Japan; T. Tohmi, Hokkaido University, Sapporo, Japan; et al.	1000 hrs AIAA-2016-4753 Measuring Nozzle Erosion in a Hybrid Rocket Motor with Ultrasound P. Nassoi, K. Venkataraman, K. Stober, B. Cantwell, Stanford University, Stanford, CA	1030 hrs AIAA-2016-4754 Development of a Hybrid Rocket Slab Motor R. Theba, C. Veale, C. Bernant, University of Kwazulu-Natal, Durban, South Africa	1100 hrs AIAA-2016-4755 Fuel Regression Behavior of a Swirling-Injection End-Burning Hybrid Rocket Engine using Paraffin-based Fuels Y. Oshige, D. Hayashi, T. Sakurai, Tokyo Metropolitan University, Hino, Japan	
Tuesday, 26 July 2016				
80-HSABP-5				
Chaired by: F. MALO-MOLINA, Raytheon Missile Systems and F. LADEINDE, TTC Technologies Inc				
0930 hrs AIAA-2016-4756 Combustion Performance of Hydrocarbon Fuel in a Dual-Mode Combustor K. Nojima, M. Soejima, T. Arakawa, Tohoku University, Sendai, Japan; S. Tomioka, N. Sakuramaka, Japan Aerospace Exploration Agency (JAXA), Kakuda, Japan	1000 hrs AIAA-2016-4757 Research on Mixing Control by Injection Scheme in Dual-Mode Combustor T. Arakawa, S. Ishizaki, K. Nojima, Tohoku University, Sendai, Japan; S. Tomioka, N. Sakuramaka, Japan Aerospace Exploration Agency (JAXA), Kakuda, Japan	1030 hrs AIAA-2016-4758 Performance Prediction of Diverging Dual-mode Combustors at Ramjet-mode Operation S. Tomioka, M. Takahashi, K. Kobayashi, K. Imai, Japan Aerospace Exploration Agency (JAXA), Kakuda, Japan; K. Nojima, T. Arakawa, Tohoku University, Sendai, Japan	1130 hrs AIAA-2016-4760 Supersonic Mixing and Combustion studies using Decoupling Strategy Y. Wang, W. Song, Northwestern Polytechnical University, Xi'an, China; H. Bai, China Aerodynamics Research and Development Center (CARDC), Mianyang, China	254 C
Tuesday, 26 July 2016				
81-HSABP-6				
Chaired by: V. TANGIRALA, General Electric and R. SPRINGER, Johns Hopkins University Applied Physics Laboratory				
0930 hrs AIAA-2016-4761 Detached Eddy Simulation of a high-Ma regenerative-cooled scramjet combustor based on skeletal kerosene mechanism W. Yoo, Y. Lu, X. Li, J. Wang, X. Fan, Chinese Academy of Sciences, Beijing, China	1000 hrs AIAA-2016-4762 Computational Analysis of Flow Phenomena in a Back-Pressured Supersonic Isolator M. Hagenmeier, E. Hasson, Air Force Research Laboratory, Wright-Patterson AFB, OH	1030 hrs AIAA-2016-4763 Control of Shock-Induced Boundary Layer Separation by High-Momentum Blowing D. Cuppoletti, C. Saucier, C. Harris, Northrop Grumman Corporation, El Segundo, CA	1100 hrs AIAA-2016-4764 CFD Analysis of Mixing Characteristics of Several Fuel Injectors at Hypervelocity Flow Conditions T. Drozda, R. Bourle, NASA Langley Research Center, Hampton, VA	255 A
Tuesday, 26 July 2016				
82-ITAR-1				
Chaired by: C. UJ, Air Force Office of Scientific Research and K. MILLSAPS, Naval Postgraduate School				
0930 hrs AIAA-2016-4765 Initial Comparison of Experimental and Numeric Premixed Rotating Detonation Engines I. Andrus, P. King, M. Polonka, Air Force Institute of Technology, Wright-Patterson AFB, OH; F. Schauer, Air Force Research Laboratory, Wright-Patterson AFB, OH; J. Hoke, Innovative Scientific Solutions, Inc., Dayton, OH	1000 hrs Oral Presentation MRL Simulations of a Rotating-Detonation-Wave Engine Concept K. Kailasmath, D. Schrier, Naval Research Laboratory, Washington, D.C.	1030 hrs AIAA-2016-4766 Integrated Fiber Optic Sensor (IFOS) System N. Ma, Physical Optics Corporation, Torrance, CA; A. Ghoshal, Army Research Laboratory, Aberdeen Proving Ground, MD; T. Nielsen, V. Romanov, Physical Optics Corporation, Torrance, CA	1100 hrs AIAA-2016-4767 Thermodynamics of RDE Flow with Axial Flow Turbine C. Nordeen, University of Connecticut, Storrs, CT; R. Mumpalli, Z. Liu, HyPerComp, Inc., Westlake Village, CA; B. Gegegn, University of Connecticut, Storrs, Storrs, CT	151 DE

Tuesday, 26 July 2016		Nozzles II		251 D
Chaired by: S. FORDE, Aerojet Rocketdyne and S. MILLER, Aerojet Rocketdyne				
0930 hrs AIAA-2016-4768	1000 hrs AIAA-2016-4769	1030 hrs AIAA-2016-4770	1100 hrs AIAA-2016-4771	
Performance Evaluation of Aerospace Nozzles for Lucrative Thrust Vector Control S. Ajith, A. S. M. Raj, R. S. Kumaraguru, College of Technology, Coimbatore, India; T. Ramesh Kumar, Auburn University, AL; A. V. Sanaal Kumar, Kumaraguru College of Technology, Coimbatore, India	3D Numerical Studies on Thrust Vectoring using Shock Induced Self Impinging Secondary Jets N. Vishnu, S. Vigneshwaran, S. Vignesh, Nichith S. Sharan, V. Sanaal Kumar, Kumaraguru College of Technology, Coimbatore, India	Diagnostic Investigation of Nozzle Flow Choking Time and Stage Separation Sequence of a Multi-stage Rocket V. Sanaal Kumar, Nichith S. Vigneshwaran, A. S. A. Kumar, S. Ajith, Kumaraguru College of Technology, Coimbatore, India; et al.	Rapid Fabrication Techniques for Liquid Rocket Channel Wall Nozzles P. Gradl, NASA Marshall Space Flight Center, Huntsville, AL	
Tuesday, 26 July 2016				
Chaired by: M. MEYER, NASA Glenn Research Center and D. KIRK, Florida Institute of Technology				
0930 hrs AIAA-2016-4772	1000 hrs AIAA-2016-4773	1030 hrs AIAA-2016-4774	1100 hrs AIAA-2016-4775	
A Detailed Historical Review of Propellant Management Devices for Low Gravity Propellant Acquisition J. Harwig, NASA Glenn Research Center, Cleveland, OH	Experimental Investigation on Liquid Acquisition Devices by Mesh-type Baffles S. Hamajima, T. Himeno, Y. Sokuma, University of Tokyo, Tokyo, Japan; Y. Umemura, H. Negishi, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan; K. Ishikawa, Mitsubishi Group, Nagoya, Japan; et al.	Analytical Prediction of Peak Pressure Transients Occurring During The Priming of a Spacecraft Propulsion System J. Flynn, Orbital ATK, Dulles, VA	Design and Operation of a Calorimeter for Advanced Multilayer Insulation Testing D. Chato, W. Johnson, NASA Glenn Research Center, Cleveland, OH; N. Van Dresar, Self, Driggs, ID	
Tuesday, 26 July 2016				
Chaired by: M. RODRIGUEZ and B. PALASZEWSKI, NASA Glenn Research Center				
0930 hrs AIAA-2016-4776	1000 hrs AIAA-2016-4777	1030 hrs AIAA-2016-4778		150 G
Inertial Electrostatic Confinement Fusion Simulation and a Statistical Treatment of Coulomb Collisions A. Chap, R. Sedwick, University of Maryland, College Park, College Park, MD	Novel Inertial Electrostatic Confinement Fusion with Buckyball Shaped Grids J. Wulfschlaer, M. Tajmar, Technical University of Dresden, Dresden, Germany	A Hybrid Solid/Gas Core Nuclear Thermal Rocket Engine for Future Solar System Exploration. L. Beveridge, Idaho State University, Pocatello, ID		
Tuesday, 26 July 2016				
Chaired by: T. JACKSON, University of Florida and N. SLAVINSKAYA, DLR - German Aerospace Center				
0930 hrs AIAA-2016-4779	1000 hrs AIAA-2016-4780	1030 hrs AIAA-2016-4781	1100 hrs AIAA-2016-4782	
Characterizing NOx Emissions for Air-Breathing Rotating Detonation Engines D. Schiwer, K. Kaltsanath, Naval Research Laboratory, Washington, D.C.	Density Functional Theory Investigations on Bulk Iridium Structures for ReaxFF Catalysis Parameterization D. Depew, J. Wang, University of Southern California, Los Angeles, CA	Skeletal Mechanism of the Methane Oxidation for Space Propulsion Applications N. Slawinskaya, German Aerospace Center (DLR), Stuttgart, Germany; O. Haidn, Technical University of Munich, Munich, Germany	Ignition Delay Testing of Various Hypergolic Ionic liquids and Oxidizers A. Thomas, K. Stober, Stanford University, Stanford, CA; R. Al-Omari, M. Aloraini, N. Almuqati, King Abdulaziz City for Science and Technology, Riyadh, Saudi Arabia; B. Evans, Stanford University, Stanford, CA, et al.	
Tuesday, 26 July 2016				
Chaired by: T. JACKSON, University of Florida and N. SLAVINSKAYA, DLR - German Aerospace Center				
Combustion Chemistry				
255 C				

Tuesday, 26 July 2016		Air-Breathing Combustion Modeling		255 D
Chaired by: S. MENON, Georgia Institute of Technology and L. SMITH, United Technologies Research Center				
0930 hrs AIAA-2016-4783 CFD Based Design of a Filming Injector for N+3 Combustors K. Almani, Vantage Partners, LLC, Cleveland, OH; H. Mongioi, Purdue University, West Lafayette, IN; P. Lee, Woodward FST, Inc., Zeeland, MI	1000 hrs AIAA-2016-4784 Effect of Radiation on Gas Turbine Combustor Liner Temperature with Conjugate Heat Transfer (CHT) Methodology Y. Soygin, S. Uslu, TOBB University of Economics and Technology, Ankara, Turkey	1030 hrs AIAA-2016-4785 LES validation practices in a model aero-engine combustor at engine relevant conditions S. Yellapantula, K. Venkatesan, General Electric Company, Niskayuna, NY; A. Prati, C. Slabaugh, R. Lucht, Purdue University, West Lafayette, IN	1100 hrs AIAA-2016-4786 Large-Eddy Simulation of a Full Annular RQL Combustion Chamber & Fuel Distribution Effects on the Combustor Exit Temperature Profile O. Kocaman, I. Aksu, S. Uslu, TOBB University of Economics and Technology, Ankara, Turkey	
Tuesday, 26 July 2016				
88-PC-8				
Chaired by: V. SANKARAN, US Air Force/AFRL/RQRC and H. TERASHIMA, Hokkaido University				
0930 hrs AIAA-2016-4787 Cryogenic Flashing Jets: A Review (Invited Paper) G. Lomanno, University of Stuttgart, Stuttgart, Germany	1000 hrs AIAA-2016-4788 Trajectory and Breakup of Cryogenic Jets in Crossflow W. Richards, A. Steinberg, University of Toronto, Toronto, Canada	1030 hrs AIAA-2016-4789 Sub- or Supercritical? A flamelet analysis of high pressure rocket propellant injection D. Banaji, Stanford University, Stanford, CA; J. Hickey, University of Waterloo, Waterloo, Canada; M. Ihme, Stanford University, Stanford, CA	1100 hrs AIAA-2016-4790 Injection of Cryogenic Propellants under Low Pressure Conditions M. Luo, O. Haidn, Technical University of Munich, Munich, Germany	1130 hrs AIAA-2016-4791 High Fidelity Large Eddy Simulation of Reacting Supercritical Fuel Jet-in-Cross-Flow using GPU acceleration K. Gortiiparthi, R. Sankaran, Oak Ridge National Laboratory, Oak Ridge, TN; J. Oefelein, Sandia National Laboratories, Livermore, CA
Tuesday, 26 July 2016				
89-SR-3				
Chaired by: A. SPURLING, Naval Air Warfare Center Weapons Division and C. ROUSSEAU, Demel (Pty) Ltd.				
0930 hrs AIAA-2016-4792 Global Instability of the Compressible Taylor-Culick Solution in Cylindrical Rockets M. Akiki, Georgia Institute of Technology, Atlanta, GA; J. Alajidani, Auburn University, Auburn, AL	1000 hrs AIAA-2016-4793 Motor Scale and Propellant Geometry Effects on Pressure Oscillations in Aft-Finocyl Solid Rocket Motors E. Cavallini, B. Favini, University of Rome "La Sapienza", Rome, Italy; A. Neri, ESA, Rome, Italy			254 A
Tuesday, 26 July 2016				
90-TM-3				
Chaired by: J. MEHTA, Belcan AETD and C. TARAU, Advanced Cooling Technologies				
0930 hrs AIAA-2016-4794 Investigations into the thermal performance of a helically coiled closed loop oscillating heat pipe S. Yeboah, University of Nottingham, Ningbo, China; J. Darukwa, University of Nottingham, Nottingham, United Kingdom	1000 hrs AIAA-2016-4795 Development of a radioactive heating system for studies of heat transfer in fuel-cooled structures D. Dong, Y. Lu, Y. Yuan, X. Fan, Chinese Academy of Sciences, Beijing, China	1030 hrs AIAA-2016-4796 Copper-Methanol Heat Pipes Development for Electronics Cooling of Surveillance Equipment R. Riehl, National Institute for Space Research (INPE), São José dos Campos, Brazil	1100 hrs AIAA-2016-4797 A novel spiral regenerator suitable for MICSE and the study on its hybrid thermodynamic cycle Z. Zhang, G. Huang, C. Xia, Y. Xu, Nanjing University of Aeronautics and Astronautics, Nanjing, China	1130 hrs AIAA-2016-4798 Investigation of Insulation Effect on Spacecraft Thermal Control System A. Farag, Egyptian Armed Forces, Cairo, Egypt; A. Elzohaby, Tanta University, Cairo, Egypt; M. Khalil, T. Wafi, Egyptian Armed Forces, Cairo, Egypt; E. Khalil, Cairo University, Giza, Egypt
Thermal System Applications and Unique Environments III				
151 AB				

Tuesday, 26 July 2016		High Power Systems for Aerospace Applications		Ballroom A-D	
91-PLNRY-4 1300 - 1430 hrs		Moderator: Graham Warwick, Managing Editor, Technology, Aviation Week and Space Technology		Randy Furnas Chief, Power Division NASA Glenn Research Center	
Panelists:		John "Rick" Hooker Design Engineer Lockheed Martin/Aeronautics		John H. Scott Chief Technologist, Propulsion and Power Division NASA Johnson Space Center	
John Nairus Chief Engineer, Power & Control Division Air Force Research Laboratory					

Tuesday, 26 July 2016		Networking Coffee Break		Exhibit Hall C	
92-NW-5 1430 - 1500 hrs					

Tuesday, 26 July 2016		Subsonic Inlets & Aerodynamic Interaction		255 F	
93-ABPSI-4		Chaired by: T. BERENS, AIRBUS Defence and Space and M. HAGEMAN			
1500 hrs AIAA-2016-4799	1500 hrs AIAA-2016-4800	1600 hrs AIAA-2016-4801	1630 hrs AIAA-2016-4802	1700 hrs AIAA-2016-4803	
Design point analysis of a distributed propulsion system with boundary layer ingestion implemented in UAV's for agriculture in the Andean region	Installed Performance Assessment of a Boundary Layer Ingesting Distributed Propulsion System at Design Point	Numerical Investigation of the Effect of Wing Position on the Aeroacoustic Field of a Propeller	Three Dimensional Design Optimization Using Adjoint Method with Newton Krylov Solver	Studies on Boundarylayer Blockage and External Flow Choking at Moving Wing in Ground Effect	S. Vignesh, S. Ganesh Shankar, S. Ajith, S. Vivek, S. Mani, V. Sanal Kumar, Kumaraguru College of Technology, Coimbatore, India
E. Valencia, National Polytechnic School, Quito, Ecuador; V. Hidalgo, Tsinghua University, Beijing, China; J. Caceres, National Polytechnic School, Quito, Ecuador	C. Goldberg, D. Nallanda, P. Phillips, D. MacManus, Cranfield University, Cranfield, United Kingdom; J. Felder, NASA Glenn Research Center, Cleveland, OH	D. Boots, D. Feszty, Carleton University, Ottawa, Canada	A. Yildirim, S. Eyi, Middle East Technical University, Ankara, Turkey		


Tuesday, 26 July 2016		Advanced Engine Control & Intelligent Systems II		150 DE	
94-AEC-2		Chaired by: R. MILLAR, Naval Postgraduate School and A. BEHBAHANI, AFRL/RQT			
1500 hrs AIAA-2016-4804	1500 hrs AIAA-2016-4805	1600 hrs AIAA-2016-4806	1630 hrs AIAA-2016-4807	1700 hrs AIAA-2016-4808	1730 hrs AIAA-2016-4809
Intelligent Modal-Based Controls Technologies for Integrated Propulsion Energy / Power / Thermal Management Systems	Development of Distributed Control Systems for Aircraft Turbofan Engines	Modeling of a Gas Turbine Using Distributed Networks with Smart Nodes and Multiple Time Delays	Performing Diagnostics & Prognostics on Simulated Engine Failures Using Neural Networks	Reconfigurable Distributed Control Systems for Turbine Engine Operation Uncertainties	Integrated Robust and Resilient Control of Propulsion Systems
A. Behbahani, Air Force Research Laboratory, Wright-Patterson AFB, OH; R. Roberts, Wright State University, Dayton, OH; A. Chandoke, Air Force Research Laboratory, Wright-Patterson AFB, OH	T. Seitz, Ohio State University, Columbus, OH; O. Macmann, University of Cincinnati, Cincinnati, OH; A. Behbahani, Air Force Research Laboratory, Wright-Patterson AFB, OH; E. Khoury, Purdue University, Lafayette, IN	T. Seitz, R. Yedavalli, Ohio State University, Columbus, OH; O. Macman, University of Cincinnati, Cincinnati, OH; A. Behbahani, Air Force Research Laboratory, Wright-Patterson AFB, OH	O. Macmann, University of Cincinnati, Cincinnati, OH; T. Seitz, Ohio State University, Columbus, OH; A. Behbahani, Air Force Research Laboratory, Wright-Patterson AFB, OH; K. Cohen, University of Cincinnati, Cincinnati, OH	S. Zeir-Sabatto, M. Baduzzaman, C. McCurry, Tennessee State University, Nashville, TN; A. Behbahani, Air Force Research Laboratory, Wright-Patterson AFB, OH	A. Behbahani, Air Force Research Laboratory, Wright-Patterson AFB, OH; O. Macmann, University of Cincinnati, Cincinnati, OH; T. Seitz, Ohio State University, Columbus, OH; R. Buehner, Wright State University, Dayton, OH

Tuesday, 26 July 2016		Advanced Propulsion Concepts I		251 D	
95-APC-2		Chaired by: A. REISZ, Reisz Engineers and J. ROBINSON, Retired f/Boeing			
1500 hrs AIAA-2016-4810	1500 hrs AIAA-2016-4811	1600 hrs AIAA-2016-4812	1630 hrs AIAA-2016-4813		
Parametric Cycle Analysis of a Turbofan with Core Engine Replaced by Revolutionary Innovative Turbine Engine	Computational Fluid Dynamics Simulations and Validation of a Novel Constant Volume Combustion Jet Engine	Aerodynamic Design and Analysis of the Hyperloop Pod	Experimental Investigation of a Baffled-Tube Ram Accelerator		
F. Yang, Z. Wang, Z. Liu, L. Zhou, X. Zhang, Northwestern Polytechnical University, Xi'an, China	J. Travis, A. Kuznetsov, North Carolina State University, Raleigh, NC; W. Roberts, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia	J. Braun, J. Sousa, C. Pekardon, Purdue University, West Lafayette, IN	University of Washington, Seattle, WA; A. Higgins, McGill University, Montreal, Canada		

Tuesday, 26 July 2016		Space Nuclear Power Generation		151 G
Chaired by: J. HAINES, Retired - formerly ESA/ESTEC and M. PATEL, US Merchant Marine Academy				
1500 hrs AIAA-2016-4814	1530 hrs AIAA-2016-4815	1600 hrs AIAA-2016-4816	1630 hrs AIAA-2016-4817	
Performance Testing of the EU/QU MMRG C. Barkley, University of Dayton Research Institute, Dayton, OH; B. Tolson, UFS, Inc., Dayton, OH; G. Bobina, N. Keyawa, W. David, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	The Selenide Saga: A Contribution Toward a History of the Selenide Isotope Generator G. Bennett, Metaspaces Enterprises, Boise, ID	Advanced Stirling Radioisotope Generator EUZ Anomaly Investigation E. Lewandowski, S. Orni, NASA Glenn Research Center, Cleveland, OH	Enhancement of the Multi-Mission Radioisotope Thermoelectric Generator with Efficient Skutterudite Thermoelectric Couples: Current Status of the Skutterudite Technology Maturation Program T. Holgate, Y. Song, D. Shi, R. Utz, I. Chung, R. Bennett, Teledyne, Hunt Valley, MD; et al.	
Tuesday, 26 July 2016				
Chaired by: E. OGEDENGE, ENERGHX Consulting/University of Lagos and S. DUNCAN, Aerospace Systems Design Laboratory, Georgia Tech				
1500 hrs AIAA-2016-4818	1530 hrs AIAA-2016-4819	1600 hrs AIAA-2016-4820	1630 hrs AIAA-2016-4821	1700 hrs AIAA-2016-4822
A Building Thermal Demand Model for a District Energy System J. Lewie, S. Oh, H. Solano, D. Mavis, Georgia Institute of Technology, Atlanta, GA	A Parametric Modeling of Water-to-air Heat Exchanger Based on CFD Analysis S. Wojnarski, Procter & Gamble Company, Zanki, Poland; J. Lewie, K. Song, S. Duncan, Georgia Institute of Technology, Atlanta, GA	"Synthetic shroud" concept for wind turbine performance optimization D. Feszty, Carleton University, Ottawa, Canada; S. McTavish, National Research Council Canada, Ottawa, Canada; J. Bodnyo, D. Jee, Carleton University, Ottawa, Canada	Air Craft Winglet Design and Performance: Cant Angle Effect E. Khalil, E. Abdelghany, G. Elhamri, Cairo University, Cairo, Egypt; O. Abdelattif, Benha University, Cairo, Egypt	Separation analysis in a high-speed rotating cylinder for a binary gas mixture S. Pradhan, Indian Institute of Science, Bengaluru, India
Tuesday, 26 July 2016				
Chaired by: M. WALKER, Georgia Institute of Technology and K. TERHUNE				
1500 hrs AIAA-2016-4824	1530 hrs AIAA-2016-4825	1600 hrs AIAA-2016-4826	1630 hrs AIAA-2016-4827	1730 hrs AIAA-2016-4829
The Ion Propulsion System for the Asteroid Redirect Robotic Mission D. Herman, W. Santiago, H. Kamhawi, NASA Glenn Research Center, Cleveland, OH; J. Polk, J. Snyder, R. Hofer, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; et al.	Development Status of the 12.5 kW HERMeS Hall Thruster for the Solar Electric Propulsion Technology Demonstration Mission R. Hofer, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; H. Kamhawi, NASA Glenn Research Center, Cleveland, OH	Performance, Facility Pressure Effects, and Stability Characterization Tests of NASA's 12.5-KW Hall Effect Rocket with Magnetic Shielding Thruster H. Kamhawi, T. Hoag, W. Huang, J. Yim, D. Herman, NASA Glenn Research Center, Cleveland, OH; P. Peterson, Vantage Partners, LLC, Cleveland, OH; et al.	Performance Comparison of the 12.5 kW HERMeS Hall Thruster Technology Demonstration Units R. Conversano, R. Hofer, M. Sakan, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; H. Kamhawi, P. Peterson, NASA Glenn Research Center, Cleveland, OH	Plasma Oscillation Characterization of NASA's HERMeS Hall Thruster via High Speed Imaging W. Huang, H. Kamhawi, T. Hoag, NASA Glenn Research Center, Cleveland, OH
Tuesday, 26 July 2016				
Chaired by: D. OH, Jet Propulsion Laboratory and J. SZABO, Busek Co., Inc.				
1500 hrs AIAA-2016-4830	1530 hrs AIAA-2016-4831	1600 hrs AIAA-2016-4832	1630 hrs AIAA-2016-4833	1700 hrs AIAA-2016-4834
High Throughput 600 Watt Hall Effect Thruster for Space Exploration J. Szabo, B. Poie, R. Tedrake, S. Paintal, L. Byrne, V. Hruby, Busek Company, Inc., Natick, MA; et al.	Characterization and Qualification of the CAM200 Low Power Hall Thruster D. Lev, R. Eytan, D. Katz-Franco, L. Appel, Rafael, Haifa, Israel	Design and characterization of a 200W Hall thruster in "magnetic shielding" configuration L. Grimaud, J. Youdfalon, S. Mazouffre, National Center for Scientific Research (CNRS), Orléans, France; C. Boniface, French Space Agency (CNES), Toulouse, France	Performance Evaluation of the T-40 Low-Power Hall Current Thruster J. Frieman, T. Liu, M. Walker, Georgia Institute of Technology, Atlanta, GA; J. Makela, A. Mathers, P. Peterson, Aerojet Rocketdyne, Redmond, WA	Experimental Study of the Effects of the Cathode Position and the Electrical Circuit Configuration on the Operation of HK40 Hall Thruster and BUSTLab Hollow Cathode N. Turan, U. Kokol, M. Celik, Bogaziçi University, Istanbul, Turkey; H. Kurt, Istanbul Medeniyet University, Istanbul, Turkey
Tuesday, 26 July 2016				
Chaired by: M. WALKER, Georgia Institute of Technology and K. TERHUNE				
HERMeS Hall Thruster I				
250 A				

Tuesday, 26 July 2016		LaB6 Hollow Cathodes		250 C
Chaired by: R. SPEKTOR, The Aerospace Corporation and B. JACKSON				
1500 hrs AIAA-2016-4835 Lanthanum Hexaboride Hollow Cathode Performance and Wear Testing for the Asteroid Redirect Mission Hall Thruster D. Goebel, J. Polk, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1530 hrs AIAA-2016-4836 Wear Test Demonstration of a Technique to Mitigate Keeper Erosion in a High-Current LaB₆ Hollow Cathode A. Ho, B. Joms, I. Mikelides, D. Goebel, A. Lopez Ortega, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1600 hrs AIAA-2016-4838 Laser-induced Fluorescence Measurements of Energetic Ions in a 100-A LaB₆ Hollow Cathode C. Dodson, University of California, Los Angeles, Los Angeles, CA; D. Perez-Granade, Charles III University of Madrid, Madrid, Spain; B. Joms, D. Goebel, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; R. Wirtz, University of California, Los Angeles, Los Angeles, CA		
Tuesday, 26 July 2016				
101-EP-18				
Chaired by: K. POLZIN, NASA Marshall Space Flight Center and N. MACDONALD, AFRL				
1500 hrs AIAA-2016-4839 Mechanisms for Pole Piece Erosion in a 6-kW Magnetically-Shielded Hall Thruster B. Joms, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; C. Dodson, University of California, Los Angeles, Los Angeles, CA; J. Anderson, D. Goebel, R. Hofer, M. Sekerak, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; et al.	1530 hrs AIAA-2016-4840 Surface Geometry Effects on Secondary Electron Emission Via Monte Carlo Modeling C. Huerta, R. Wirtz, University of California, Los Angeles, Los Angeles, CA	1600 hrs AIAA-2016-4841 Multi-diagnostic Measurements of Sputter Yield of Molybdenum under Argon Plasma Bombardment G. Li, T. Matlock, University of California, Los Angeles, Los Angeles, CA; D. Goebel, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; R. Wirtz, University of California, Los Angeles, Los Angeles, CA	1630 hrs AIAA-2016-4842 Search for Anomalous Ridge Growth during Stressed Material Plasma Erosion A. Schneider, M. Walker, J. Rimoli, Georgia Institute of Technology, Atlanta, GA	1700 hrs AIAA-2016-4843 A Parametric Computational Study of Boron Transport in Hall Thrusters B. Smith, J. Boyd, University of Michigan, Ann Arbor, Ann Arbor, MI
Tuesday, 26 July 2016				
102-EP-19				
Chaired by: R. KAWASHIMA, The University of Tokyo and J. CARDINI, VACCO				
1500 hrs AIAA-2016-4844 Research and Development of a High-Power Electrothermal Pulsed Plasma Thruster System onboard Osaka Institute of Technology 2nd PROITERES Nano-Satellite K. Kanooka, H. Tairano, Osaka Institute of Technology, Osaka, Japan	1530 hrs AIAA-2016-4845 Observation of Late-Time Ablation in Electric Solid Propellant Pulsed Microthrusters M. Glascock, J. Rovey, Missouri University of Science and Technology, Rolla, MO; S. Williams, J. Thresher, Digital Solid State Propulsion, Inc., Reno, NV	1600 hrs AIAA-2016-4846 Pulsed Plasma Thruster Development Using A Novel HAN-Based Green Electric Monopropellant J. Thresher, S. Williams, P. Takahashi, J. Sausa, Digital Solid State Propulsion, Inc., Reno, NV	1630 hrs AIAA-2016-4847 Characteristics of a Coaxial Pulsed Plasma Thruster Using Liquid Propellant K. Miyagi, Kyushu Institute of Technology, Kitakyushu, Japan; A. Kakami, University of Miyazaki, Miyazaki, Japan; T. Tachibana, Kyushu Institute of Technology, Kitakyushu, Japan	1700 hrs AIAA-2016-4848 Development and Testing of Electric Propulsion Systems at TU Dresden D. Bock, F. Nürnberger, C. Drobny, P. Lauer, M. Tajmar, Technical University of Dresden, Dresden, Germany
Tuesday, 26 July 2016				
103-F360-4				
1500 - 1730 hrs				
Moderator: Lee Mason, Chief, Thermal Energy Conversions Branch, NASA Glenn Research Center				
Panelists:				
Rex Geveden Chief Operating Officer BWX Technologies, Inc.	John Casani NASA Jet Propulsion Laboratory (ret.)	Leonard Dudzinski Science Mission Directorate NASA	Susan Voss President Global Nuclear Network Analysis, LLC	Patrick McClure Los Alamos National Laboratory
Nuclear Power for Distant Solar System Destinations				
Ballroom F				

Tuesday, 26 July 2016		Advanced Materials and Technology for Gas Turbine Engines		251 A
Chaired by: M. RICKLICK, Embry Riddle Aeronautical University				
1500 hrs AIAA-2016-4849 Integrated High Temperature Sensors for Advanced Propulsion Materials K. Wong, S. Sahoo, M. McFarland, Acrece Technologies, Inc., Concord, CA	1530 hrs AIAA-2016-4850 The influences of foreign object damage on the high cycle fatigue behavior of titanium alloy TC4 Z. Zhao, X. Xu, W. Chen, T. Wu, Nanjing University of Aeronautics and Astronautics, Nanjing, China	1600 hrs AIAA-2016-4851 Preliminary Investigation of an Oblique Jet Impingement Cooling on a GMC Rough Surface K. Krishna, M. Ricklick, Embry-Riddle Aeronautical University, Daytona Beach, FL	1630 hrs AIAA-2016-4852 Effect of Semi-Molten Particulate on Tailored Thermal Barrier Coatings for Gas Turbine Engine A. Ghoshal, M. Murugan, M. Walock, B. Barnett, M. Peji, S. Jeffrey, Army Research Laboratory, Aberdeen Proving Ground, MD, et al.	1700 hrs AIAA-2016-4853 Fatigue Analysis of a Cylindrical Turbine Disk with Integrated Heat Pipes S. Eisenmann, T. Schmidt, V. Günner, Technical University of Munich, Garching, Germany; A. Hupfer, University of the German Federal Armed Forces, Neubiberg, Germany
Tuesday, 26 July 2016				
Turbines III				
251 B				
Chaired by: M. ATTIA, Embry-Riddle Aeronautical University				
1500 hrs AIAA-2016-4854 A Comparative Evaluation of Heat Transfer and Friction Behavior of a Square Channel with Sharp and Rounded 45° Ribs at Wide Range of Reynolds Numbers Using Experimental and Numerical Computation L. Ahmed, P. Iran, C. Vargas, E. Fernandez, University of Central Florida, Orlando, FL; L. Means, J. Rodriguez, Siemens, Orlando, FL, et al.	1530 hrs AIAA-2016-4855 Investigation of Pressure Drop and Heat Transfer Behavior of a Square Channel with 45° Angle Turbulators on One and Two Wall Configuration M. Benson, M. Cremins, A. Lachance, C. Snow, B. Van Poppel, C. Verhulst, U.S. Military Academy, West Point, NY, et al.	1600 hrs AIAA-2016-4856 Experimental and Computational Flow Analyses of a Single Jet Impinging on a Flat Plate M. Benson, M. Cremins, A. Lachance, C. Snow, B. Van Poppel, C. Verhulst, U.S. Military Academy, West Point, NY, et al.	1630 hrs AIAA-2016-4857 Analysis of a Coupled Micro- and Triple-Impingement Cooling Configuration in the C3X Vane C. Rossman, M. Ricklick, Embry-Riddle Aeronautical University, Daytona Beach, FL	
Tuesday, 26 July 2016				
Gas Turbine Engine Testing Techniques				
251 C				
Chaired by: R. HANCOCK, AFRL/RQT and J. KELLY, AEDC				
1500 hrs AIAA-2016-4858 Approximation of Engine Casing Temperature Constraints for Casing Mounted Electronics J. Kratz, D. Cullley, J. Chapman, NASA Glenn Research Center, Cleveland, OH	1530 hrs AIAA-2016-4859 An Inverse Heat Conduction Problem applied to the Rotor Casing of a Transonic Turbine B. Hilbert, S. Morris, University of Notre Dame, Notre Dame, IN	1600 hrs AIAA-2016-4860 Experimental and Numerical Analysis of a Piezo Driven Fluidic Device for Active Flow Control M. Mair, L. Chen, J. Turner, M. Bacci, P. Ireland, University of Oxford, Oxford, United Kingdom	1630 hrs AIAA-2016-4861 Investigation on the dynamic response of aero-engine structures due to fan blade out event through subscale testing L. Liu, W. Chen, Z. Zhao, G. Luo, Nanjing University of Aeronautics and Astronautics, Nanjing, China	
Tuesday, 26 July 2016				
107-HR-5				
Chaired by: T. SHIMADA, Japan Aerospace Exploration Agency and S. WHITMORE, Utah State University				
1500 hrs AIAA-2016-4862 Combustion Characteristics of Gas Hybrid Rocket using H₂O as Oxidizer-Effect of Mg-Al Particle Sizes- Y. Sato, T. Kuwahara, Self, Funabashi, Japan	1530 hrs AIAA-2016-4863 Development of a 75 mm Hybrid Rocket Motor to Test Metal Additives C. Mohanji, K. Venle, J. Priot, C. Belmont, University of Kwazulu-Natal, Durban, South Africa	1600 hrs AIAA-2016-4864 Design and performance evaluation of hybrid rocket using 95 wt.% H2O2 S. Kang, D. Lee, E. Lee, S. Kwon, Korea Advanced Institute of Science and Technology, Daejeon, South Korea	1630 hrs AIAA-2016-4865 AP and Boron combustion characteristics in Staged Hybrid Rocket Engine D. Lee, C. Lee, Konkuk University, Seoul, South Korea	253 AB
Development and Evaluation of Novel O/F Formulations and Combinations				

Tuesday, 26 July 2016		Combustion Stability, Motor Performance, and Related Issues		255 B
Chaired by: B. MADHANABHARATHAM, Aerospace Consultant and A. KARABEYOGLU, Space Propulsion Group Inc.				
1500 hrs AIAA-2016-4866 Nondestructive Mapping of Hybrid Rocket Fuel Grains A. Costantino, California Institute of Technology, Pasadena, CA; P. Narsai, B. Cantwell, Stanford University, Stanford, CA	1530 hrs AIAA-2016-4867 Effects of Radiation Heating on Additively Printed Hybrid Fuel Grain O/F Shift S. Whimone, S. Menkley, Utah State University, Logan, UT	1600 hrs AIAA-2016-4868 A Fundamental Study on the Hybrid Rocket Clustering for the Rocket Sled Propulsion System D. Nakata, K. Yasuda, S. Hario, K. Higashino, Murooran Institute of Technology, Murooran, Japan	1630 hrs AIAA-2016-4869 Pressure Oscillation and Combustion in Shear Layer of Hybrid Rocket Post Chamber Y. Moon, C. Lee, Konkuk University, Seoul, South Korea	1730 hrs AIAA-2016-4871 Measuring Time-Varying Fuel Regression Rates with Image Processing in a Hybrid Rocket Motor P. Narsai, K. Venkataraman, K. Strober, B. Cantwell, Stanford University, Stanford, CA
Tuesday, 26 July 2016				
109-HSABP-7				
Chaired by: H. HUO, General Electric				
1500 hrs AIAA-2016-4872 Aerothermodynamics cycle model for new hypersonic propulsion: Rocket Ignited Supersonic Combustion Ram Jet J. Barros, Federal University of Minas Gerais, Belo Horizonte, Brazil; M. Gebaldo, Technology Consultation Services srl, Villafranca di Verona, Italy; M. Guerra, Lunar Metals, Santana do Parnaiba, Brazil	1530 hrs AIAA-2016-4873 Ignition Test of Solid Fuel Ramjet Combustor W. Jung, S. Beek, Korea Advanced Institute of Science and Technology, Daejeon, South Korea; J. Park, T. Kwon, Defense Research and Development Institute, Kwangju, South Korea; S. Kwon, Korea Advanced Institute of Science and Technology, Daejeon, South Korea	1600 hrs AIAA-2016-4874 Numerical Analysis of a Dual-mode Scramjet Engine VS a Rocket-Based Combined-Cycle Engine L. Shi, Northwestern Polytechnical University, Xi'an, China	1630 hrs AIAA-2016-4875 The Effects of Air Vibration on the Supersonic Turbulent Channel flow using Direct Numerical Simulation X. Chen, Zhejiang University, Hangzhou, China; X. Li, Chinese Academy of Sciences, Beijing, China; H. Dou, Zhejiang University, Hangzhou, China	254 C
Tuesday, 26 July 2016				
110-HSABP-8				
Chaired by: K. KAILASANATH, Naval Research Laboratory and A. HAYASHI, Aoyama Gakuin University				
1500 hrs AIAA-2016-4876 Preliminary Parametric Analysis of a Rotating Detonation Engine by Analytic Methods A. Mizener, F. Lu, University of Texas, Arlington, Arlington, TX	1530 hrs AIAA-2016-4877 Man Disk Pressure Measurement Technique within Rotating Detonation Engine J. Coroni, K. Cho, Air Force Research Laboratory, Wright-Patterson AFB, OH; J. Hoke, Innovative Scientific Solutions, Inc., Dayton, OH; F. Schauer, Air Force Research Laboratory, Wright-Patterson AFB, OH	1600 hrs AIAA-2016-4878 Analytical Model of Shock Dynamics in Pulse Detonation Engine Nozzles J. Pearce, F. Lu, University of Texas, Arlington, TX	1630 hrs AIAA-2016-4879 Criteria for rotating detonation to pass obstacles near the inlet Y. Wang, Southwest University of Science and Technology, Mianyang, China	255 A
Tuesday, 26 July 2016				
111-ITAR-2				
Chaired by: C. BROPHY, Naval Postgraduate School and S. CLAFLIN, Aerojet Rocketdyne				
1500 hrs Oral Presentation Toxic Monopropellant Thruster. Consider for ITAR session. A. Shcherkovskiy, T. McKee, Plasma Processes, LLC, Huntsville, AL; S. Mustruik, Dynamics, Inc., Huntsville, AL	1530 hrs AIAA-2016-4881 Development of 10 inch Diameter Titanium Rolling Metal Diaphragm Tank for Green Propellant H. Conomos, J. Yeager, J. Moore, R. Goodard, T. Salzier, J. Fetes, Moog, Niagara Falls, NY, et al.	1600 hrs AIAA-2016-4882 HTP CubeSat Propulsion Module A. Vazquez, N. Love, A. Clouthier, University of Texas, El Paso, El Paso, TX	1630 hrs AIAA-2016-4883 Schlieren Visualizations within a Rotating Detonation Engine J. Coroni, Innovative Scientific Solutions, Inc., Dayton, OH; K. Cho, Air Force Research Laboratory, Wright-Patterson AFB, OH; J. Hoke, Innovative Scientific Solutions, Inc., Dayton, OH; F. Schauer, Air Force Research Laboratory, Wright-Patterson AFB, OH	151 DE
Launch Vehicles I (CAT-IV) 				
1700 hrs AIAA-2016-4884 Launch Vehicle Low Shock Stage Separation System H. Golden, S. Sawhill, Systema Technologies, Inc., Kirkland, WA				

Tuesday, 26 July 2016		Nuclear Thermal Propulsion: Engines and Missions		251 E
Chaired by: C. JOYNER, Aerojet Rocketdyne and S. BOROWSKI, NASA Glenn Research Center				
1530 hrs AIAA-2016-4885	1530 hrs AIAA-2016-4886	1600 hrs AIAA-2016-4887	1630 hrs AIAA-2016-4888	1730 hrs AIAA-2016-4889
Nuclear Thermal Rocket - Arc Jet Integrated System Model B. Taylor, W. Emrich, NASA Marshall Space Flight Center, Huntsville, AL	Three-Dimensional Analysis of a Hydrogen Containment Process For Nuclear Thermal Engine Ground Testing T. Wang, E. Stewart, F. Canabal, NASA Marshall Space Flight Center, Huntsville, AL	Comparing Low Enriched Fuel to Highly Enriched Fuel for use in Nuclear Thermal Propulsion Systems V. Patel, Center for Space Nuclear Research, Idaho Falls, ID; M. Eades, Ohio State University, Columbus, OH; P. Vemuri, Korea Advanced Institute of Science and Technology, Daejeon, South Korea; C. Joyner, Aerojet Rocketdyne, West Palm Beach, FL	Engine Design Attributes Relative to HEU and LEU Core Approaches for a Small Thrust NTP C. Joyner, D. Leacock, T. Jennings, Aerojet Rocketdyne, West Palm Beach, FL; M. Eades, Ohio State University, Columbus, OH; V. Patel, Center for Space Nuclear Research, Idaho Falls, ID	Atmospheric Mining in the Outer Solar System: Outer Planet Orbital Transfer and Lander Analyses B. Palaszewski, NASA Glenn Research Center, Cleveland, OH
Tuesday, 26 July 2016				
114-PC-9				
Chaired by: R. HAUSEN, Honeywell and E. LYNCH, Aerojet Rocketdyne				
1500 hrs AIAA-2016-4890	1530 hrs AIAA-2016-4891	1600 hrs AIAA-2016-4892		
Alternative Bio-Derived JP-8 Class Fuel and JP-8 Fuel: Flame Tube Combustor Test Results Compared using a GE TAPS Injector Configuration Y. Hicks, S. Feader, R. Anderson, NASA Glenn Research Center, Cleveland, OH	A Comparison of Three Second-Generation Swirl-Venturi Lean Direct Injection Combustor Concepts K. Tachio, NASA Glenn Research Center, Cleveland, OH; P. Lee, Woodward FSI, Inc., Zealand, MI; H. Mongioi, Purdue University, West Lafayette, IN; B. Dam, Woodward FSI, Inc., Zealand, MI; Z. He, D. Padboy, NASA Glenn Research Center, Cleveland, OH	Flame-Flow interaction under Distributed Combustion Conditions A. Khalil, A. Gupta, University of Maryland, College Park, College Park, MD		
Tuesday, 26 July 2016				
115-PC-10				
Chaired by: O. KNAB, Airbus Defense & Spacecraft Launcher and T. DROZDA, NASA Langley Research Center				
1500 hrs AIAA-2016-4893	1530 hrs AIAA-2016-4894	1600 hrs AIAA-2016-4895	1630 hrs AIAA-2016-4896	1730 hrs AIAA-2016-4898
Review of experimental test cases for modelling high frequency combustion instability (Invited paper) J. Hardi, S. Gröning, S. Webster, S. Benke, D. Suslov, M. Oswald, German Aerospace Center (DLR), Lampoldshausen, Germany	Generations of unstable combustion in a non-premixed GCH4/GOX rocket injector H. Ierashima, Hokkaido University, Sapporo, Japan; Y. Dainon, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan	Towards Numerical Prediction of Jet Fuels Sensitivity of Flame Dynamics in a Swirl Spray Combustion System R. Ranjan, A. Panchoi, G. Hammebrigue, S. Menon, Georgia Institute of Technology, Atlanta, GA	Exploration of POD-Galerkin Techniques for Developing Combustion Response Functions C. Huang, W. Anderson, C. Merkle, Purdue University, West Lafayette, IN	Numerical Study of the Influence of the Opening Ratio on the Damping Capacity of the Injector H. An, W. Nie, S. Feng, Equipment Academy, Beijing, China
Tuesday, 26 July 2016				
116-PC-11				
Chaired by: C. KIRCHBERGER, German Aerospace Center (DLR) and S. SILVESTRI				
1500 hrs AIAA-2016-4899	1530 hrs AIAA-2016-4900	1600 hrs AIAA-2016-4901	1630 hrs AIAA-2016-4902	1700 hrs AIAA-2016-4903
Lean Blowout with a High Pressure Well Stirred Reactor J. Gross, D. Shouse, C. Neuroth, Air Force Research Laboratory, Wright-Patterson AFB, OH	Fuel Distribution and Gas Temperature Measurements in a Nonuniformly-Fueled Bluff-Body Flame B. Hueltskamp, L. Goss, Innovative Scientific Solutions, Inc., Dayton, OH; D. Richardson, Spectral Energies, LLC, Dayton, OH; G. Wang, General Electric Company, Niskayuna, NY; A. Lynch, V. Belovich, Air Force Research Laboratory, Wright-Patterson AFB, OH; et al.	Planar Laser Absorption Spectroscopy for the Resolution of Simultaneous, Spatially-Distinct Absorption Paths J. France, M. Gamba, University of Michigan, Ann Arbor, Ann Arbor, MI	Assessment of Flames heat radiation prediction A. da Silva, M. Venturini, N. Coetano, Federal University of Santa Maria, Santa Maria, Brazil	Hydrocarbon Fuel Thermal Performance Modeling based on Systematic Measurement and Comprehensive Chromatographic Analysis M. Billingsley, Air Force Research Laboratory, Edwards AFB, CA; N. Keim, B. Hill-Lam, Johns Hopkins University, Columbia, MD; R. Synovec, University of Washington, Seattle, Seattle, WA
Tuesday, 26 July 2016				
117-PC-12				
Chaired by: C. KIRCHBERGER, German Aerospace Center (DLR) and S. SILVESTRI				
1500 hrs AIAA-2016-4904	1530 hrs AIAA-2016-4905	1600 hrs AIAA-2016-4906	1630 hrs AIAA-2016-4907	1730 hrs AIAA-2016-4908
Flow Field Characterization of a High Pressure Well Stirred Reactor J. Gross, D. Shouse, C. Neuroth, Air Force Research Laboratory, Wright-Patterson AFB, OH	Flow Field Characterization of a High Pressure Well Stirred Reactor J. Gross, D. Shouse, C. Neuroth, Air Force Research Laboratory, Wright-Patterson AFB, OH	Flow Field Characterization of a High Pressure Well Stirred Reactor J. Gross, D. Shouse, C. Neuroth, Air Force Research Laboratory, Wright-Patterson AFB, OH	Flow Field Characterization of a High Pressure Well Stirred Reactor J. Gross, D. Shouse, C. Neuroth, Air Force Research Laboratory, Wright-Patterson AFB, OH	Flow Field Characterization of a High Pressure Well Stirred Reactor J. Gross, D. Shouse, C. Neuroth, Air Force Research Laboratory, Wright-Patterson AFB, OH

Tuesday, 26 July 2016		Small Satellites I		251 F
Chaired by: J. STRAUB, University of North Dakota				
1500 hrs AIAA-2016-4904	1530 hrs AIAA-2016-4905	1600 hrs AIAA-2016-4906	1630 hrs AIAA-2016-4907	
Design Optimization and Performance Evaluation of A Monopropellant Satellite Thruster C. Nichih, P. P. S. Sraam, S. Mani, V. Sanal Kumar, Kumaraguru College of Technology, Coimbatore, India	Complete EM System Development for Busek's 1U CubeSat Green Propulsion Module M. Tsuy, J. Zwahlen, D. Laffo, C. Feng, M. Robin, Busek Company, Inc., Natick, MA	Development of Propulsion System with Bi-propellants Based on Green Propellant for Microsatellite J. Matsushima, M. Kaku, M. Banno, H. Sahara, Tokyo Metropolitan University, Tokyo, Japan; Y. Araki, Astrospace Japan, Inc., Tokyo, Japan	Development of a MEMS Pyrotechnic Thruster for Micro Propulsion Applications H. Shukla, Birla Institute of Technology, Ranchi, India; R. Singh Nandan, P. Shukla, V. Kumar N, Vikram Sarabhai Space Centre, Thiruvananthapuram, India; M. Varma, Birla Institute of Technology, Ranchi, India	
Tuesday, 26 July 2016				
118-SR-4				
Chaired by: H. GIEZKI, DLR - German Aerospace Center and K. NAUMANN, Bayern-Chemie GmbH				
1500 hrs AIAA-2016-4909	1530 hrs AIAA-2016-4910	1600 hrs AIAA-2016-4911	1630 hrs AIAA-2016-4908	254 A
Brazilian Thrust Vector Control System Development: Status and Trends T. Wekerle, Technological Institute of Aeronautics (ITA), São José dos Campos, Brazil; E. Barbosa, C. Botajini, Aeronautics and Space Institute (IAE), São José dos Campos, Brazil; L. Loures da Costa, L. Trabasso, Technological Institute of Aeronautics (ITA), São José dos Campos, Brazil	Design of Environmental Friendly Chevron Nozzles for Lower Stage Rockets R. Sathya Prabha, S. Vigneshwaran, R. Manishan, S. Ajith, S. Mani, V. Sanal Kumar, Kumaraguru College of Technology, Coimbatore, India	Investigation of Vortex Valve Controlled Variable Thrust SRM X. Yu, Northwestern Polytechnical University, Xi'an, China; Y. Wang, China Aerospace Science and Technology Corporation (CASTC), Shanghai, China; X. Wei, Northwestern Polytechnical University, Xi'an, China	Electrolytic Combustion in the Polyvinyl Alcohol + Hydroxyl Ammonium Nitrate Solid Propellant J. Baird, J. Tang, A. Hiant, R. Frederick, University of Alabama, Huntsville, Huntsville, AL	
Tuesday, 26 July 2016				
119-TM-4				
Chaired by: J. MEHTA, Belcan AETD				
1500 hrs AIAA-2016-4912	1530 hrs AIAA-2016-4913	1600 hrs AIAA-2016-4914	1630 hrs AIAA-2016-4915	151 AB
Effect of internal partitions on thermal comfort and IAQ level provided by underfloor air distribution system in a typical Office Space A. Abouzaid, E. Khalil, Cairo University, Cairo, Egypt	Thermal analysis of RBCC engine at ejector, ramjet and scramjet modes T. Jing, G. He, B. Lin, W. Li, F. Qin, Y. Liu, Northwestern Polytechnical University, Xi'an, China	Numerical Study of Decreasing the Spread of Sarin (GB) in an Air-conditioned Aircraft Cabin A. Farag, Egyptian Armed Forces, Cairo, Egypt; E. Khalil, M. Hassan, Cairo University, Cairo, Egypt	Enhanced ECS/Generator Models in an Integrated Air Vehicle Platform A. Donovan, R. Roberts, M. Wolff, Wright State University, Dayton, OH	1700 hrs AIAA-2016-4916 Predictions of the Air Flow Regimes and Thermal Comfort in Islamic Worship: Religious Rituals of Hajj and her infant Ishmael between Al-Safa and Al-Marwah. A. Eldeeny, E. Khalil, Cairo University, Cairo, Egypt
Tuesday, 26 July 2016				
120-PLNRY-5				
1800 - 1930 hrs				
Moderators: Bonnie Prado Pino, Graduate Student, School of Aeronautics and Astronautics, Purdue University Guillermo Jaramillo Pizarro, Graduate Student, School of Aeronautics and Astronautics, Purdue University				
Panelists:				
David Bowles Director NASA Langley Research Center	Duane Cuffrell Director, Operations Engineering and Technical Operations, Lockheed Martin Corporation	Julie Van Kleeck Vice President, Advanced Space and Launch Business Unit Aerojet Rocketdyne	Rickey Shyme Director, Research and Engineering NASA Glenn Research Center	Ballroom A-D

Tuesday, 26 July 2016		Future Flight Propulsion Systems I		150 G
Chaired by: B. PALASZEWSKI, NASA Glenn Research Center and B. CASSENTI, University of Connecticut				
121-NFF-5 1900 hrs AIAA-2016-4917 WWAT: Warp Drives, Wormholes, Antigravity and Time Travel B. Casseini, University of Connecticut, Storrs, CT	1930 hrs AIAA-2016-4918 Destination Universe: Some Thoughts on Faster-than Light (FTL) Travel G. Bennett, Metaspaces Enterprises, Boise, ID	2000 hrs AIAA-2016-4919 Testing the Possibility of Weight Changes in Highly-Polarized Electrets M. Tajmar, T. Schreiber, Dresden University of Technology, Dresden, Germany		
Wednesday				
Wednesday, 27 July 2016		The Impact of Additive Manufacturing on the Design Process		Ballroom A-D
122-PLNRY-6 0800 - 0900 hrs				
Elizabeth Robertson Team Lead, Liquid Engine Systems Branch Marshall Space Flight Center				
Wednesday, 27 July 2016		Networking Coffee Break		Exhibit Hall C
123-NW-6 0845 - 0930 hrs				
Wednesday, 27 July 2016		Seal Material Advancements and Advanced Seal Technology		255 E
Chaired by: P. DUNLAP, NASA Glenn Research Center and N. SARAWATE, GE Global Research Center				
0930 hrs AIAA-2016-4920 Film Riding Pressure Activated Leaf Seal Proof of Concept T. Kirk, A. Bowsher, P. Craggington, Cross Manufacturing Company Ltd., Devizes, United Kingdom; C. Gronadell, J. Dudley, CMG Tech, LLC, Restford, NY; A. Pawlak, Cross Manufacturing Company, Ltd., Devizes, United Kingdom	1000 hrs AIAA-2016-4921 Non-Contacting Finger Seals Static Performance Test Results at Ambient and High Temperatures M. Proctor, NASA Glenn Research Center, Cleveland, OH	1030 hrs AIAA-2016-4922 Characterization of thermoplastic-elastomeric seals at high pressures and temperatures B. Dev, J. Wang, O. Samudrala, Q. Xuele, General Electric Company, Niskayuna, NY	1100 hrs AIAA-2016-4923 An Electrically Conductive Elastomer Seal for Spacecraft C. Daniels, H. Oravec, J. Mather, University of Akron, Akron, OH; P. Dunlap, NASA Glenn Research Center, Cleveland, OH	
Wednesday, 27 July 2016		Advanced Propulsion Concepts II		251 C
Chaired by: A. REISZ, Reisz Engineers and J. ROBINSON, Retired f/Boeing				
0930 hrs AIAA-2016-4924 Experimental Investigation on Rotating Detonation Engine with Different Mixing Distance X. Han, S. Zhang, J. Wang, Peking University, Beijing, China	1000 hrs AIAA-2016-4925 Laser powered air breathing blast wave propulsion guided by donut mode beam K. Mori, Nagoya University, Nagoya, Japan	1030 hrs AIAA-2016-4926 Feasibility Study of a DRBCC-Powered Single-Stage-To-Orbit Launch Vehicle F. Zhang, H. Zhang, B. Wang, Tsinghua University, Beijing, China		

Wednesday, 27 July 2016		Space and Aircraft Power Generation, Processing and Performance		151 G
Chaired by: J. HAINES, Retired - formerly ESA, ESTEC and G. LAM, Lockheed Martin Corporation				
0930 hrs AIAA-2016-4927 Solar Probe Plus (SPP) Power System Electronics A. Baisden, D. Frankford, Johns Hopkins University Applied Physics Laboratory, Laurel, MD	1100 hrs AIAA-2016-4928 Proposal and Development of a High Voltage Variable Frequency Alternating Current Power System for Hybrid Electric Aircraft D. Sadey, L. Taylor, R. Beach, NASA Glenn Research Center, Cleveland, OH	1030 hrs AIAA-2016-4929 Improving Solar Arrays for LILT and High Radiation Environments J. McHatt, NASA Glenn Research Center, Cleveland, OH; C. Taylor, NASA Langley Research Center, Hampton, VA; M. Piszczor, NASA Glenn Research Center, Cleveland, OH	1100 hrs AIAA-2016-4930 Further Analyses of the NASA Glenn Research Center Solar Cell and Photovoltaic Materials Experiment onboard the International Space Station M. Myers, M. Piszczor, M. Krasowski, N. Prokop, D. Wolford, J. McHatt, NASA Glenn Research Center, Cleveland, OH	
Wednesday, 27 July 2016				
127-EC-3				
Chaired by: B. SMITH, Pacific Scientific Energetic Materials Company				
0930 hrs Oral Presentation 2016 CAD/PAD Technology Roadmap Update J. Burchett, T. Blachowski, A. Woods, Naval Surface Warfare Center, Indian Head, MD	1000 hrs AIAA-2016-4931 A Review on Relationship between Reliability and Lot Acceptance Sample Size for ECS L. Yang, Self, La Canada Flintridge, CA	1030 hrs AIAA-2016-4932 Thermal-Mechanical Characterization of Bridgewires and Surrounding Materials Utilizing Thermal Transient Testing C. Moore, J. Morgan, L. Roberson, NASA Kennedy Space Center, Cape Canaveral, FL; J. Carney, University of Florida, Gainesville, FL; J. Whitaker, a.i. solutions, Inc., Cape Canaveral, FL; J. Glass, Vencore, Cape Canaveral, FL	1100 hrs AIAA-2016-4933 Detonating Cord Assembly (DCA) Second Source Project Overview T. Blachowski, Naval Surface Warfare Center, Indian Head, MD; G. Teewee, Austin Star Detonator, Brownsville, TX	254 C
Wednesday, 27 July 2016				
128-EDU-3				
Chaired by: R. FREDERICK, University of Alabama @ Huntsville and M. HIT, The University of Alabama in Huntsville				
0930 hrs AIAA-2016-4934 Measurement of Micro-Thruster Performance Characteristics Using a Magnetically Levitating Thrust Stand A. Patel, D. Lineberry, J. Cassidy, R. Frederick, University of Alabama, Huntsville, AL	1000 hrs AIAA-2016-4936 A parametric model for thrust chamber preliminary design R. Rezende, V. de Castro Perez, A. Pimenta, Technological Institute of Aeronautics (ITA), São José dos Campos, Brazil	1030 hrs AIAA-2016-4937 ITA Candy rocket motor design and solid propellant manufacture challenges D. Bonfatti, S. Gomes, L. Rocco, R. Jachura, J. Rocco, K. Iha, Technological Institute of Aeronautics (ITA), São José dos Campos, Brazil	1100 hrs AIAA-2016-4935 Laboratory Experimentation and Basic Research Investigating Electric Solid Propellant Electrolytic Characteristics A. Hunt, R. Frederick, University of Alabama, Huntsville, Huntsville, AL	253 AB
Wednesday, 27 July 2016				
129-EP-20				
Chaired by: K. KOMURASAKI, The University of Tokyo and J. LITTLE, Princeton University				
0930 hrs AIAA-2016-4938 On the Validity of the Boltzmann Assumption for Electrons in Plasma Plume Modeling Y. Hu, J. Wang, University of Southern California, Los Angeles, CA	1000 hrs AIAA-2016-4939 SM/WURF: Current Capabilities and Verification as a Replacement of AFRL Plume Simulation Tool COLISEUM S. Araki, R. Morfin, ERC, Inc., Edwards AFB, CA; D. Bilyeu, J. Koo, Air Force Research Laboratory, Edwards AFB, CA	1030 hrs AIAA-2016-4940 Numerical Simulations of Unsteady Plasma Plume Flows C. Cai, Michigan Technological University, Houghton, MI	1100 hrs AIAA-2016-4941 Carbon Back Sputter Modeling for Hall Thruster Testing J. Gilland, G. Williams, J. Burt, Ohio Aerospace Institute, Brook Park, OH; J. Yim, NASA Glenn Research Center, Cleveland, OH	250 A

Wednesday, 27 July 2016		Mid Power Hall Thruster Development		250 B
Chaired by: S. MAZOUFFRE, ICARE-CNRS and P. CAGAS, Virginia Tech				
0930 hrs AIAA-2016-4942 Laboratory Testing of Hall Thrusters for All-electric Propulsion Satellite and Deep Space Explorers I. Funaki, Japan Aerospace Exploration Agency (JAXA), Sagamihiro, Japan; S. Iihara, IHI Corporation, Tomioka, Japan; S. Cho, K. Kubota, Japan Aerospace Exploration Agency (JAXA), Chofu, Japan; H. Watanabe, Tokyo Metropolitan University, Hino, Japan; K. Fuchigami, IHI Corporation, Isoya, Japan; et al.	1000 hrs AIAA-2016-4943 Integration Tests of the 4 kW-class High Voltage Hall Accelerator Power Processing Unit with the HiVHAc and the SPT-140 Hall Effect Thrusters H. Kamitani, L. Piharo, T. Hoag, W. Huang, D. Altieri, NASA Glenn Research Center, Cleveland, OH; R. Liang, Space Systems Loral, Palo Alto, CA; et al.	1030 hrs AIAA-2016-4944 Research and Development of low-Power and High-Power Three-types Hall Thrusters at Osaka Institute of Technology T. Kakuma, H. Tahara, Osaka Institute of Technology, Osaka, Japan		
Wednesday, 27 July 2016				
131-EP-22				
Chaired by: D. GOEBEL, Jet Propulsion Laboratory and A. LOPEZ ORTEGA, Jet Propulsion Laboratory				
0930 hrs AIAA-2016-4945 Experimental Performance Characterization of a Novel Direct Current Cold Cathode Neutralizer for Electric Thruster Applications A. Gurcullo, A. Knoll, University of Surrey, Guildford, United Kingdom; P. Bianco, Airbus, Portsmouth, United Kingdom	1000 hrs AIAA-2016-4946 3D Particle Simulation for Electron Extraction Mechanisms of a Miniature Microwave Discharge Neutralizer K. Hiromoto, Yokohama National University, Yokohama, Japan; Y. Nakagawa, H. Koizumi, K. Komurasaki, University of Tokyo, Tokyo, Japan; Y. Takao, Yokohama National University, Yokohama, Japan	1030 hrs AIAA-2016-4947 Performance of a Hall Thruster Operating with a Radio Frequency Plasma Cathode H. Watanabe, M. Ichimura, H. Takegahara, Tokyo Metropolitan University, Hino, Japan		250 C
Wednesday, 27 July 2016				
132-EP-23				
Chaired by: H. WHITE, NASA-Johnson Space Center and J. KOBECK				
0930 hrs AIAA-2016-4948 Antenna Coupling and Thrust Measurements in a Direct Wave-Drive Thruster M. Feldman, E. Choucri, Princeton University, Princeton, NJ	1000 hrs AIAA-2016-4949 Experimental Performance Analysis of the BUSLab Microwave Electrothermal Thruster M. Yildiz, Turkish Air Force Academy, Istanbul, Turkey; M. Celik, Bogazici University, Istanbul, Turkey	1030 hrs AIAA-2016-4950 Advances in Duration Testing of the VASIMR® VX-200SS™ System J. Squire, M. Carter, F. Chang Diaz, L. Dean, M. Giambusso, Ad Astra Rocket Company, Webster, TX; J. Castro, Ad Astra Rocket Company, Liberia, Costa Rica; et al.	1100 hrs AIAA-2016-4951 Preliminary Investigation of an External Discharge Plasma Thruster B. Karadag, Graduate University for Advanced Studies, Sagamihiro, Japan; S. Cho, Japan Aerospace Exploration Agency (JAXA), Sagamihiro, Japan; Y. Oshio, Tokyo University of Agriculture and Technology, Oshio, Japan; Y. Hamada, University of Tokyo, Hongo, Japan; I. Funaki, Japan Aerospace Exploration Agency (JAXA), Sagamihiro, Japan; K. Komurasaki, University of Tokyo, Hongo, Japan	250 D
Wednesday, 27 July 2016				
133-F360-5				
0930 - 1200 hrs				
This session will begin with Rex Geveden, Chief Operating Officer, BWX Technologies, Inc., speaking about "Seven Career Hacks for Professional Success." After that, there will be a round table of persons talking about their own and colleagues' professional success. Mr. Geveden will moderate and coordinate the question and answer period.				
Rising Leaders in Aerospace -- Forum 360 Combined Session				Ballroom F

Wednesday, 27 July 2016		Fossil-Fuel Power Technologies II		150 DE
Chaired by: A. CHOUDHURI, University of Texas at El Paso and B. KHANDLWAL, The University of Sheffield				
0930 hrs AIAA-2016-4952 Reactor Parameters Effects on Hydrogen Production from Hydrogen Sulfide A. El-Melhi, University of Maryland, College Park, College Park, MD; S. Ibrahim, A. Al Shoaibi, Petroleum Institute, Abu Dhabi, United Arab Emirates; A. Gupta, University of Maryland, College Park, College Park, MD	1000 hrs AIAA-2016-4953 The Effect of the Fuel Change from Petroleum Kerosene to HEFA Alternative Jet Fuel on the Emission of an RQL Type Gas Turbine Combustor K. Okai, University of Tokyo, Tokyo, Japan; H. Fujiwara, M. Makiida, K. Shimodaira, H. Yamada, Japan; Aerospace Exploration Agency (JAXA), Tokyo, Japan; M. Nakamura, Mitsubishi Group, Nagoya, Japan	1030 hrs AIAA-2016-4954 Bio-Ethanol Fuel Mixtures Theoretical Influence on Aviation Reciprocating Engines J. Vega, J. Ieynon, L. Monico, University of San Buenaventura, Bogota, Colombia	1100 hrs AIAA-2016-4955 Emission Characteristics of Laminar Prevaporized Petroleum and Biodiesel Flames at near Stoichiometric Conditions A. Balakrishnan, R. Parthasarathy, S. Gollahalli, University of Oklahoma, Norman, Norman, OK	1130 hrs AIAA-2016-4956 Experimental Investigation of the Laminar Flame Speeds of GTL Fuel Blends S. Samini, S. Ahmed, Qatar University, Doha, Qatar
Wednesday, 27 July 2016				
135-GEPC-2/EOA-1				
Chaired by: M. BRADLEY, Boeing Commercial Airplanes and T. ABDEL-SALAM, East Carolina University and E. GARCIA, Georgia Institute of Technology				
0930 hrs Oral Presentation Air Force Research Laboratory More Electric Aircraft Technologies J. Nairis, AFRL Aerospace Systems Directorate, Ohio, OH	1000 hrs Oral Presentation Exploration of Enabling Technologies and Preliminary Design of High Efficiency, High Specific Power Drive for Hybrid Propulsion Systems F. Luo, Ohio State University, Columbus, OH	1030 hrs Oral Presentation Carbon Emissions Impact of Hybrid Electric Propulsion and Secondary Power Systems C. Lents, United Technologies Research Center, Hartford, CT	1100 hrs Oral Presentation Enabling Technology Development for Hybrid and Distributed Electric Aircraft Propulsion M. Armstrong, Rolls Royce, Cherry Point, NC	1130 hrs Oral Presentation Review of Hybrid and Turbo Electric Propulsion for Large Transport Aircraft J. Felder, NASA Glenn Research Center, Cleveland, OH
254 B				
Wednesday, 27 July 2016				
136-GTE-14				
Chaired by: J. CSANK, NASA Research Center				
0930 hrs AIAA-2016-4957 Application of Symmetry Property for Transient Response Analysis of Mismatched Bladed Disks J. Yao, W. Zhu, N. Hu, Chongqing University, Chongqing, China; J. Wang, Beihang University, Beijing, China	1000 hrs AIAA-2016-4958 Analytical Modeling of Helium Compressor Performance D. Wilson, P. Balaji, University of Texas, Arlington, Arlington, TX	1030 hrs AIAA-2016-4959 Three-objective Optimization for the Design of Mechanical Component Using Evolutionary Numerical Simulation Approach N. Nagaiah, J. Kapur, University of Central Florida, Orlando, FL; C. Geiger, Universal Orlando Resort, Orlando, FL	1100 hrs AIAA-2016-4960 Optical Characterization of a Cross flow Fan for Distributed Propulsion G. Rausi, Technical University of Catalonia, Terrassa, Spain; L. Villafane, Stanford University, Stanford, CA; G. Pannagou, Purdue University, West Lafayette, IN	
251 A				
Wednesday, 27 July 2016				
Compressors III				
Chaired by: J. CSANK, NASA Research Center				
0930 hrs AIAA-2016-4957 Application of Symmetry Property for Transient Response Analysis of Mismatched Bladed Disks J. Yao, W. Zhu, N. Hu, Chongqing University, Chongqing, China; J. Wang, Beihang University, Beijing, China	1000 hrs AIAA-2016-4958 Analytical Modeling of Helium Compressor Performance D. Wilson, P. Balaji, University of Texas, Arlington, Arlington, TX	1030 hrs AIAA-2016-4959 Three-objective Optimization for the Design of Mechanical Component Using Evolutionary Numerical Simulation Approach N. Nagaiah, J. Kapur, University of Central Florida, Orlando, FL; C. Geiger, Universal Orlando Resort, Orlando, FL	1100 hrs AIAA-2016-4960 Optical Characterization of a Cross flow Fan for Distributed Propulsion G. Rausi, Technical University of Catalonia, Terrassa, Spain; L. Villafane, Stanford University, Stanford, CA; G. Pannagou, Purdue University, West Lafayette, IN	
251 B				
Wednesday, 27 July 2016				
137-GTE-15/ABPSI-6/HSABP-11				
0930 - 1200 hrs The AIAA Foundation and the Technical Committees GTE, ABPSI, and HSABP have worked together to sponsor a design competition. Undergraduate students from universities around the world were asked to prepare a design report to respond to a Request for Proposal (RFP). This RFP asked students to design a candidate engine for a next-generation trainer.				
All of the reports have been reviewed and scored by technical experts, and this session features the top three proposal winners, who have been invited to the AIAA Propulsion and Energy Forum 2016 to make an oral presentation to a panel of judges. These judges will assess the design, presentation, and responses to questions. They will add their scores to those provided by the technical judges to come up with a 1st-3rd place ranking. The final rankings will be announced at the conclusion of the session.				

Wednesday, 27 July 2016		Design and Development of Novel Hybrid Rocket Motor Concepts II		255 B
Chaired by: S. COOGAN, Southwest Research Institute and Y. CHEN, National Space Organization, Taiwan				
0930 hrs AIAA-2016-4961	1100 hrs AIAA-2016-4962	1030 hrs AIAA-2016-4963	1100 hrs AIAA-2016-4964	1130 hrs AIAA-2016-4965
Design of a Hybrid CubeSat Orbit Insertion Motor E. Jans, A. Karp, B. Nakazono, D. Eldred, M. DeVost, D. Vaughan, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	A Hybrid Mars Ascent Vehicle Concept for Low Temperature Storage and Operation A. Karp, B. Nakazono, J. Benito Manrique, R. Shatwell, D. Vaughan, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; G. Story, NASA Marshall Space Flight Center, Huntsville, AL	Experiments of an Ejector-jet using a Wax-based Fuel Hybrid Rocket Motor Y. Nakada, I. Nakagawa, Tokai University, Hiratsuka, Japan	Static Burning Tests on a Bread Board Oxidizer-Flow-Type Hybrid Rocket Engine K. Ozawa, T. Usuki, G. Mishima, K. Kringawa, Institute of Space and Astronautical Science, Sagamihara, Japan; M. Yamashita, M. Mizuchi, Kyushu University, Fukuoka, Japan, et al.	Design of a Lab-Scale Hybrid Rocket Test Stand J. Thomas, J. Stahl, G. Morrow, E. Petersen, Texas A&M University, College Station, TX
Wednesday, 27 July 2016				
139-HSABP-9				
Chaired by: T. O'BRIEN, Raytheon Missiles Systems				
0930 hrs AIAA-2016-4966	1000 hrs AIAA-2016-4967	1030 hrs AIAA-2016-4968	1100 hrs AIAA-2016-4969	
Design and Experiments of a Continuous Rotating Detonation Engine: a Spinning Wave Generator and Modulated Fuel/Oxidizer Mixing J. Boening, J. Heath, T. Byrd, J. Koch, A. Matlack, R. Breidenfahl, University of Washington, Seattle, WA, et al.	Theoretical and Experimental Consideration of the Continuous Rotating Detonation Engine M. Kurosaka, C. Knowlen, J. Boening, University of Washington, Seattle, WA	Preliminary Experiments on Transpiration Cooling in Ramjets and Scramjets F. Strauss, C. Marletti, D. Freudenmann, J. Witte, S. Schlechtriem, German Aerospace Center (DLR), Hardthausen, Germany	Flow Field Characteristics of Non-Axisymmetric High Subsonic Jets G. Valenitch, R. Kumar, Florida State University, Tallahassee, FL; D. Cippolletti, M. Alphonso, C. Harris, Northrop Grumman Corporation, Redondo Beach, CA	
Wednesday, 27 July 2016				
140-ITAR-3				
Chaired by: J. CASTRO, Aerojet Rocketdyne and C. BROPHY, Naval Postgraduate School				
0930 hrs AIAA-2016-4970	1000 hrs AIAA-2016-4971	1030 hrs AIAA-2016-4972	1100 hrs AIAA-2016-4973	1130 hrs AIAA-2016-4974
High Energy Radiation Effects on Spacecraft Service Valve O-ring Leak Rates G. Coll, R. Gigliuto, G. Webster, M. Espinosa, NASA Goddard Space Flight Center, Greenbelt, MD	Microgravity Flight Testing of Multi-Pulse Small Solid Motors (Consider for ITAR Session) S. Williams, P. Takahashi, J. Sousa, Digital Solid State Propulsion, Inc., Reno, NV; A. Nicholas, Naval Research Laboratory, Washington, D.C.	Design and Development of Gaseous Hydrogen and Oxygen Tank Pressurization Assemblies for the Space Launch System Core Stage H. Pitts, M. Effenhan, The Boeing Company, Huntsville, AL; P. Park, V. Cardoso, R. Kelly, Y. Gerasimov, Vector Engineering Corporation, Springfield, NJ	Design and Fabrication of an Ultra-Low-Cost Variant of the Banam Liquid Rocket Engine Family for Application to the DARPA Experimental Spaceplane (XS-1) and Other Future Low-Cost Launch Applications J. Castro, W. Sack, J. Little, Aerojet Rocketdyne, West Palm Beach, FL	Pyroshock Dynamic Loading Impacts on Thermoelectric Module Assemblies and Bi-Couples in Multi-Mission Radioisotope Thermoelectric Generators T. Hendricks, D. Heff, N. Keyawa, B. Nesmith, P. Bohmer, A. Derkorkjian, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, et al.
Wednesday, 27 July 2016				
141-LP-12				
Chaired by: S. CHIANESE, SpaceX and A. DEVEREAUX, Surrey Satellite Technology Ltd (SSTL)				
0930 hrs AIAA-2016-4975	1000 hrs AIAA-2016-4976	1030 hrs AIAA-2016-4977		
Development and Testing of a $0_2/CH_4$ Torch Igniter for Propulsion Systems L. Sanchez, J. Chuparro, S. Torres, N. Love, A. Choudhuri, University of Texas, El Paso, El Paso, TX	Characterising the Infrared Signature of a Liquid Propellant Engine Plume C. Higgins, QinetiQ, Sevenoaks, United Kingdom; T. Smithson, Defense Research and Development Canada, Québec, Canada; I. Coxhill, Moog, Aylesbury, United Kingdom; P. Fournier, S. Ringuette, Defense Research and Development Canada, Québec, Canada	Digital Image Correlation Techniques Applied to Large Scale Rocket Engine Testing P. Gradl, NASA Marshall Space Flight Center, Huntsville, AL		
Wednesday, 27 July 2016				
Rocket Engine Components				
251 D				


Wednesday, 27 July 2016		Propulsion Systems – Design & Test II		251 E
Chaired by: D. COOTE, NASA Stennis Space Center and D. GUADAGNOLI, Orbital ATK				
0930 hrs AIAA-2016-4978 Numerical Studies of Dynamic Response for an Oxidizer Injector to Detonation Wave K. Mikashiba, S. Soudastmukhi, D. Siechmann, S. Heister, Purdue University, West Lafayette, IN	1100 hrs AIAA-2016-4979 Experimental Study of Liquid Injector Elements for Use in Rotating Detonation Engines W. Anderson, D. Lim, Purdue University, West Lafayette, IN; M. Washington, U.S. Air Force Academy, Colorado Springs, CO; S. Heister, Purdue University, West Lafayette, IN	1030 hrs AIAA-2016-4980 Monopropellant Hydrazine Thrusters – Bringing Updated Designs to Flight V. Yarnor, M. Dawson, O. Morgan, Aerojet Rocketdyne, Redmond, WA	1100 hrs AIAA-2016-4981 Effects of Water Hammer on Propulsion Systems B. Binnale, J. Gilbert, J. Moore, G. Richa, Penn State Altoona, Altoona, PA	
Wednesday, 27 July 2016				
Chaired by: B. MARCU and S. FORDE, Aerojet Rocketdyne				
0930 hrs AIAA-2016-4982 Unique Characteristics of Imbalanced Torque Force of a Partial Admission Turbine for 50% Partiality K. Yoda, S. Kawasaki, M. Uchiyumi, Japan Aerospace Exploration Agency (JAXA), Kakuda, Japan; H. Kato, K. Funazaki, Iwate University, Morioka, Japan	1000 hrs AIAA-2016-4983 The Design and Analysis of Low Solidity Vaned Diffusers for Increased Turbopump Throttling Capability S. Sargent, Barber-Nichols, Inc., Arvada, CO	1030 hrs AIAA-2016-4984 Turbopump Design and Development for the Virgin Galactic NewtonThree Engine System S. Sargent, J. Noall, Barber-Nichols, Inc., Arvada, CO; M. Becker, S. Mocklin, Virgin Galactic, Long Beach, CA	1130 hrs AIAA-2016-4986 Characterization of Rotating Cavitation in a Four Bladed Inducer C. Lettieri, Delft University of Technology, Delft, The Netherlands; Z. Spakoszky, Massachusetts Institute of Technology, Cambridge, MA; D. Jackson, The Aerospace Corporation, Los Angeles, CA; V. Wang, Massachusetts Institute of Technology, Cambridge, MA	251 F
Wednesday, 27 July 2016				
Chaired by: B. CASSENTI, University of Connecticut and M. TAJMAR, Dresden University of Technology				
0930 hrs AIAA-2016-4987 Anomalous Electromagnetically Induced Propulsion Effects on Self-contained "RAMA" Devices H. Brito, R. De Alessandaro, M. Brito, Aeronautical University Institute, Córdoba, Argentina	1000 hrs AIAA-2016-4988 First Measurements of a 0.6 Gigawatt Superconducting Gravity-Impulse-Generator I. Lörincz, M. Tajmar, Dresden University of Technology, Dresden, Germany	1030 hrs AIAA-2016-4989 Propulsion Estimates for High Energy Lunar Missions Using Future Propellants B. Palaszewski, NASA Glenn Research Center, Cleveland, OH; G. Bennett, Aerospace Enterprises, Boise, ID		150 G
Wednesday, 27 July 2016				
Chaired by: C. CADOU, University of Maryland and H. CIEZKI, DLR - German Aerospace Center				
0930 hrs AIAA-2016-4990 Comparison of single and multi-injector GOC/CH4 combustion chambers M. Celano, S. Silvestri, C. Bauer, N. Perakis, G. Schlieben, O. Haidin, Technical University of Munich, Munich, Germany	1000 hrs AIAA-2016-4991 Investigation of Green Hypergolic Propellants for Hybrid Rockets K. Slobar, A. Thomas, B. Evans, B. Cantwell, Stanford University, Stanford, CA	1030 hrs AIAA-2016-4992 Characterization of a Multi-Injector GOC/CH4 Combustion Chamber S. Silvestri, M. Celano, G. Schlieben, O. Haidin, Technical University of Munich, Munich, Germany	1130 hrs AIAA-2016-4994 A 1D Multiphase Mixture Model for the Design of Catalysts for Monopropellant Thrusters C. Baffa, O. Haidin, Technical University of Munich, Munich, Germany	255 C

Wednesday, 27 July 2016		Single Injector Test Case Modeling		255 D
146-PC-13	Chaired by: O. HAIN, Technische Universität München and Y. DAIMON, Japan Aerospace Exploration Agency			
0930 hrs AIAA-2016-4995	1100 hrs AIAA-2016-4996	1030 hrs AIAA-2016-4997	1100 hrs AIAA-2016-4998	1130 hrs AIAA-2016-4999
Numerical Investigation of Flow and Combustion in a Single Element GCH4/GOX Rocket Combustor	Numerical Investigation of Flow and Combustion in a Single-Element GCH ₄ /GOX Rocket Combustor: Chemistry Modeling and Turbulence-Combustion Interaction	Numerical Investigation of Flow and Combustion in a Single-Element GCH ₄ /GOX Rocket Combustor: A comparative LES study	Numerical Modeling of Flow and Combustion in a Single-Element GCH ₄ /GOX Rocket Combustor: Aspects of Turbulence Modeling	On the Effects of Chemical Kinetics and Thermal Conditions on the Flow and Flame Features in a Single-Element GCH ₄ /GOX Rocket Combustor
C. Roth, O. Hain, A. Chemnitz, T. Sattelmayer, Technical University of Munich, Germany; G. Frank, University of the German Federal Armed Forces, Munich, Germany; H. Müller, Technical University of Munich, Munich, Germany; et al.	D. Maestro, B. Cuenot, CERFACS, Toulouse, France; A. Chemnitz, T. Sattelmayer, C. Roth, O. Hain, Technical University of Munich, Munich, Germany; et al.	H. Müller, J. Zips, M. Pfizner, University of the German Federal Armed Forces, Munich, Germany; D. Maestro, B. Cuenot, CERFACS, Toulouse, France; S. Menon, Georgia Institute of Technology, Atlanta, GA; et al.	A. Chemnitz, T. Sattelmayer, C. Roth, O. Hain, Technical University of Munich, Munich, Germany; Y. Daimon, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan; R. Keller, University of Stuttgart, Stuttgart, Germany; et al.	R. Rantjan, A. Panchal, S. Menon, Georgia Institute of Technology, Atlanta, GA
Wednesday, 27 July 2016				
147-SR-5				
Chaired by: M. RANDALL, Aerojet-Rocketdyne East and D. POE, Aerojet-Rocketdyne				
0930 hrs AIAA-2016-5000	1000 hrs AIAA-2016-5001	1030 hrs AIAA-2016-5002	1100 hrs AIAA-2016-5003	
Observation in Ballistic Evaluation Motor Static Firing: Graphite Nozzle Cracking	Multidisciplinary Optimization of a Solid Propellant Sectional Geometry for Internal Ballistic and Structural Strength Criteria	Effect of Ageing on Mechanical Properties of Composite Solid Propellants	"Thermal-Mechanical" Coupled Model Based on Porous Media Characteristics of EPDM Insulator Char Layer	
T. K. A. Rao, R. Jakk, Defence Research and Development Organisation, Jagdipur, India	C. Tola, M. Nikbay, Istanbul Technical University, Istanbul, Turkey	H. Naseem, H. Murthy, P. Ramakrishna, Indian Institute of Technology Madras, Chennai, India	Y. Liu, J. Pei, Northwestern Polytechnical University, Xi'an, China	
Wednesday, 27 July 2016				
148-TM-5				
Chaired by: C. TARAU, Advanced Cooling Technologies and E. KHALLI, Cairo University				
0930 hrs AIAA-2016-5004	1000 hrs AIAA-2016-5005	1030 hrs AIAA-2016-5006	1100 hrs AIAA-2016-5007	
Air Cycle Machine Transient Modeling with Exergy Analysis	CFD Investigation of Smoke Management in Underground Tunnels	Lumped Parameter Modelling and Testing of a Free Piston Stirling Engine Heat Exchanger Using Laminated Woven Copper Wire Mesh as Heat Transfer Areas	Oxidizer Composition Effects on NOx Emissions from Swirl Burner	
M. Bracey, S. Nuzum, R. Roberts, M. Wolff, Wright State University, Dayton, OH; J. Zumberge, Air Force Research Laboratory, Wright-Patterson AFB, OH	E. Khalli, W. El-Sayed Sweida, O. Huzzayyin, Cairo University, Cairo, Egypt	F. Sende, South African Nuclear Energy Corporation, Pelindaba, South Africa; P. Serrão, R. Dabson, Stellenbosch University, Stellenbosch, South Africa	E. Khalli, A. Ahmed, M. Hassan, H. Kayed, Cairo University, Cairo, Egypt	
Wednesday, 27 July 2016				
149-PLNRY-7				
1330 - 1500 hrs				
The Strategic Challenges and Opportunities in the Power and Propulsion Markets				Ballroom A-D
Pierre Chao Founding Partner Renaissance Strategic Advisors				

Wednesday, 27 July 2016		Propulsion Systems Integration		255 F
Chaired by: D. CROWE, Air Force Institute of Technology and A. PRAKASH, University of Teesside				
1500 hrs AIAA-2016-5008 Computational and Experimental Evaluation of a Complex Inlet Swirl Pattern Generation System D. Sanders, C. Nessler, W. Copenhaver, M. List, T. Januszewski, Air Force Research Laboratory, Wright-Patterson AFB, OH	1530 hrs AIAA-2016-5009 Parametrical Optimization of a three-dimensional Dump Diffuser with Aerodynamically-shaped Flame Tube for Modern Aircraft Engines Sonal Kumar, Kumanguru College of Technology, Coimbatore, India; V. Rangaraj, J. Allen, University of Oklahoma, Norman, OK	1600 hrs AIAA-2016-5010 Development of an Engine-integrated Fuel Cell Concept Demonstrator: Phase I Efforts L. Pratt, S. Vannoy, C. Cadou, University of Maryland, College Park, College Park, MD	1630 hrs AIAA-2016-5011 Development and Analysis of a Group 1 UAV Series Hybrid Power System with Two Engine Options M. Hageman, C. Wisniewski, U.S. Air Force Academy, Colorado Springs, CO	
Wednesday, 27 July 2016				
151-ECD-3				
Chaired by: T. HENDRICKS, NASA-Jet Propulsion Laboratory and L. MASON, NASA Glenn Research Center				
1500 hrs AIAA-2016-5012 Fission Surface Power Technology Demonstration Test Results M. Briggs, M. Gibson, S. Geng, NASA Glenn Research Center, Cleveland, OH; J. Sanzi, Vantage Partners, LLC, Cleveland, OH	1530 hrs AIAA-2016-5013 Two-Step Multi-Physics Analysis of an Annular Linear Induction Pump for Fission Power Systems S. Geng, T. Reid, NASA Glenn Research Center, Cleveland, OH	1600 hrs AIAA-2016-5014 Performance Testing of a High Temperature Linear Alternator for Stirling Convertors J. Metscher, S. Geng, NASA Glenn Research Center, Cleveland, OH	1630 hrs AIAA-2016-5015 Active Vibration Reduction of the Advanced Stirling Converter S. Wilson, J. Metscher, N. Schiffer, NASA Glenn Research Center, Cleveland, OH	1700 hrs AIAA-2016-5016 Stirling Engine Performance with Optimized Piston and Displacer Waveforms M. Briggs, NASA Glenn Research Center, Cleveland, OH
			1730 hrs AIAA-2016-5017 Maturing Technologies for Stirling Space Power Generation S. Wilson, B. Nowlin, NASA Glenn Research Center, Cleveland, OH; M. Dobbs, P. Schmitz, Vantage Partners, LLC, Brook Park, OH; J. Hufh, Converter Source, LLC, Athens, OH	151 AB
Wednesday, 27 July 2016				
152-EE-4				
Chaired by: S. DUNCAN, Aerospace Systems Design Laboratory, Georgia Tech and Y. YAVOR, Technion - Israel Inst. of Technology				
1500 hrs AIAA-2016-5018 Optimal Technique for Separation of Particulate-rich Syngas in Cyclone for Efficient Methanation O. Olatokun, E. Ogedengbe, University of Lagos, Akoka-Yaba, Nigeria	1530 hrs AIAA-2016-5019 Dry (CO₂) Reformation of Methane using Nickel-Barium Catalyst K. Barua, A. Gupta, University of Maryland, College Park, College Park, MD	1600 hrs AIAA-2016-5020 Simultaneous Differential Thermal and Thermogravimetric Analysis of Chicken Manure Gasification using Nitrogen and Carbon Dioxide R. Amamo, M. Husssein, University of Wisconsin, Milwaukee, Glendale, WI	1630 hrs AIAA-2016-5021 Aluminum-Water Reaction Mechanism – Modeling of the Different Reaction Stages Y. Yavor, Technion-Israel Institute of Technology, Haifa, Israel	1700 hrs AIAA-2016-5022 The Generalized Onsager Model for a Binary Gas Mixture with Swirling Feed S. Pradhan, Indian Institute of Science, Bengaluru, India
			1730 hrs AIAA-2016-5023 Analysis of High-Speed Rotating Flow in 2D Polar (r-θ) Coordinate S. Pradhan, Indian Institute of Science, Bengaluru, India	254 B
Wednesday, 27 July 2016				
153-EE-2				
Chaired by: S. DUNCAN, Aerospace Systems Design Laboratory, Georgia Tech and Y. YAVOR, Technion - Israel Inst. of Technology				
Renewable Fuel Generation And Processing				
1500 hrs AIAA-2016-5018 Optimal Technique for Separation of Particulate-rich Syngas in Cyclone for Efficient Methanation O. Olatokun, E. Ogedengbe, University of Lagos, Akoka-Yaba, Nigeria	1530 hrs AIAA-2016-5019 Dry (CO₂) Reformation of Methane using Nickel-Barium Catalyst K. Barua, A. Gupta, University of Maryland, College Park, College Park, MD	1600 hrs AIAA-2016-5020 Simultaneous Differential Thermal and Thermogravimetric Analysis of Chicken Manure Gasification using Nitrogen and Carbon Dioxide R. Amamo, M. Husssein, University of Wisconsin, Milwaukee, Glendale, WI	1630 hrs AIAA-2016-5021 Aluminum-Water Reaction Mechanism – Modeling of the Different Reaction Stages Y. Yavor, Technion-Israel Institute of Technology, Haifa, Israel	1700 hrs AIAA-2016-5022 The Generalized Onsager Model for a Binary Gas Mixture with Swirling Feed S. Pradhan, Indian Institute of Science, Bengaluru, India
			1730 hrs AIAA-2016-5023 Analysis of High-Speed Rotating Flow in 2D Polar (r-θ) Coordinate S. Pradhan, Indian Institute of Science, Bengaluru, India	150 G

Wednesday, 27 July 2016		HERMeS Hall Thruster II		250 A
Chaired by: T. MATLOCK and S. GILDEA, AFRL				
1500 hrs AIAA-2016-5024 Transient Thermal Analysis of the 12.5 kW HERMeS Hall Thruster S. Reilly, M. Selenak, R. Hofer, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA	1530 hrs AIAA-2016-5025 2000-hour Wear-Testing of the HERMeS Thruster G. Williams, J. Gilland, Ohio Aerospace Institute, Cleveland, OH; P. Peterson, Vantage Partners, LLC, Cleveland, OH; H. Kamhawi, W. Huang, M. Swiatek, NASA Glenn Research Center, Cleveland, OH; et al.	1600 hrs AIAA-2016-5026 Hollow Cathode Assembly Development for the HERMeS Hall Thruster T. Sarver-Velthey, H. Kamhawi, NASA Glenn Research Center, Cleveland, OH; D. Goebel, J. Polk, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; P. Peterson, D. Robinson, Vantage Partners, LLC, Brook Park, OH	1630 hrs AIAA-2016-5027 MASA's HERMeS Hall Thruster Electrical Configuration Characterization P. Peterson, H. Kamhawi, W. Huang, G. Williams, J. Gilland, J. Yim, NASA Glenn Research Center, Cleveland, OH; et al.	1700 hrs AIAA-2016-5028 Ion Acoustic Turbulence and Ion Energy Measurements in the Plume of the HERMeS Thruster Hollow Cathode N. Yanes, California Institute of Technology, Pasadena, CA; B. Jorns, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; A. Friss, Colorado State University, Fort Collins, CO; J. Polk, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA; P. Guerrero, J. Austin, California Institute of Technology, Pasadena, CA
Wednesday, 27 July 2016				
High Power Hall Thruster & PPU Development				
Chaired by: O. DUCHEMIN, Snecma S.A. and R. CONVERSANO, Jet Propulsion Laboratory				
1500 hrs AIAA-2016-5029 Investigation of Channel Interactions in a Nested Hall Thruster Part II: Probes and Performance S. Cusson, E. Dale, A. Gallimore, University of Michigan, Ann Arbor, Ann Arbor, MI	1530 hrs AIAA-2016-5030 Investigation of Channel Interactions in a Nested Hall Thruster Part I: Acceleration Region Velocimetry M. Geogin, V. Dhaliwal, A. Gallimore, University of Michigan, Ann Arbor, Ann Arbor, MI	1600 hrs AIAA-2016-5031 Performance of a High-Fidelity 4kW-Class Engineering Model PPU and Integration with HIVHAc System L. Pniro, H. Kamhawi, NASA Glenn Research Center, Cleveland, OH; V. Shilo, Colorado Power Electronics, Inc., Fort Collins, CO	1630 hrs AIAA-2016-5032 Electric Propulsion Electronics Activities in Europe 2016 M. Gollor, ESA, Noordwijk, The Netherlands; E. Bourguignon, Thales Group, Charleroi, Belgium; G. Glorieux, Airbus, Elancourt, France; N. Wegner, Airbus, Friedrichshafen, Germany; J. Palencia, Criso, Tres Cantos, Spain; P. Galantini, Selex ES, Nerviano, Italy; et al.	1700 hrs AIAA-2016-5033 High Input Voltage, Power Processing Unit Performance Demonstration W. Santiago, K. Bazzak, L. Pniro, R. Scheidegger, M. Gonzalez, A. Birchenough, NASA Glenn Research Center, Cleveland, OH; et al.
Wednesday, 27 July 2016				
Magnetoplasma Dynamics and EP Diagnostics				
Chaired by: R. LOBBIA, University of Michigan and P. PETERSON, NASA Glenn Research Center				
1500 hrs AIAA-2016-5034 Plume and beam properties of miniaturized low-power cylindrical Hall thruster for micro-satellites H. Kim, Korea Advanced Institute of Science and Technology, Daejeon, South Korea; S. Lee, Korea Institute of Materials Science, Changwon, South Korea; Y. Lim, J. Kim, W. Choe, Korea Advanced Institute of Science and Technology, Daejeon, South Korea	1530 hrs AIAA-2016-5035 Kinetic modeling of collisionless electron cooling on magnetized plasma expansions S. Correyero Plaza, J. Navarro, E. Aheido, G. Sanchez, Charles III University of Madrid, Leganes, Spain	1600 hrs AIAA-2016-5036 Measurement of Electron and Neutral Atom Density Downstream of an Electric Propulsion N. Yamamoto, M. Iwamoto, T. Morita, H. Nakashima, Kyushu University, Kasuga, Japan	1630 hrs AIAA-2016-5037 Collisionless electron cooling in unmagnetized plasma thruster plumes M. Merino-Martinez, P. Fajardo, E. Aheido, Charles III University of Madrid, Leganes, Spain	1730 hrs AIAA-2016-5039 Thrust Performance and Cathode Temperature Evaluation of MW Class Quasi-Steady MPD Thruster Y. Oshio, Tokyo University of Agriculture and Technology, Kagamei, Japan; S. Tanooka, Graduate University for Advanced Studies, Sugamihara, Japan; I. Funaki, Japan Aerospace Exploration Agency (JAXA), Sugamihara, Japan
Wednesday, 27 July 2016				
Micropropulsion				
Chaired by: W. HOSKINS, Aerojet Rocketdyne and M. GLASCOCK				
1500 hrs AIAA-2016-5040 Micropropulsion Based on Vacuum Arc Physics and Technology: A Review J. Kolbeck, M. Keidar, George Washington University, Washington, D.C.; A. Anders, Lawrence Berkeley National Laboratory, Berkeley, CA	1530 hrs AIAA-2016-5041 A Vacuum Arc Thruster with Ablatable Anode J. Kolbeck, J. Lukas, G. Teel, M. Keidar, George Washington University, Washington, D.C.	1600 hrs AIAA-2016-5042 Preliminary Measurements of an Integrated Prototype of the CubeSat Ambipolar Thruster T. Collard, J. Sheehan, University of Michigan, Ann Arbor, Ann Arbor, MI	1630 hrs AIAA-2016-5043 Linear Actuated Micro-Cathode Arc Thruster System S. Hurley, M. Keidar, George Washington University, Washington, D.C.	1730 hrs AIAA-2016-5045 Lifetime Testing of the mN-FEEP Thruster A. Reissner, University of Applied Sciences, Wiener Neustadt, Austria

Wednesday, 27 July 2016		Turbines IV		250 F
Chaired by: C. PERULLO, Georgia Institute of Technology				
1500 hrs AIAA-2016-5046 Determination of Transient Heat Transfer Rates for a Film Cooled Metal Plate in a Blowdown Facility using Infrared Thermography L. Chen, R. Mathison, Ohio State University, Columbus, OH	1530 hrs AIAA-2016-5047 Integrated Turbine Tip Clearance and Gas Turbine Engine Simulation J. Chapman, Vantage Partners, LLC, Cleveland, OH; T. Guo, J. Kratz, J. Litt, NASA Glenn Research Center, Cleveland, OH	1600 hrs AIAA-2016-5048 An Experimental and Numerical Investigation of the Flow Field and Heat Transfer from a Single Impinging Jet with Varying Confinement Conditions J. Hodges, L. Blanchette, H. Zavan, E. Fernandez, University of Central Florida, Orlando, FL; J. Rodriguez, Siemens, Orlando, FL; J. Kapat, University of Central Florida, Orlando, FL	1630 hrs AIAA-2016-5049 Multi-objective optimization method for high pressure turbine casing based on thermal-structural coupling analysis W. Chen, Z. Zhao, X. Dai, Nanjing University of Aeronautics and Astronautics, Nanjing, China	
Wednesday, 27 July 2016				
Aerodynamic Flows in Gas Turbine Engines				
Chaired by: A. SURYANARAYANAN, FMC Technologies				
1500 hrs AIAA-2016-5050 Transition and turbulence in a wall-bounded channel flow at high Mach number S. Pradhan, Indian Institute of Science, Bengaluru, India	1530 hrs AIAA-2016-5051 Large eddy simulation of flat plate film cooling flow characteristics based on plasma actuation G. Li, J. Yu, F. Chen, L. Li, Y. Song, Harbin Institute of Technology, Harbin, China	1600 hrs AIAA-2016-5052 Application of the Maximum Lyapunov Exponent to Analyze the Effect on the Flow Separation with Vibration Wall W. Jianhui, F. Xin, G. Huang, H. Shui, Nanjing University of Aeronautics and Astronautics, Nanjing, China; Z. Yuanchi, General Electric Company, Suzhou, China	1630 hrs AIAA-2016-5053 Experimental Study on Effusion Cooling with Tangential Air Inlet H. Yu, J. Suo, H. Jiang, L. Zheng, Northwestern Polytechnical University, Xi'an, China	1700 hrs AIAA-2016-5054 Application of Crossflow Transition Criteria to Local Correlation-Based Transition Model C. Bode, J. Friedrichs, Technical University of Braunschweig, Braunschweig, Germany; C. Müller, F. Heibst, Leibniz University, Hannover, Germany
Wednesday, 27 July 2016				
Gas Turbine Inlets				
Chaired by: D. FOJTICH, The Boeing Company				
1500 hrs AIAA-2016-5055 Numerical investigation on influence of suction in S-shaped inlet to the rear fan-stage performance J. Yu, H. Liu, Harbin Institute of Technology, Harbin, China; L. Liu, Hangzhou Dianzi University, Hangzhou, China; G. Li, F. Chen, Y. Song, Harbin Institute of Technology, Harbin, China	1530 hrs AIAA-2016-5056 Performance Estimation for Serpentine Nozzle Coupled with Aero-engine S. Xiaolin, Z. Wang, L. Zhou, J. Shi, Northwestern Polytechnical University, Xi'an, China	1600 hrs AIAA-2016-5057 Fast Uncertainty Quantification in Engine Nacelle Inlet Design Using a Reduced Dimensional Polynomial Chaos Approach X. Guo, Y. Wang, N. Spotts, N. Xie, S. Roy, A. Prasad, Colorado State University, Fort Collins, CO	1630 hrs AIAA-2016-5058 Analysis and Comparison of Inlet Distortion Flow Physics at Design and Near Stall Operating Condition Using Proper Orthogonal Decomposition R. Spencer, S. Gorrell, M. Jones, Brigham Young University, Provo, UT; E. Duque, Intelligent Light, Rutherford, NJ	1700 hrs AIAA-2016-5059 Modeling of ice accretion on rotating cone in aero-engine L. Zhang, M. Zhang, X. Zhang, Z. Liu, Northwestern Polytechnical University, Xi'an, China
Wednesday, 27 July 2016				
Gas Turbine Engine Modeling				
Chaired by: J. TAL, Georgia Institute of Technology				
1500 hrs AIAA-2016-5060 Exergetic, Exergoeconomic and Exergoenvironmental Analysis of Intercooled Gas Turbine Engine A. Almutairi, P. Piliadis, Cranfield University, Cranfield, United Kingdom; N. Al-Mutawwa, Kuwait University, Kuwait	1530 hrs AIAA-2016-5061 Dynamic Modeling of a Mixed-Flow Afterburning Turbofan Using MATLAB/Simulink R. Buetner, R. Roberts, M. Wolff, Wright State University, Dayton, OH	1600 hrs AIAA-2016-5062 Design Parameter Identification of the Air Supply for a turboshaft Engine Quick-Start System M. Kerler, C. Schaffner, W. Erhard, V. Gümmer, Technical University of Munich, Garching, Germany	1630 hrs AIAA-2016-5063 Development and Validation of an NPSS Model of a Small Turbojet Engine S. Vannoy, C. Cadoux, University of Maryland, College Park, College Park, MD	1730 hrs AIAA-2016-5065 Size Estimation and Performance Analysis of a New Intercooled and Recuperated Aero-engine Y. Xu, H. Tang, M. Chen, Beihang University, Beijing, China

Wednesday, 27 July 2016		Internal Ballistics Modeling II		255 B
Chaired by: A. KARP, Jet Propulsion Laboratory and M. KOBALD, DLR-German Aerospace Center				
1500 hrs AIAA-2016-5066 Modeling of Paraffin-Based Fuels in the Simulation of Hybrid Rocket Flowfields G. Leccese, D. Bianchi, F. Nisini, University of Rome "La Sapienza", Rome, Italy	1530 hrs AIAA-2016-5067 Pressure-Measurement Based Estimation of Fuel Regression Rate in Hybrid Rockets C. Comincino, University of Naples "Federico II", Naples, Italy; D. Pastrone, Technical University of Turin, Turin, Italy	1600 hrs AIAA-2016-5068 Development and Testing of Three Alternative Designs for Additively Manufactured Hybrid Thrusters S. Whitmore, S. Mathias, Utah State University, Logan, UT	1630 hrs AIAA-2016-5069 Generalized Triaxial Flows: Swirling Motion in Rockets with Arbitrary Headwall Injection O. Ceal, J. Mujidjani, Auburn University, Auburn, AL	
Wednesday, 27 July 2016				
163-HSABP-10				
Chaired by: R. MOEHLINKAMP, Aerojet Rocketdyne				
1500 hrs AIAA-2016-5070 Control of Shock Wave – Boundary Layer Interaction Using Nanosecond Dielectric Barrier Discharge Plasma Actuators K. Kinefuchi, A. Starkovskiy, R. Miles, Princeton University, Princeton, NJ	1530 hrs AIAA-2016-5071 Experimental Investigation of Fuel Cooled Combustor L. Taddeo, N. Gascoin, K. Chetahama, National Institute of Applied Sciences (INSA), Bourges, France; A. Ingegnito, F. Gomma, University of Rome "La Sapienza", Rome, Italy; M. Bouchez, MBDA, Bourges, France; et al.	1600 hrs AIAA-2016-5072 Experimental Study on Start/Unstart Behavior of Two Dimensional Mixed Compression Inlet by Cowl Actuation R. Ananthapadmanabhan, T. Aluriganandam, Indian Institute of Technology Madras, Chennai, India		255 A
Experimental Developments in High-speed Air-Breathing Systems				
Wednesday, 27 July 2016				
164-ITAR-4				
Chaired by: N. JOSHI, GE and K. KAILASANATH, Naval Research Laboratory				
1500 hrs AIAA-2016-5073 The Influence of Pore Pressure Modeling on Thermal Analysis of Charring Materials T. Laker, M. Ewing, Orbital ATK, Promontory, UT	1530 hrs AIAA-2016-5074 Nusselt Number Correlation for Rocket Nozzle Analysis B. Losser, M. Ewing, Orbital ATK, Promontory, UT	1600 hrs AIAA-2016-5075 Experimental Investigation of Fine Droplet Injectors on AF-M315E Microthruster Operation R. Grist, C. Knowlen, University of Washington, Seattle, WA; G. Shaw, S. Sawhill, Systema Technologies, Inc., Kirkland, WA	1700 hrs AIAA-2016-5077 Development and Validation of Autonomous Operational Sequences for the NEXT System R. Thomas, M. Patterson, NASA Glenn Research Center, Cleveland, OH	151 DE
Launch Vehicles II (CAT-IV) 				
Wednesday, 27 July 2016				
165-IP-15				
Chaired by: I. LEYVA, AFOSR and S. SCHUMAKER, Air Force Research Laboratory				
1500 hrs AIAA-2016-5078 Study on Combustion Characteristics of LOX/LNG (methane) Co-axial Type Injector under High Pressure Condition H. Asakawa, IHI Corporation, Tomioka, Japan; H. Nami, I. Masuda, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan; R. Shimohara, Y. Ishikawa, H. Sakaguchi, IHI Corporation, Tomioka, Japan	1530 hrs AIAA-2016-5079 Mixing of Supercritical Fluid in Shear Coaxial Injector Configuration S. Sardeshmukh, W. Anderson, Purdue University, West Lafayette, IN	1600 hrs AIAA-2016-5080 Performance Evaluation of Rocket Engine Combustors using Ethanol/Liquid Oxygen Pintle Injector K. Sakaki, H. Kakuado, S. Nakaya, M. Tsue, University of Tokyo, Tokyo, Japan; R. Kanoi, K. Suzuki, Interstellar Technologies, Inc., Tokyo, Japan; et al.	1630 hrs AIAA-2016-5081 Study on atomization and combustion characteristics of LOX/Methane pintle injectors F. Xinxin, S. Chibing, National University of Defense Technology, Changsha, China	251 D
Injectors				

Wednesday, 27 July 2016		Combustion Stability		251 E
Chaired by: P. GLOYER, Gloyer-Taylor Laboratory and D. LINEBERRY, UAH Propulsion Research Center				
1500 hrs AIAA-2016-5082 Dynamic Characteristics of Various Liquid Propulsion Engine Cycles as Relates to Pogo Stability Analysis D. Ransom, Southwest Research Institute, San Antonio, TX	1530 hrs AIAA-2016-5083 Experimental Investigation of Transverse Combustion Instabilities in a High Pressure Multi-Element Combustor R. Gejji, Purdue University, West Lafayette, IN; B. Austin, IN Space, LLC, West Lafayette, IN; W. Anderson, Purdue University, West Lafayette, IN	1600 hrs AIAA-2016-5084 Large Eddy Simulations of Transverse Combustion Instability in a Multi-element Injector M. Harvazinski, Air Force Research Laboratory, Edwards AFB, CA; Y. Desai, HyperComp, Inc., Westlake Village, CA; D. Talley, V. Sankaran, Air Force Research Laboratory, Edwards AFB, CA	1630 hrs AIAA-2016-5085 High Amplitude Acoustic Field Effects on Air-Assisted Liquid Jet A. Fiacicello, F. Baillet, J. Blusot, National Center for Scientific Research (CNRS), Saint-Etienne-du-Rouvray, France; C. Richard, University of Rouen, Saint-Etienne-du-Rouvray, France; M. Theron, French Space Agency (CNES), Paris, France	1730 hrs AIAA-2016-5087 Numerical Investigation on Combustion Instability in a small MMH/NTD Liquid Rocket Engine J. Qin, H. Zhang, B. Wang, Tsinghua University, Beijing, China
Wednesday, 27 July 2016				
167-LP-17				
Chaired by: A. LEKEUX, CNES and G. COLL, Orbital ATK				
1500 hrs AIAA-2016-5088 Material Compatibility of Bio-Ethanol Fuel with Rocket Engine Combustion Chamber Cooling Channels N. Azuma, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan; D. Ogawa, A. Iijima, K. Higashino, Muroran Institute of Technology, Muroran, Japan; T. Hiraiwa, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan; M. Oguma, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan	1530 hrs AIAA-2016-5089 Designing and Building a Hydrogen Peroxide-Kerosene Rocket Engine V. Tarcusis, Z. Seider, A. Demarest, S. Nyquist, Son Jose State University, San Jose, CA	1600 hrs AIAA-2016-5090 Modeling of Fuel Film Cooling Using Steady State RANS and Unsteady DES Approaches K. Brown, E. Coy, M. Harvazinski, V. Sankaran, Air Force Research Laboratory, Edwards AFB, CA	1630 hrs AIAA-2016-5091 Development of Hydrogen Peroxide/Kerosene 2,500 N Bipropellant Thruster for Long-term Operation by Film Cooling S. Heo, S. Kwon, S. Jung, Korea Advanced Institute of Science and Technology, Daejeon, South Korea	251 F
Wednesday, 27 July 2016				
168-LP-18				
Chaired by: T. POURPOINT, Purdue University and J. SAUER, Orbital Technologies Corporation				
1500 hrs AIAA-2016-5092 Development and testing of a nitrous-oxide/ethanol bi-propellant rocket engine J. Phillip, S. Youngblood, New Mexico Institute of Mining and Technology, Socorro, NM; M. Grubelich, W. Sou, Sandia National Laboratories, Albuquerque, NM; M. Hargather, New Mexico Institute of Mining and Technology, Socorro, NM	1530 hrs AIAA-2016-5093 Study on the Thermal Decomposition of Bioethanol as a High-Pressure Rocket Propellant A. Iijima, D. Nakata, K. Higashino, Muroran Institute of Technology, Muroran, Japan	1600 hrs AIAA-2016-5094 Pressure Drop Measurement of Porous Materials: Flashback Arrestors for a N_2O/C_2H_4 Premixed Green Propellant L. Wierling, S. Müller, A. Hauk, H. Ciezki, S. Schleithienem, German Aerospace Center (DLR), Lampoldshausen, Germany		253 AB
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169-PC-14				
Chaired by: D. MAESTRO and C. ROTH, TU München				
1500 hrs AIAA-2016-5095 An Overview of Spray Modeling With OpenWCC and its Application to Emissions Predictions of a LDI Combustor at High Pressure M. Reju, Vantage Partners, LLC, Brook Park, OH	1530 hrs AIAA-2016-5096 Numerical Investigation of Liquid Jet Breakup and Droplet Statistics with Comparison to X-ray Radiography L. Bravo, Army Research Laboratory, Aberdeen Proving Ground, MD; D. Kim, F. Ham, Cascade Technologies, Inc., Palo Alto, CA; C. Powell, D. Duke, K. Matusiak, Argonne National Laboratory, Argonne, IL; et al.	1600 hrs AIAA-2016-5097 Computational simulation on the performance of Scramjet combustor using Multi-strut circular shaped injector K. Pandey, G. Choubey, National Institute of Technology, Silchar, India	1630 hrs AIAA-2016-5098 Solid rocket motor burn simulation considering complex 3D propellant grain geometries G. Meijer, R. Jachura, S. Gomes, L. Rocco, J. Rocco, K. Iha, Technological Institute of Aeronautics (ITA), São José dos Campos, Brazil	255 C

Wednesday, 27 July 2016		Rotating Detonation Concepts		255 D
Chaired by: J. MURPHY, The Aerospace Corporation and C. CADOU, University of Maryland				
1500 hrs AIAA-2016-5099 High-Pressure Rotating Detonation Engine Testing and Flameholding Analysis with Hydrogen and Natural Gas D. Stechmann, S. Heister, S. Sardeshmukh, Purdue University, West Lafayette, IN	1530 hrs AIAA-2016-5100 Experimental Study of Effects of Injector Configurations on Rotating Detonation Engine Performance K. Goto, Y. Kato, K. Ishihara, K. Matsuoka, J. Kasahara, Nagoya University, Nagoya, Japan; A. Matsuo, Keio University, Yokohama, Japan; et al.	1600 hrs AIAA-2016-5101 Numerical Simulation towards Investigating the Factor for Velocity Decrease of Detonation Wave in Rotating Detonation Engine Chamber J. Fujii, Y. Kumazawa, A. Matsuo, Keio University, Yokohama, Japan; S. Nakagami, K. Matsuoka, J. Kasahara, Nagoya University, Nagoya, Japan	1630 hrs AIAA-2016-5102 Numerical Study for Rotating Detonation Propagation in a Two-Parallel-Plane Combustor Y. Kumazawa, J. Fujii, A. Matsuo, Keio University, Yokohama, Japan; S. Nakagami, K. Matsuoka, J. Kasahara, Nagoya University, Nagoya, Japan	1700 hrs AIAA-2016-5103 Experimental Study of Research of Centrifugal-Compressor-Radial-Turbine Type Rotating Detonation Engine C. Ishiyama, K. Miyazaki, S. Nakagami, K. Matsuoka, J. Kasahara, Nagoya University, Chikusa, Japan; A. Matsuo, Keio University, Hyoshi, Japan; et al.
Wednesday, 27 July 2016				
171-PC-16				
Chaired by: B. CHEHROUDHI, Advanced Technology Consultants and J. LEYLEGIAN, Manhattan College				
1500 hrs AIAA-2016-5104 Comparative Analysis of Alternative Fuels in Detonation Combustion M. Azami, M. Szwili, Cranfield University, Cranfield, United Kingdom	1530 hrs AIAA-2016-5105 Numerical Simulation of Interaction of Detonation with Metal Particles in Condensed Matter J. Zhang, Florida Institute of Technology, Melbourne, FL; T. Jackson, University of Florida, Gainesville, Gainesville, FL	1600 hrs AIAA-2016-5106 Numerical Studies of Detonation Initiation by Supersonic Projectiles using a High-Order Adaptive Cut-cell Method B. Muralidharan, S. Menon, Georgia Institute of Technology, Atlanta, GA	1630 hrs AIAA-2016-5107 An Experimental Study on the Deflagration-to-Detonation Transition in Millimeter Scale Tubes J. He, W. Fan, T. Yan, Y. Chi, Northwestern Polytechnical University, Xi'an, China	1700 hrs AIAA-2016-5108 Numerical investigation of the initiation and propagation of oblique detonation waves in a confined combustion chamber H. Lee, W. Fan, Northwestern Polytechnical University, Xi'an, China; Q. Xiao, McGill University, Montréal, Canada
Wednesday, 27 July 2016				
172-PP-1				
Chaired by: L. CHEN, Texas A&M University				
1500 hrs AIAA-2016-5109 Energy Management Strategy of Hybrid PEMFC-PV-Battery Propulsion System for Low Altitude UAVs X. Zhang, L. Liu, G. Xu, Beijing Institute of Technology, Beijing, China	1530 hrs AIAA-2016-5110 Influence and efficiency of energy harvesting on the process of de-orbiting using bare electrodynamic tether system Q. Xia, K. Xie, X. Liu, Z. Wu, N. Wang, Beijing Institute of Technology, Beijing, China	1600 hrs AIAA-2016-5111 Combustion and Performance Sensitivity to Fuel Cetane Number in an Aviation Diesel Engine M. Szendmayer, C. Kweon, K. Kruger, Army Research Laboratory, Aberdeen Proving Ground, MD; J. Gibson, R. Armstrong, C. Lindsey, U.S. Army AMRDEC, Redstone Arsenal, AL; et al.	1630 hrs AIAA-2016-5112 The Testing of a Small-Scale Wave Rotor for Use as a Modified Brayton-Cycle Engine M. McCleam, M. Polonka, K. Lupp, Air Force Institute of Technology, Wright-Patterson AFB, OH; M. Matczyński, F. Schauer, Air Force Research Laboratory, Wright-Patterson AFB, OH; D. Paxson, NASA Glenn Research Center, Cleveland, OH	1700 hrs Oral Presentation D-DALUS Cyclopro Explorer Propulsion System for UAVs D. Wills, M. Schwaiger, Innovative Aeronautics Technologies GmbH, Linz, Austria
Wednesday, 27 July 2016				
173-SATS-2				
Chaired by: J. STRAUB, University of North Dakota				
1500 hrs AIAA-2016-5113 Application of Technology Readiness Levels to Micro-Propulsion Systems W. Hargus, J. Singleton, Air Force Research Laboratory, Edwards AFB, CA	Small Satellites Fusion Panel			
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174-SR-6 Chaired by: B. LEARY, Johns Hopkins University Applied Physics Laboratory and C. ROUSSEAU, Denel (Pty) Ltd.	1530 hrs AIAA-2016-5115 Laboratory-Scale Burning of Composite Solid Propellant Using In-Situ Synthesized Iron Oxide A. Demko, C. Diller, G. Morrow, T. Sammet, Texas A&M University, College Station, TX; K. Grossman, S. Seal, University of Central Florida, Orlando, FL; et al.	1600 hrs AIAA-2016-5116 Stability of filler-binder interface under hygrothermal aging C. Pereira, Technological Institute of Aeronautics (ITA), São José dos Campos, Brazil; L. Madureira, Aeronautics and Space Institute (IAE), São José dos Campos, Brazil; J. Scheper, Federal University of São Carlos, São Carlos, Brazil; L. Vitor, Aeronautics and Space Institute (IAE), São José dos Campos, Brazil	1630 hrs AIAA-2016-5117 Combustion Characteristics in the Secondary Combustor of Ducted Rockets - Effects of the Changing Distance Rate of B Particles- K. Shiratori, T. Kawahara, Nihon University, Chiba, Japan	1700 hrs AIAA-2016-5118 Comparison of Solid Propellant Burning Rate Determination Methods from Industrial Point of View Ö. Atık, B. Zıttın, M. Yumusak, ROKETSAN Missile Industries, Inc., Ankara, Turkey
175-TM-6 1500 - 1630 hrs	Nano-Technology for Thermal Management (Panel)			151 G
Panelists will discuss the application of nano-technology for aerospace and terrestrial thermal management, with emphasis on challenges and opportunities. Each panel member will also make a short presentation to highlight his/her scope of involvement in nano-technology and view of the future demands for this technology for thermal management.				
Panelists:				
Keunhan (Kay) Park Assistant Professor of Mechanical Engineering, Micro/Nanoscale Energy Transport & Conversion Laboratory University of Utah	Massood Tabib-Azar USTAR Professor and Chair of Solid-State/Circuits/MEMS Curricular Committee, Electrical & Computer Engineering, University of Utah Visiting Scholar, EECS, University of California Berkeley (2015-2016)			
Wednesday, 27 July 2016	Heat Transfer and Transport Modeling and Analysis III			151 G
176-TM-7 Chaired by: E. OGEDENGBE, ENERGHX Consulting/University of Lagos	1630 hrs AIAA-2016-5120 Outdoor Air Conditioning: Case Study of Open Football Stadium M. Ashimawy, E. Khalil, Cairo University, Cairo, Egypt	1700 hrs AIAA-2016-5121 Sensitivity Analysis of Upwinding Schemes for Three Dimensional Advection-Diffusion Transport Using Control-Volume Based Finite Element Method K. Olaitan, E. Ogedengbe, University of Lagos, Akoka-Ibe, Nigeria	1730 hrs AIAA-2016-5122 Air Flow Regimes in Air-Conditioned Spectators' Zone of Qatar Stadium E. Khalil, M. Ashimawy, W. Abdelsamea, Cairo University, Cairo, Egypt	
No Presentation				

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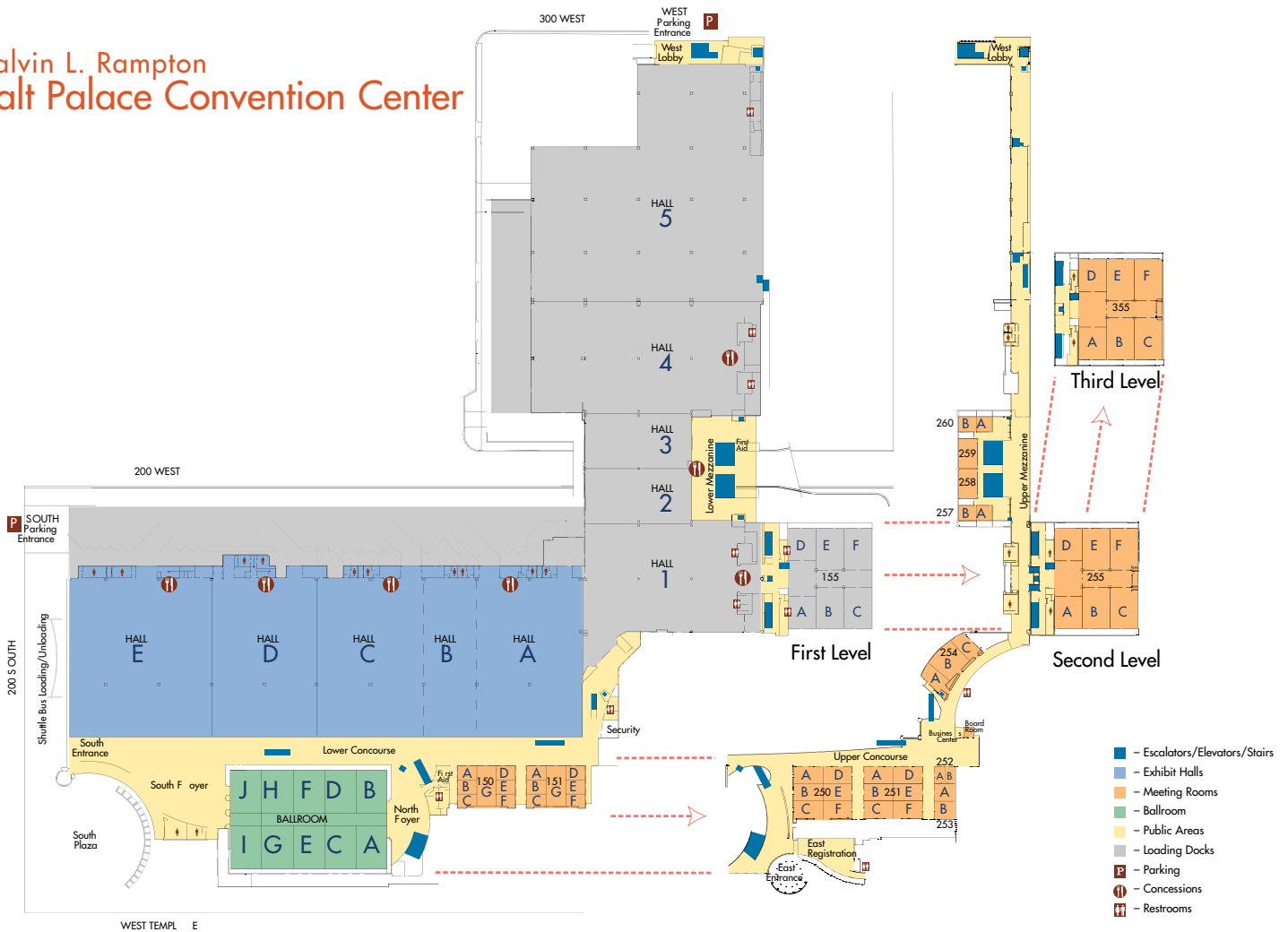
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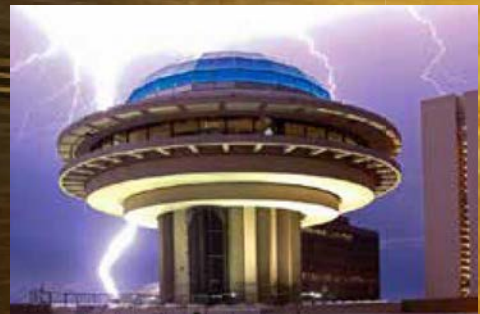
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