

**SPACE TECHNOLOGY & APPLICATIONS  
INTERNATIONAL FORUM (STAIF-2007)**  
February 11 - 15, 2007

**“Space Renaissance: Inspiring the Next Generation”**

**PROGRAM BOOK**

- 11<sup>th</sup> CONFERENCE ON THERMOPHYSICS APPLICATIONS IN MICROGRAVITY**  
**24<sup>th</sup> SYMPOSIUM ON SPACE NUCLEAR POWER AND PROPULSION**  
**5<sup>th</sup> CONFERENCE ON HUMAN/ROBOTIC TECHNOLOGY AND THE VISION FOR  
SPACE EXPLORATION**  
**5<sup>th</sup> SYMPOSIUM ON SPACE COLONIZATION**  
**4<sup>th</sup> SYMPOSIUM ON NEW FRONTIERS AND FUTURE CONCEPTS**

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## EXHIBITS

### *Hotel Albuquerque, Exhibit Area*

Exhibit Hours:	Monday, February 12	7:45am – 12:30pm	1:30pm – 5:00pm	
	Tuesday, February 13	7:45am – 12:30pm	1:30pm – 5:00pm	6:30pm – 7:30pm
	Wednesday, February 14	7:45am – 12:30pm	1:30pm – 4:30pm	

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## AWARDS AND OUTREACH

### SCHREIBER-SPENCE ACHIEVEMENT AWARD

The Schreiber-Spence Space Achievement Award was established by The University of New Mexico's Institute for Space and Nuclear Power Studies to recognize contributions that have advanced capabilities in space technologies and applications through excellence in pioneering applications, technical contributions, public service, or leadership. The award consists of a memento and a monetary award of \$2,500 (shared equally if there are multiple awardees who have contributed jointly). Presented by the Institute, the award is given when a worthy person (or persons contributing jointly) is identified by the Awards Committee. The award is not given more frequently than, nor necessarily, annually. The Award(s) will be presented at the STAIF-2007 Banquet. The awardee(s) is expected to attend the STAIF Conference, at which the award is given, and to address the attendees on a relevant topic. The award honors Raemer E. Schreiber and Roderick W. Spence for their pioneering and technical contributions to concepts and designs for nuclear propulsion in space during their tenure at Los Alamos National Laboratory.

**NOMINATION:** Nominations for the award can be submitted at any time to The University of New Mexico's Institute for Space and Nuclear Power Studies, c/o Schreiber-Spence Space Achievement Award, on the special nomination form. The final selection for the award will be made based on the criteria described in the award bylaws. A copy of the award bylaws and the nomination form can be obtained by writing to the Institute or by calling (505) 277-0446.

Nominations will be retained for consideration for a three-year period.

**SELECTION CRITERIA:** Strict selection criteria have not been adopted, nor judged to be appropriate, except as they are implicit in the purposes for which the Award has been established and as noted in the first paragraph of these "Guidelines." Additionally, contributions are, or have been, substantial and specific, and contributions acknowledged to be worthy of unusual recognition for excellence by those actively engaged in the field of space technologies and applications.

**NOMINATION FORM:** To be considered by the Award Committee, all sections of the Nomination Form must be completed in compliance with the requirements. The Award Committee will place particular emphasis in its review of the nominations on evidence substantiating the excellence of the contributions noted in the citation and as contained in the basis for the nomination. Nominations can be submitted at any time on the Nomination Form to ISNPS.

**2007 AWARD COMMITTEE:**

**Robert L. Wiley** (chair), U.S. Department of Energy; **Stanley K. Borowski**, NASA Glenn Research Center; **Lawrence DeFillipo**, Science Applications International Corporation; **Stanley Gunn**, Rocketdyne (Retired); **Kenneth R. Johnson**, Jet Propulsion Laboratory; **Eric Rice**, Orbital Technologies Corporation (ORBITEC); **Harrison Schmitt**, Consultant; and **Ted Swanson**, NASA Goddard Space Flight Center.

#### Recipients of the Schreiber-Spence Space Achievement Award:

1988 Raemer E. Schreiber  
 1988 Roderick W. Spence  
 1990 Jerome Mullein  
 1990 William E. Wright  
 1991 Stanley V. Gunn  
 1992 Harold B. Finger  
 1993 Robert T. Carpenter  
 1993 James J. Lombardo  
 1994 George Gryaznov, Russia  
 1994 Victor Ya. Poupko, Russia  
 1995 Martin Marietta Astro Space RTG Team  
 1996 SNAP-10A Team  
 1996 Gary L. Bennett

1997 Wesley T. Huntress  
 1998 The Cassini Mission Power Source Team  
 1999 NSTAR Team and SCARLET Team  
 2002 Robert L. Wiley  
 2003 Robert L. Forward  
 2003 Teledyne Transit/ Nimbuss/ Pioneer/Viking/ RTG Team  
 2004 Robert W. Bussard  
 2005 Ronald J. Sovie  
 Franklin P. Durham and Keith Boyer Team  
 2006 Milton Klein  
**2007 Chauncey Starr**

## About the Schreiber-Spence Achievement Award Momento

Each Schreiber-Spence Achievement momento is handcrafted following the original design for the award by Mark D. Hoover, a former STAIF publications co-chair, and one of the co-founders of the Symposium Series. Because the scientific contributions each Schreiber-Spence awardee

has made to the field are unique, Hoover believes "the momentos should be unique in the world," as well. Hoover creates the bases himself of solid walnut, while the logo-etched glass component is made by a local Albuquerque artisan.

## MANUEL LUJAN, JR. STUDENT PAPER AWARD

The Manuel Lujan Jr. Student Paper Award was established in 1987 by The University of New Mexico's Institute for Space and Nuclear Power Studies to recognize outstanding contributions by students in the field addressed at all conferences and symposia of the Space Technology & Applications International Forum. Up to two awards could be granted at the forum, with each consisting of a certificate and \$500.00, shared equally if more than one awardee. The award is given by the Institute when worthy contributions are identified by the award committee.

**NOMINATION CRITERIA:** Nominations for the award will be based on the quality of the

paper published in the STAIF proceedings, as well as on the technical quality and originality of the oral presentation at the annual meeting. For a paper to be considered for the award, it must have the student as the lead author and he, she must have done the majority of the research.

### 2007 AWARD COMMITTEE:

**Stephen Gaddis**, NASA Marshall Space Flight Center; **Mike Pauken**, Jet Propulsion Laboratory; **Robert S. Reid**, Los Alamos National Laboratory; **Jonathan Stabb**, Jet Propulsion Laboratory; and **Jim Woodward**, California State University, Fullerton.

## Recipients of the Manuel Lujan, Jr. Student Paper Award:

1988-Vladimir Valentakovich, University of California at LA  
 1989-John McGhee, ISNPS, University of New Mexico  
 1990-John Metzger, ISNPS, University of New Mexico  
 1991-Theodore Tessner, Oregon Graduate Institute of Science  
 1992-Christopher S. Murray, ISNPS, University of New Mexico  
 1992-Ronald A. Pawlowski, Oregon State University  
 1992-Bernard R. Wernsman, ISNPS, University of New Mexico  
 1993-Jonathan Witter, Massachusetts Institute of Technology  
 1994-David I. Poston, University of Michigan  
 1995-Jun Liu, Auburn University  
 1996-James R. Luke, ISNPS, University of New Mexico

1996-Jean-Michel Tournier, ISNPS, University of New Mexico  
 1998-Jeffrey S. Allen, University of Dayton  
 1999-Gerrit Wölk, University of Bremen, Germany  
 1999-Thomas L. Mahood, California State University  
 2000-Jeffrey C. King, ISNPS, University of New Mexico  
 2001-Eric Choiniere, University of Michigan  
 2002-David P. Morris, University of Michigan  
 2004-Shannon Bragg-Sitton, University of Michigan  
 2005-Jeffrey C. King, ISNPS, University of New Mexico  
**2006-Steven A. Hatton, ISNPS, University of New Mexico**  
**2006-Benjamin Amiri, University of Florida**

## OUTSTANDING PAPER AWARD

The Space Nuclear Power and Propulsion Outstanding Paper Award was established in 1992 by The University of New Mexico's Institute for Space and Nuclear Power Studies (ISNPS) to recognize outstanding technical contributions to the fields of all hosted conferences and symposia of the Space Technology and Applications International Forum (STAIF). The recognition of an

outstanding contribution is based upon the written paper published in the STAIF Proceedings and the content of the presentation at the meeting. The award is presented by ISNPS upon the recommendation of the STAIF Award Committees.

**NOMINATION AND EVALUATION PROCEDURE:** Contributions from STAIF conferences could be nominated by the session

## STAIF-2007 Program Book

chair and co-chair, or any member of that conference or symposia Outstanding Paper Award Subcommittee. Nomination forms will be given to the session chairs and co-chairs at the speakers' breakfast. Individuals who wish to have their contribution or a colleague's contribution considered may request that a member of the Outstanding Paper Award Committee attend the session in which the presentation will be made. The request must be made in writing to the ISNPS office or to the STAIF Outstanding Paper Award Committee Chair. For consideration, nominations must be received by the ISNPS office or Outstanding Paper Award Committee Chair by the 2nd Friday in February following the STAIF Conference.

### NOMINATION AND EVALUATION

CRITERIA: The paper and the content of the presentation represents a technical contribution that (1) has an influential impact on the field of the topic of the conference or symposia in which it was presented, (2) has lasting technical value, and (3) is likely to be built upon and referenced by their peers. The primary emphasis in the selection of the award will be based on the written paper. In the case of a close decision, input from subcommittee members who heard the oral presentation and the session chair and co-chair may be used to render a final decision. The paper must be well written, well organized, and have appropriate references and acknowledgments. The paper must also present a complete and scientifically sound analysis. The STAIF Outstanding Paper Award is presented for technical contributions. While overview and historical papers are important for the historical archives, they will not be considered for the award. The author(s) must be a major technical contributor to the work. The paper should also acknowledge all major technical contributors to the work who are not co-authors.

### 2007 AWARD COMMITTEES:

*Conference on Thermophysics Applications in Microgravity:* **Tung L. Lam**, (Chair) The Aerospace Corporation; **R. Panneer Selvam**, University of Arkansas; **Eric Silk**, NASA Goddard Space Flight Center; **Kirk Yerkes**, U.S. Air Force Research Laboratory.

*Symposium on Space Nuclear Power and Propulsion:* **Michael Houts**, (Chair) NASA Marshall Space Flight Center; **Robert Abelson**, Jet Propulsion Laboratory; **Patrick Frye**, Pratt &

Whitney Rocketdyne; **Thomas Marcille**, Los Alamos National Laboratory; **Melissa Van Dyke**, NASA Marshall Space Flight Center; **Robert Wegeng**, NASA Headquarters; **Abraham Weitzburg**, Massachusetts Institute of Technology (retired); **James Werner**, Idaho National Laboratory.

*Symposium on Space Colonization:* **Alex Ignatiev**, (Chair) University of Houston; **Ronald Lipinski**, Sandia National Laboratories; **Edward McCullough**, The Boeing Company; **Narayanan Ramachandran**, Jacobs Engineering, NASA Marshall Space Flight Center.

*Symposium on New Frontiers and Future Concepts:* **Glen A. Robertson**, (Chair) Gravi Atomic Research; **Michael LaPointe**, NASA Marshall Space Flight Center; **Raymond A. Lewis**, NASA Marshall Space Flight Center; **Clive Woods**, Louisiana State University.

### RECIPIENTS OF 2006 AWARD

**10<sup>th</sup> Conference on Thermophysics in Microgravity:** Ryoji Oinuma, David Bean, Charles Neill, Kevin Supak and Frederick Best, Texas A & M University, College Station, TX, USA, for their paper, "Two-Phase Pressure Drop in a Twisted Tape Boiler for a Microgravity Rankine Cycle Power System."

**23<sup>rd</sup> Symposium on Space Nuclear Power and Propulsion:** Shannon M. Bragg-Sitton, NASA Marshall Space Flight Center, Nuclear & Advanced Propulsion Branch, AL, USA; T.J. Morton, Department of Chemical and Nuclear Engineering, University of New Mexico, Albuquerque, NM, USA, for their paper, "Dynamic Response Testing in an Electrically Heated Reactor Test Facility."

**3<sup>rd</sup> Symposium on New Frontiers and Future Concepts:** E. W. Davis, H. E. Puthoff, Inst. for Advanced Studies at Austin, Austin, TX, USA; V. L. Teofilo, Lockheed Martin Space Systems, Sunnyvale, CA, USA; B. Haisch, ManyOne Networks, Scotts Valley, CA, USA; L. J. Nickisch, NorthWest Research Associates, Bellevue, WA, USA; A. Rueda, Dept. of Electrical Engineering, Cal. State Univ.-Long Beach, Long Beach, CA, USA; D. C. Cole, Dept. of Manufacturing Engineering, Boston University, Boston, MA, USA for their paper, "Review of Experimental Concepts for Studying the Quantum Vacuum Field."

# GENERAL ERNEST C. HARDIN SCHOLARSHIP AWARD

This scholarship fund was established in 1986 by The University of New Mexico's Institute for Space and Nuclear Power Studies to recognize outstanding undergraduate and graduate students in engineering and science disciplines with emphasis on space science and technology and related fields. Several awards are offered annually to deserving freshmen and undergraduate students. In addition, awards consist of a certificate of recognition and a monetary sum of \$500 per year, for up to four years. The graduate student award has a monetary value of \$14,000-\$16,000 per year, plus tuition waivers and health insurance for up to three years.

This year's recipient of a \$500 scholarship is **Ben Maestas**, a senior in The University of New Mexico's Nuclear Engineering Program.

## SECONDARY SCHOOL SPECIAL SESSION

### 19<sup>th</sup> Secondary School Special Session

This session is sponsored by the University of New Mexico's Institute for Space and Nuclear Power Studies. Activities are coordinated by **Jon Webb**, UNM-ISNPS, and **Susan Ostlie**, Madison Middle School. New Mexico secondary school students and teachers participating in the Space Design Competition are invited to attend this session. Space related topics will be presented to the attendees by members of the science and engineering committees.

### 19<sup>th</sup> Annual Space Design Competition

This event is sponsored by the University of New Mexico's Institute for Space and Nuclear Power Studies. Activities are coordinated by **Jon Webb**, **Timothy Schriener**, and **Jack Parker**, UNM-ISNPS. This year's design objective is entitled, "Lunar Resort." Judging of the event will take place during the Secondary School Special Session, and the results of the competition will be presented during Plenary Session – II, Monday, February 12, 2007.

## PUBLICATIONS

Available from the American Institute of Physics, c/o Springer New York, Customer Service, 1-800-777-4643, or e-mailorders-ny@springer.com, or mail to Springer New York, P. O. Box 2485, Secaucus, NJ 07094-2485, USA (For North America, add \$5.00 for shipping and handling for the first volume, plus \$1.00 for each additional volume. For orders outside of North America, add \$10.00 for first volume and \$5.00 for each additional volume.)

Proc. Space Technology and Applications International Forum (**STAIF-2007**):  
AIP Conf. Proceedings 880, (1-vol. hardcover book), ISBN 978-0-7354-0386-4... \$286.00  
CD-ROM Version, ISBN 978-0-7354-0387-1 .....\$145.00

Proc. Space Technology and Applications International Forum (**STAIF-2006**):  
AIP Conf. Proceedings 813, (1-vol. hardcover book), ISBN 0-7354-0305-8 ..... \$320.00  
CD-ROM Version, ISBN 0-7354-0306-6 .....\$145.00

Proc. Space Technology and Applications International Forum (**STAIF-2005**):  
AIP Conf. Proceedings 746, (1-vol. hardcover book), ISBN 0-7354-0231-0 ..... \$320.00  
CD-ROM Version, ISBN 0-7354-0230-0 .....\$145.00

Proc. Space Technology and Applications International Forum (**STAIF-2004**):  
AIP Conf. Proceedings 699, (1-vol. hardcover book), ISBN 0-7354-0171-3 ..... \$290.00  
CD-ROM Version, ISBN 0-7354-0172-0 .....\$145.00

Proc. Space Technology and Applications International Forum (**STAIF-2003**):  
AIP Conf. Proceedings 654, (1-vol. hardcover book), ISBN 0-7354-0114-4 ..... \$280.00  
CD-ROM Version, ISBN 0-7354-0115-2 ..... \$140.00

STAIF-2007 Program Book

Proc. Space Technology and Applications International Forum ( <b>STAIF-2002</b> ):	
AIP Conf. Proceedings 608, (1-vol. hardcover book), ISBN 0-7354-0052-0.....	\$295.00
CD-ROM Version, ISBN 0-7354-0053-9.....	\$150.00
Proc. Space Technology and Applications International Forum ( <b>STAIF-2001</b> ):	
AIP Conf. Proceedings 552, (1-vol. hardcover book), ISBN 1-56396-980-7.....	\$280.00
CD-ROM Version, ISBN 1-56396-981-5.....	\$150.00
Proc. Space Technology and Applications International Forum ( <b>STAIF-2000</b> ):	
AIP Conf. Proceedings 504, (2-vol. hardcover set), ISBN 1-56396-919-X.....	\$300.00
CD-ROM Version, ISBN 1-56396-920-3.....	\$200.00
Proc. Space Technology and Applications International Forum ( <b>STAIF-99</b> ):	
AIP Conf. Proceedings 458, (2-vol. hardcover set), ISBN 1-56396-846-0.....	\$300.00
CD-ROM Version, ISBN 1-56396-879-7.....	\$200.00
Proc. Space Technology and Applications International Forum ( <b>STAIF-98</b> ):	
AIP Conf. Proceedings 420 (3-vol. hardcover set), ISBN 1-56396-747-2.....	\$320.00
Proc. 12th Symposium on Space Nuclear Power & Propulsion, Conf. on Alternative Power from Space, and Conf. on Accelerator-Driven Transmutation Technologies and Applications ( <b>1995</b> )	
AIP Conf. Proceedings 324 (2-vol. hardcover set), ISBN 1-56396-427-9.....	\$225.00
Proc. 1st Conf. on NASA Centers for Commercial Development of Space (1-vol. hardcover book),	
ISBN 1-56396-431-7, AIP Conf. Proceedings 325.....	\$125.00
A Critical Review of Space Nuclear Power & Propulsion ( <b>1984-1993</b> ) (Anniversary Issue), AIP Press, ISBN 1-56396-317-5.....	\$ 75.00
Proceedings of the 10th Symposium ( <b>1993</b> ) (3-vol. hardcover set), ISBN 1-56396-137-7, AIP Conf. Proceedings 271.....	\$275.00
Proceedings of the 9th Symposium ( <b>1992</b> ) (3-vol. hardcover set), ISBN 1-56396-027-3, AIP Conf. Proceedings 246.....	\$225.00
Proceedings of the 8th Symposium ( <b>1991</b> ) (3-vol. hardcover set), ISBN 0-88318-838-4, AIP Conf. Proceedings 217.....	\$175.00
AIP Conf. Proceedings Volume 301 (Space Nuclear Power and Propulsion- <b>1994</b> ), Volume 361 ( <b>STAIF-1996</b> ), and Volume 387 ( <b>STAIF-1997</b> ) . . .out of print.	

## HOTEL ACCOMMODATIONS

Hotel Albuquerque, 800 Rio Grande Blvd. NW, Albuquerque, NM 87104  
(505) 843-6300, Fax (505) 842-9863, Toll Free Reservations: 1-800-237-2133

Guest rooms have been reserved at the Hotel Albuquerque, located in Albuquerque's Old Town District, for those who identify themselves as participants of STAIF-2007. The rates are:

### ROOM RATES

Single Occupancy \$70.00	Triple Occupancy \$70.00
Double Occupancy \$70.00	Quadruple Occupancy \$70.00

ALL ATTENDEES ARE RESPONSIBLE FOR MAKING THEIR OWN RESERVATIONS DIRECTLY WITH THE HOTEL.

All group-rate reservation requests must be received by the hotel no later than JANUARY 26, 2007. Attendees must identify themselves as participants of STAIF-2007, the hotel will not be able to ensure the quoted group rate or guest room availability. Rates will not be changed at check-in or check-out for attendees who fail to identify their affiliation with this meeting. All reservations must be guaranteed with a one night's deposit in the form of credit card, check, or money order. Check-in time is 3:00 pm and Check-out is 12:00 noon. Contact the hotel for more information on reservation requirements and cancellation policies.

## REGISTRATION AND FEES

### *Hotel Albuquerque, Fireplace Room*

Sunday, February 11,	4:30 pm - 7:30 pm
Monday, February 12,	7:00 am - 5:30 pm
Tuesday, February 13,	7:00 am - 7:00 pm
Wednesday, February 14	7:00 am - 4:30 pm
Thursday, February 15	7:30 am - 10:30 am

### ALL ATTENDEES AND EXHIBITORS MUST REGISTER & PAY A REGISTRATION FEE

- (a) Open Technical Meeting Full Registration Fee: Includes Sessions, Tuesday banquet, daily coffee breaks, and a set of Proceedings on CD-ROM.
- (b) One-Day Registration: Includes Technical Sessions, coffee breaks and a set of Proceedings on CD ROM. (Banquet tickets are not included, but are available for purchase).
- (c) Student Registration: **TO QUALIFY, INDIVIDUALS MUST SHOW PROOF OF FULL TIME ENROLLMENT** for the 2007 Spring Semester. Pre-registrants should enclose a copy of their 2007 spring schedules. Registration fee includes a set of Proceedings on CD ROM, banquet ticket, and coffee breaks.
- (d) Additional luncheon tickets can be purchased on-site if available, although pre-purchasing luncheon tickets is encouraged to help provide accurate numbers to the caterer.

Cash, corporate or personal checks, Visa and MasterCard will be accepted. Payment by a personal or corporate check should be made payable to: INSTITUTE FOR SPACE & NUCLEAR POWER STUDIES, STAIF-2007 Conferences, MSC01-1120, FEC Room 239, 1 University of New Mexico, Albuquerque, NM 87131-0001, (505) 277-2813 or (505) 277-0446.

	<u>Early</u>	<u>Late</u> (after 12/18/2006)
OPEN TECHNICAL MEETING(a)	\$550.00	\$595.00
ONE DAY REGISTRATION (b)	\$370.00	\$395.00
STUDENT (c)	\$185.00	\$195.00
ADDITIONAL BANQUET TICKET(d)	\$40.00	\$55.00

## CANCELLATIONS AND REFUNDS

Those unable to attend the conferences may receive a refund of their registration fee (less a 20% processing charge) by calling the Institute office at (505) 277-0446 or by email at: [isnps@unm.edu](mailto:isnps@unm.edu) no later than January 16, 2007. All refunds will be made promptly by mail. **NO REFUNDS WILL BE ISSUED after JANUARY 16, 2007.**

## AWARDS BANQUET

Tuesday, February 13, 7:30 pm - 9:30 pm, Alvarado Ballroom, Hotel Albuquerque.

One banquet ticket will be included with each full registration. Additional tickets must be purchased in advance. Please be certain that you and each of your guests have registered. *All guests must check in at registration to receive their name badge and banquet tickets.* Guest banquet tickets will *not* be included in the host's registration packet.

**Master of Ceremonies: Donald Cobb, Los Alamos National Laboratory (retired), Los Alamos, NM**

**Guest Speaker: Roger D. Launius, Chair, Division of Space History, National Air and Space Museum, The Smithsonian Institution, Washington, DC**

## CHAIRS' AND SPEAKERS' BREAKFAST

All STAIF-2007 speakers and session chairs are requested to attend the hosted Speakers' Breakfast from 7:00 am to 7:45 am in the Franciscan Room on the day of their session or presentation to discuss the session arrangements and guidelines.

## AUDIO / VISUAL EQUIPMENT

One (1) LCD Data Projector, and one (1) screen will be provided at all sessions. A slide or overhead projector will also be provided on request without charge. Additional A/V equipment must be ordered through Institute personnel, in advance, and paid for by the author. Please call (505) 277-0446 with special requests. Attendees must provide their own laptop computers.

## COMMITTEE MEETINGS

### Schreiber-Spence Award Committee

Monday, February 12, 12:45 pm – 1:45 pm, Weavers Room

### Steering and Executive Committees

Monday, February 12, 6:30 pm – 8:30 pm, Alvarado A

### Technical Program Committees

Tuesday, February 13, 12:30 pm – 1:45 pm

(All Session Chairs and Co-Chairs are committee members. Lunch is available for purchase)

11<sup>th</sup> Conf. on Thermophysics Applications in Microgravity, **Alvarado A**

24<sup>th</sup> Symp. on Space Nuclear Power and Propulsion, **Alvarado D**

5<sup>th</sup> Conf. on Human/Robotic Tech. and the Vision for Space Exploration, **Alvarado B/C**

5<sup>th</sup> Symp. on Space Colonization, **Alvarado G/H**

4<sup>th</sup> Symp. on New Frontiers and Future Concepts, **Alvarado F**

### Executive Committee

Wednesday, February 14, 12:30 pm – 2:00 pm, Franciscan Room

## PROGRAM ACTIVITIES

### SUNDAY, February 11, 2007

4:30 pm - 7:30 pm **Registration**, Fireplace Room

### MONDAY, February 12, 2007

7:00 am - 7:45 am **Speakers' Breakfast**, Franciscan Room

7:00 am - 5:30 pm **Registration**, Fireplace Room

8:00 am - 12:30 pm **Space Design Competition**, West/North Atrium

8:00 am - 8:45 am **Opening Remarks and Keynote Speech**, Alvarado Ballroom

8:45 am - 10:25 am **Plenary Session I**, Alvarado Ballroom

10:25 am - 10:45 am **Coffee Break**, East/North Atrium

10:45 am - 12:45 pm **Plenary Session II**, Alvarado Ballroom

10:05 am - 12:30 pm **Secondary School Special Session**, Alvarado B/C

12:30 pm - 12:45 pm **Space Design Competition Awards Ceremony**, Alvarado Ballroom

12:45 pm - 1:45 pm **Lunch Break**

12:45 pm - 1:45 pm **Schreiber-Spence Award Committee Meeting**, Weavers Room

1:45 pm - 3:45 pm **Technical Sessions** (see table of contents or centerfold for time and room)

3:45 pm - 4:00 pm **Coffee Break**, East/North Atrium

4:00 pm - 6:00 pm **Technical Sessions** (see table of contents or centerfold for time and room)

6:30 pm - 8:30 pm **Joint Steering and Executive Committee Meeting**, Alvarado A

### TUESDAY, February 13, 2007

7:00 am - 7:45 am **Speakers' Breakfast**, Franciscan Room

7:00 am - 7:00 pm **Registration**, Fireplace Room

8:00 am - 10:00 am **Technical Sessions** (see table of contents or centerfold for time and room)

10:00 am - 10:30 am **Coffee Break**, East/North Atrium

10:30 am - 12:30 pm **Technical Sessions** (see table of contents or centerfold for time and room)

12:30 pm - 1:45 pm **Lunch Break**

12:30 pm - 1:45 pm **STAIF Technical Program Committee Meetings**

11<sup>th</sup> Conf. on Thermophysics Applications in Microgravity, Alvarado A

24<sup>th</sup> Symp. on Space Nuclear Power and Propulsion, Alvarado D

5<sup>th</sup> Conf. on Human/Robotic Technology and the Vision for Space Exploration, Alvarado B/C

5<sup>th</sup> Symp. on Space Colonization, Alvarado G/H

4<sup>th</sup> Symp. on New Frontiers and Future Concepts, Alvarado F

1:45 pm - 3:45 pm **Technical Sessions** (see table of contents or centerfold for time and room)

3:45 pm - 4:00 pm **Coffee Break**, East/North Atrium

4:00 pm - 6:00 pm **Technical Sessions** (see table of contents or centerfold for time and room)

7:00 pm - 7:30 pm **No-Host Cocktail Reception**, East Atrium

7:30 pm - 9:30 pm **STAIF-2007 Awards Banquet**, Alvarado Ballroom

### WEDNESDAY, February 14, 2007

7:00 am - 7:45 am **Speakers' Breakfast**, Franciscan Room

7:00 am - 4:30 pm **Registration**, Fireplace Room

8:00 am - 10:00 am **Technical Sessions** (see table of contents or centerfold for time and room)

10:00 am - 10:30 am **Coffee Break**, East/North Atrium

10:30 am - 12:30 pm **Technical Sessions** (see table of contents or centerfold for time and room)

12:30 pm - 2:00 pm **Lunch Break**

12:30 pm - 2:00 pm **Executive Program Committee Meeting**, Franciscan Room

2:00 pm - 4:00 pm **Technical Sessions** (see table of contents or centerfold for time and room)

4:00 pm - 4:15 pm **Coffee Break**, East/North Atrium

4:15 pm - 6:15 pm **Technical Sessions** (see table of contents or centerfold for time and room)

6:30 pm - 7:30 pm **Special Plenary**, Alvarado Ballroom

### THURSDAY, February 15, 2007

7:00 am - 7:45 am **Speakers' Breakfast**, Franciscan Room

7:00 am - 10:30 am **Registration**, Fireplace Room

8:00 am - 10:00 am **Technical Sessions** (see table of contents or centerfold for time and room)

10:00 am - 10:30 am **Coffee Break**, East/North Atrium

10:30 am - 12:30 pm **Technical Sessions** (see table of contents or centerfold for time and room)

## OPENING REMARKS AND KEYNOTE SPEAKER

*Monday, February 12, 8:00 am – 8:45 am, Alvarado Ballroom*

**Donald D. Cobb**, STAIF-2007 General Chair, Los Alamos National Laboratory (retired)  
**Joseph L. Cecchi**, Dean, School of Engineering, University of New Mexico  
**Terry Yates**, Vice President for Research and Economic Development, University of New Mexico  
**Thomas J. Bowles**, Science Advisor to NM Governor Bill Richardson, NM State Capitol

## PLENARY SESSION I: INSPIRING THE NEXT GENERATION

*Monday, February 12, 8:45 am – 10:25 am, Alvarado Ballroom*

**Donald D. Cobb**, Chair  
Acting Deputy Director (retired)  
Los Alamos National Laboratory  
Los Alamos, NM

**Brewster Shaw**, Co-Chair\*  
VP & General Manager, Space Exploration  
The Boeing Company  
Houston, TX

### Introduction

**Mike Anastasio**, Director, Los Alamos National Laboratory  
**Thomas Hunter**, President and Laboratories Director, Sandia National Laboratories  
**Joyce L. Winterton**, Associate Administrator for Education, NASA  
**Rachel Zimmerman Brachman**, Solar System and Technology Outreach Specialist, Jet Propulsion Laboratory  
\***Leonard Nicholson**, Chief Engineer, Constellation Space Exploration, The Boeing Company is appearing for Brewster Shaw

## PLENARY SESSION II: ENABLING THE SPACE RENAISSANCE

*Monday, February 12, 10:45 am - 12:45 pm, Alvarado Ballroom*

**Bonnie Dunbar**, Chair  
President & CEO  
Seattle Museum of Flight  
Seattle, WA

**Harold F. McFarlane**, Co-Chair  
Director, Space Nuclear Systems  
& Technology Division  
Idaho National Laboratory  
Idaho Falls, ID

### Introduction

**Douglas Cooke**, Deputy Associate Administrator, Exploration Systems Mission Directorate, NASA Headquarters  
**Patrick McKenzie**, Project Orion Business Development Manager, Lockheed Martin Space Systems Company  
**Robert Lange**, Director, Office of Space & Defense, U.S. Department of Energy  
**Bernd Sommer**, Space Management - General Technologies and Robotics, German Aerospace Center  
**12:30 pm – Presentation of Space Design Competition Student Awards**, Jon Webb, Jack Parker, and Timothy Schriener, UNM-ISNPS

## **SECONDARY SCHOOL SPECIAL SESSION: HUMAN EXPLORATION – FUTURE SPACE MISSIONS AND EARTH APPLICATIONS**

*Monday, February 12, 10:05 am - 12:30 pm – Alvarado B/C*

**Jon Webb**, Chair  
UNM-ISNPS, Albuquerque, NM

**Susan Ostlie**, Co-Chair  
Madison Middle School, Albuquerque, NM

**Dava Newman**, Director, Technology and Policy Program, Massachusetts Institute of Technology

## **SPECIAL EVENING PLENARY: REFLECTIONS ON EXPLORATION ACROSS THE AGES**

*Wednesday, February 14, 6:30 pm - 7:30 pm – Alvarado Ballroom*

**Roger D. Launius**, Chair  
Chair, Division of Space History  
Air and Space Museum  
Smithsonian Institution  
Washington, DC

**Ted Swanson**, Co-Chair  
Goddard Senior Fellow  
Assistant Chief for Technology,  
NASA Goddard Space Flight Center  
Greenbelt, MD

**Stephen J. Pyne**, Regents Professor, Human Dimensions Faculty, School of Life Sciences, Arizona State University

**James Horn**, Director of Research, and Abby and George O'Neill Director, John D. Rockefeller Jr. Library, Colonial Williamsburg Foundation.

## TECHNICAL SESSIONS

MONDAY, FEBRUARY 12, 2007

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### [A01] Current Topics in Thermal Control

*Monday, February 12, 2007, 1:45 pm - 3:45 pm - Alvarado Salon A*

**Chairs:** Ted Swanson, NASA Goddard Space Flight Center, Greenbelt, MD, USA  
Tung T. Lam, The Aerospace Corporation, Los Angeles, CA, USA

**1:45 pm - Trends in Thermal Control Technology Development**

Ted Swanson, NASA Goddard Space Flight Center, Greenbelt, MD, USA

**2:15 pm - Orion Crew Exploration Vehicle Thermal Control System Architecture**

Gary Adamson and Mark Caron, Hamilton Sundstrand, Windsor Locks, CT, USA

### [C01] Space Nuclear Power and Propulsion Opening Session

*Monday, February 12, 2007, 1:45 pm - 3:45 pm - Alvarado Ballroom D*

**Chairs:** Garry Burdick, Jet Propulsion Laboratory, Pasadena, CA, USA  
Michael G. Houts, NASA Marshall Space Flight Center, Marshall Space Flight Center, AL, USA

**1:45 pm - Opening Session Welcome**

Garry Burdick, Jet Propulsion Laboratory, Pasadena, CA, USA

**2:00 pm - The NASA Radioisotope Power Systems Development Program**

B. Alan Harmon, Science Mission Directorate, NASA Headquarters, from Radioisotope Power Systems Office, U. S. Department of Energy, Washington, DC, USA; David B. Lavery, Science Mission Directorate, NASA Headquarters, Washington, DC, USA

**2:30 pm - NASA Prometheus Power and Propulsion**

John Warren, NASA Headquarters, Washington, DC, USA

**2:50 pm - DOE Space Nuclear Program**

Robert Lange, Department of Energy Headquarters, Germantown, MD, USA

**3:00 pm - Q & A Panel**

### [D01] Human & Robotic Opening Session

*Monday, February 12, 2007, 1:45 pm - 3:45 pm - Alvarado Ballroom E*

**Chairs:** John C. Mankins, Artemis Innovation Management Solutions LLC, Ashburn, VA, USA  
Christopher Moore, NASA Headquarters, Washington, DC, USA

**1:45 pm - Technology for the Lunar Architecture**

Christopher Moore, NASA Headquarters, Washington, DC, USA

**2:15 pm - Precursor Robotic Exploration of the Moon**

Benjamin Neumann, NASA Headquarters, Washington, DC, USA

**3:15 pm - ETD Program**

Frank Peri, NASA Langley Research Center, Hampton, VA, USA

**3:45 pm - Robots and Humans in Spaceflight: Technology, Evolution, and Interplanetary Travel**

Roger Launius, National Air and Space Museum, Smithsonian Institution, Washington, DC, USA; Howard E. McCurdy, School of Public Affairs, The American University, Washington, DC, USA

### [E01] Space Colonization - Opening Session I

*Monday, February 12, 2007, 1:45 pm - 3:45 pm - Alvarado Salon B/C*

**Chairs:** Edward McCullough, The Boeing Company, Huntington Beach, CA, USA  
Klaus Heiss, High Frontier and The Jamestown Group, Alexandria, VA, USA

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- 1:45 pm - *The Space Colonization Technical Committee Policy Statement for a Robust Implementation of the President's Space Exploration Initiative***  
Edward McCullough, Boeing Phantom Works, Huntington Beach, CA, USA; Klaus P. Heiss, High Frontier and The Jamestown Group, Alexandria, VA, USA; Eric Rice, Orbital Technologies Corporation (ORBITEC), Madison, WI, USA
- 2:15 pm - *LPRP: A Robotic Focus to the Vision***  
T. Lavoie, R. French and M. Nall, NASA Marshall Space Flight Center, AL, USA
- 2:45 pm - *Issues and Problems Related to Lunar Dust***  
Narayanan Ramachandran, Jacobs Engineering, NASA Marshall Space Flight Center, AL, USA
- 3:15 pm - *Current Knowledge on the Existence and Distribution of H2O on Mars***  
Greg Mungas, Jet Propulsion Laboratory, Pasadena, CA, USA

### [F01] Potential Frontiers

*Monday, February 12, 2007, 1:45 pm - 3:45 pm - Alvarado Salon G/H*

- Chairs:** Charles Suchomel, Air Force Research Laboratory, Wright-Patterson AFB, OH, USA  
Franklin B. Mead, Air Force Research Laboratory, Edwards AFB, CA, USA
- 1:45 pm - *Exploring Gravity and Gravitational Wave Dynamics Part I: Gravitational Anomalies***  
Paul Murad, Department of Defense, Vienna, VA, USA
- 2:15 pm - *Revolutionary Design for Astronaut Exploration - Beyond the Bio-Suit System***  
Dava J. Newman, and Marita Canina, Massachusetts Institute of Technology, Cambridge, MA, USA; Guillermo L. Trotti, Trotti and Associates, Inc., Marblehead, MA, USA
- 2:45 pm - *Inertial Mass Dependency on Local Vacuum Fluctuation Mean Free Path***  
Harold G. White, League City, TX, USA
- 3:15 pm - *Progress in Quantum Engineering Propulsion***  
Fabrizio Pinto, InterStellar Technologies Corporation, Monrovia, CA, USA

### [C02] Thermal Energy Transport and Heat Rejection Technology

*Monday, February 12, 2007, 4:00 pm - 6:00 pm - Alvarado Salon F*

- Chairs:** Donald M. Ernst, Advanced Cooling Technologies, Inc., Lancaster, PA, USA  
Garry Burdick, Jet Propulsion Laboratory, Pasadena, CA, USA
- 4:00 pm - *High Performance Lightweight Compact Thermal Radiator for Space Vehicles***  
Ching-fen Tsai, Julian Prabhu, and Frank Shen, The Boeing Company, Huntington Beach, CA, USA
- 4:30 pm - *Thermal Energy Storage Technology Developments***  
Michael Pauken, Nick Emis, and Brenda Watkins, Jet Propulsion Laboratory, Pasadena, CA, USA
- 5:00 pm - *An Ultra-Lightweight, High Performance Carbon-Carbon Space Radiator***  
W.O. Miller, Mike Wang, Wei Shih, Rogelio Ramirez, Duane Beach, Dennis Youchison, Roger Lenard, Justin Liguori, and Ed Liguori, Allcomp, City of Industry, CA, USA
- 5:30 pm - *Thermal Energy Reservoirs Derived from Processed Lunar Regolith***  
Robert S Wegeng, National Aeronautics and Space Administration, Washington, DC, USA; John C. Mankins, Artemis Innovation Management Solutions LLC, Ashburn, VA, USA; Lawrence A Taylor, Planetary Geosciences Institute, University of Tennessee, TN, USA

### [C03] Propulsion Systems Concepts

*Monday, February 12, 2007, 4:00 pm - 6:00 pm - Franciscan Room*

- Chairs:** James Polk, Jet Propulsion Laboratory, Pasadena, CA, USA  
George R. Schmidt, NASA Marshall Space Flight Center, AL, USA
- 4:00 pm - *Application of Solar-Electric Propulsion to Robotic Missions in Near-Earth Space***

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Gordon R. Woodcock and John Dankanich, Gray Research Inc., Huntsville, AL, USA

- 4:30 pm - Paris to Hektor: A Concept for a Mission to the Jovian Trojan Asteroids**  
Robert E. Gold, R. L. McNutt Jr., D. H. Napolillo, E. D. Schaefer, J. R. Tanzman, T. J. Hartka, D. S. Mehoke, P. H. Ostdiek, D. F. Persons, L. M. Prockter, and S. R. Vernon, Johns Hopkins University, Applied Physics Laboratory, Laurel, MD, USA; D. I. Fielher, QSS Group, Inc., NASA Glenn Research Center, Cleveland, OH, USA
- 5:00 pm - A New Capability for Nuclear Thermal Rocket Propulsion Design**  
Benjamin W. Amiri, Richard J. Kapernick, and Bryan T. Sims, Los Alamos National Laboratory, Los Alamos, NM, USA; Steven P. Simpson, NASA Marshall Space Flight Center, Huntsville, AL, USA
- 5:30 pm - Q & A**

## [D02] Architecture Studies

*Monday, February 12, 2007, 4:00 pm - 6:00 pm - Alvarado Ballroom E*

- Chairs:** Douglas Craig, NASA Headquarters, Washington, DC, USA  
Robert Wegeng, NASA Headquarters, Washington, DC, USA
- 4:00 pm - The Making of a Lunar Outpost - Exploring a Future Case Study**  
Ruthan Lewis, National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD, USA; Kurt Micheels, Nexterra, Inc., Pensacola, FL, USA; Cathy Dankewicz, Swales Aerospace, Inc., Beltsville, MD, USA
- 4:30 pm - Alternative Applications for Exploration System Elements**  
Patrick A. Troutman, NASA Langley Research Center, Hampton, VA, USA
- 5:00 pm - Space Solar Power – An Update**  
John C. Mankins, Artemis Innovation Management Solutions LLC, Ashburn, VA, USA
- 5:30 pm - Technology Assessment in Support of Lunar Exploration**  
Charles R. Weisbin, William Lincoln, Joe Mrozinski, Hook Hua, Sofia Merida, Kacie Shelton, Virgil Adumitroaie, and Jason Derleth, Jet Propulsion Laboratory, Pasadena, CA, USA; Robert Silberg, Raytheon Corporation, Pasadena, CA, USA

## [E02] Space Colonization - Opening Session II

*Monday, February 12, 2007, 4:00 pm - 6:00 pm - Alvarado Salon B/C*

- Chairs:** Edward McCullough, The Boeing Company, Huntington Beach, CA, USA  
Klaus Heiss, High Frontier and The Jamestown Group, Alexandria, VA, USA
- 4:00 pm - Atlas V Experience Boosts Your Adventure: Launching Space Tourism**  
Jeff A. Patton, Lockheed Martin Space Systems Company, Denver, CO, USA
- 4:30 pm - Space Colonization-System Health Monitoring, Failure Detection, Diagnosis and Response**  
David Buchanan, United Launch Alliance, Huntington Beach, CA, USA
- 5:00 pm - NASA In-Situ Resource Utilization (ISRU) Implementation and Deployment Strategy**  
Gerald B. Sanders, Thomas M. Simon, and Landon Moore, NASA Johnson Space Center, Houston, TX, USA; William E. Larson, NASA Kennedy Space Center, FL, USA; Kurt R. Sacksteder and John J. Caruso, NASA Glenn Research Center, Cleveland, OH, USA; Carole McLemore, NASA Marshall Space Flight Center, AL, USA; Kenneth Johnson, Jet Propulsion Laboratory, Pasadena, CA, USA
- 5:30 pm - Moon Base: Gateway to Economic Expansion into Space**  
Klaus Heiss, High Frontier and The Jamestown Group, Alexandria, VA, USA

## [F02] Advanced Technologies for Terrestrial (Earth, Lunar, and Mars) and Relativistic Environments Based on Propulsion and Power

*Monday, February 12, 2007, 4:00 pm - 6:00 pm - Alvarado Salon G/H*

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- Chairs:** John W. Cole, NASA Marshall Space Flight Center, Huntsville, AL, USA  
David Goodwin, U.S. Department of Energy, Washington, DC, USA
- 4:00 pm - *Local and System Level Considerations for Plasma-Based Techniques in Hypersonic Flight***  
Charles Suchomel and Datta Gaitonde, Aeronautical Sciences Division, Air Force Research Laboratory, Wright Patterson AFB, Dayton, OH, USA
- 4:30 pm - *Space Exploration and Conversion of Sunlight to Coherent Light***  
Richard L. Fork, and Spencer T. Cole, University of Alabama, Huntsville, AL, USA
- 5:00 pm - *An Overview of the Development of a Capillary Discharge Based Pulsed Plasma Thruster***  
Jean-Luc Cambier, M. Young, L. Pekker, and A. Pancotti, United States Air Force Research Laboratory, Edwards AFB, CA, USA
- 5:30 pm - *The Influence of High-Frequency Gravitational Waves Upon Muscles***  
Lawrence S. Moy, Manhattan Beach, CA, USA; and Robert M. L. Baker, Jr., GRAVWAVE, LLC, Playa del Rey, CA, USA

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## TUESDAY, FEBRUARY 13, 2007

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### [A02] Two-Phase Thermal Control Systems

*Tuesday, February 13, 2007, 8:00 am - 10:00 am - Alvarado Salon A*

- Chairs:** Michael Pauken, Jet Propulsion Laboratory, Pasadena, CA, USA  
Scott Garner, Advanced Cooling Technologies, Lancaster, PA, USA
- 8:00 am - *Gravity Effect on Capillary Limit in a Miniature Loop Heat Pipe with Multiple Evaporators and Multiple Condensers***  
Hosei Nagano, JAXA, Yoshinodai, JAPAN; Jentung Ku, NASA Goddard Space Flight Center, Greenbelt, MD, USA
- 8:30 am - *Spacecraft Thermal Management using Advanced Hybrid Two-Phase Loop Technology***  
Chanwoo Park, Aparna Vallury, Jon Zuo, Advanced Cooling Technologies, Inc. Lancaster, PA, USA; Jeffrey Perez, Paul Rogers, U.S. Army TACOM, Warren, MI, USA
- 9:00 am - *Advanced Thermal Control for Future Space Science Missions or Mars/Lunar Base Household and Research Part I: TC Issues That Deserve More Attention, and and II: Restarted Developments and Novel Research Issues***  
A.A.M. Delil, Advanced Aerospace Thermal Control Systems Consultant, AATCS, Emmeloord, Netherlands
- 9:30 am - *JWST ISIM Harness Thermal Evaluation***  
Mark Kobel, Stuart Glazer, Jim Tuttle, NASA/Goddard Space Flight Center, Greenbelt, MD, USA; Mario Martins, Lun Xi, Warren Tolson, Swales Aerospace, Beltsville, MD, USA; Walter Ancarrow, WCA Inc., Jarrettsville, MD, USA

### [C04] Materials for Space Nuclear Power and Propulsion Systems

*Tuesday, February 13, 2007, 8:00 am - 10:00 am - Alvarado Ballroom D*

- Chairs:** Wayne Ohlinger, Bechtel Bettis, Inc., Upper St. Clair, PA, USA  
Robert Hickman, NASA Marshall Space Flight Center, Huntsville, AL, USA
- 8:00 am - *Thermodynamic Prediction of Compositional Phases Confirmed by Transmission Electron Microscopy on Tantalum-Based Alloy Weldments***  
Daniel P. Kramer, and Chadwick D. Barklay, University of Dayton, Dayton, OH, USA; William E. Moddeman, and Janine C. Birkbeck, Pantex Plant, Amarillo, TX, USA; Roger G. Miller, and Lawrence F. Allard, Oak Ridge National Laboratory, Oak Ridge, TN, USA
- 8:30 am - *Investigation of Effects of Neutron Radiation on Tantalum Alloys for Radioisotope***

***Power System Applications***

Chadwick D. Barklay, and Daniel Kramer, University of Dayton Research Institute, Dayton, OH, USA; Roger Miller, Oak Ridge National Laboratory, Oak Ridge, TN, USA; Joseph Talnagi, The Ohio State University, Columbus, OH, USA

**9:00 am - *The Effects Of Neutron Radiation on the Electrical Properties of Si and SiC Schottky Power Diodes***

Jonathan A. Kulisek, and Thomas E. Blue, The Ohio State University, Springfield, OH, USA

**9:30 am - *Powder Processing of High Temperature Cermets and Carbides at Marshall Space Flight Center***

Pat Salvail, Binayak Panda, and Robert R. Hickman, Marshall Space Flight Center, Huntsville, AL, USA

**[C05] Space Reactors and Shield Design Methods and Technologies**

*Tuesday, February 13, 2007, 8:00 am - 10:00 am - Alvarado Salon F*

**Chairs:** J. Boise Pearson, NASA Marshall Space Flight Center, Marshall Space Flight Center, AL, USA

Shannon Bragg-Sitton, NASA Marshall Space Flight Center, Huntsville, AL, USA

**8:00 am - *Integral, Shaped Shielding for Fission Reactors on the Lunar/Martian Surface***

David I. Poston, Robert B. Foresman, David D. Dixon, Los Alamos National Laboratory, Los Alamos, NM

**8:30 am - *Experimental Evaluation of the Thermal Performance of a Water Shield for a Surface Power Reactor***

J. Boise Pearson, and E. Stewart, NASA Marshall Space Flight Center, Nuclear & Advanced Propulsion Branch, Huntsville, AL, USA; R. Reid, Los Alamos National Laboratory, Nuclear Design and Risk Analysis, Los Alamos, NM, USA

**9:00 am - *FRINK - A Code to Evaluate Space Reactor Transients***

David I. Poston, David D. Dixon, Thomas F. Marcille, Benjamin Amiri, Los Alamos National Laboratory, Los Alamos, NM, USA

**9:30 am - *Q & A***

**[D03] Advanced Operations and In-Situ Resource Utilization**

*Tuesday, February 13, 2007, 8:00 am - 10:00 am - Alvarado Ballroom E*

**Chairs:** Laura O'Connor, NASA Langley Research Center, Hampton, VA, USA

Robert Wegeng, NASA Headquarters, Washington, DC, USA

**8:00 am - *Extreme Mobility: Next Generation Tetrahedral Rovers***

P.E. Clark, S.A. Curtis, M.L. Rilee, C.Y. Cheung, R. Wesenberg, G. Brown, C. Cooperrider, NASA Goddard Space Flight Center, Greenbelt, MD, USA

**8:30 am - *Exploration Challenges: Transferring Ground Repair Techniques to Space Flight Application***

Carole A. McLemore, NASA Marshall Space Flight Center, Huntsville, AL, USA; James P. Kennedy, and Brian W. Evans, Teledyne Brown Engineering, Huntsville, AL, USA; Frederick A. Rose, bd Systems Inc., Huntsville, AL, USA

**9:00 am - *Surface Operations: Two Case Studies of Simulated Lunar Operations***

William Bluethmann, Chris Culbert, NASA Johnson Space Center, Houston, TX, USA

**9:30 am - *NASA In-Situ Resource Utilization (ISRU) Technology and Development Project Overview***

Gerald B. Sanders, NASA Johnson Space Center, Houston, TX, USA; William E. Larson, NASA Kennedy Space Center, FL, USA; Kurt R. Sacksteder, NASA Glenn Research Center, Cleveland, OH, USA; Carole McLemore, NASA Marshall Space Flight Center, AL, USA; Kenneth Johnson, Jet Propulsion Laboratory, Pasadena, CA, USA

### [E03] Space Exploration

*Tuesday, February 13, 2007, 8:00 am - 10:00 am - Alvarado Salon B/C*

- Chairs:** Mark Benton, The Boeing Company Space and Intelligence Systems, Los Angeles, CA, USA  
Ronald Turner, ANSER, Arlington, VA, USA
- 8:00 am - *Nanoparticle Electric Propulsion for Space Exploration***  
Thomas M. Liu, Louis D. Musinski, Prashant R. Patel, Alec D. Gallimore, Brian E. Gilchrist, and Michael Keidar, University of Michigan, Ann Arbor, MI, USA
- 8:30 am - *Centaur Application to Robotic and Crewed Lunar Lander Evolution***  
Bonnie Birckenstaedt, Bernard F. Kuttler, and Frank Zegler, United Launch Alliance, Denver, CO, USA
- 9:00 am - *Propellant Selection for CEV and Mars Exploration Vehicles***  
Timothy Chen and Edward McCullough, The Boeing Company, Huntington Beach, CA, USA
- 9:30 am - *A Quantitative Method For Evaluating Regolith Simulants***  
Doug Rickman, National Space Science and Technology Center, NASA Marshall Space Flight Center, Huntsville, AL, USA; Hans Hoelzer, Rick Howard, and Charles Owens, Teledyne Brown Engineering, Huntsville, AL, USA; Paul Carpenter, BAE Systems Analytical and Ordnance Solutions, NASA Marshall Space Flight Center, AL, USA; Laurent Sibille, ASRC Aerospace Corp., NASA Kennedy Space Center, FL, USA

### [F03] Propulsion and Power Concepts for Taming the Solar System

*Tuesday, February 13, 2007, 8:00 am - 10:00 am - Alvarado Salon G/H*

- Chairs:** Eric W. Davis, Institute for Advanced Studies at Austin, Austin, TX, USA  
Robert M.L. Baker, Jr., GRAVWAVE, LLC, Playa Del Rey, CA, USA
- 8:00 am - *Modified Design of Novel Variable-Focus Lens for VHFGW***  
R. Clive Woods, Louisiana State University, Baton Rouge, LA, USA
- 8:30 am - *Surveillance Applications of High-Frequency Gravitational Waves***  
Robert M. L. Baker, Jr., Gravewave LLC and Transportation Sciences Corp., Playa del Rey, CA, USA
- 9:00 am - *Compact Reactor***  
Pharis E. Williams, Williams Research, Los Alamos, NM, USA
- 9:30 am - *Extraction of Thrust from Quantum Vacuum Using Squeezed Light***  
Yoshinari Minami, Space Technology Research Office, Yokohama, Japan

### [C06] Terrestrial Programs and Technologies with Space Application

*Tuesday, February 13, 2007, 10:30 am-12:30 pm - Alvarado Ballroom D*

- Chairs:** James E. Werner, Idaho National Laboratory, Idaho Falls, ID, USA  
Lloyd Jollay, BWX T Y-12, Oak Ridge, TN, USA
- 10:30 am - *A Wide Range Neutron Detector for Space Nuclear Reactor Applications***  
Eduardo Nassif and Miguel Sisonda, INVAP S.E., Bariloche, Rio Negro, Argentina; Emilio Matatagui, Solydes, Argentina; Stephan Pretorius, Payload Systems Inc, Cambridge, MA, USA
- 11:00 am - *Space Propulsion Activities in Brazil***  
Lamartine Guimarães, Institute for Advanced Studies, Sao Jose dos Campos, SP, Brazil
- 11:30 am - *Particle-Particle Interaction in Electromagnetic Fields for Force-Field Tailoring***  
Sameh S. Wanis, Thilini Rangedera, Cedric Justin, Narayanan M. Komerath, Georgia Institute of Technology, Atlanta, GA, USA
- 12:00 pm - *Q & A***

## **[C07] Nuclear Thermal Rockets: Past, Present and Future**

*Tuesday, February 13, 2007, 10:30 am - 12:30 pm - Alvarado Salon F*

- Chairs:** Stanley K. Borowski, NASA Glenn Research Center, Cleveland, OH, USA  
Russell Joyner, Pratt and Whitney Rocketdyne, West Palm Beach, FL, USA
- 10:30 am - *Tie Tube Heat Transfer Modeling for Bimodal Nuclear Thermal Rockets***  
Joshua Clough, Ryan Starkey, and Mark Lewis, University of Maryland, College Park, MD, USA; Tom Lavelle, NASA Glenn Research Center, Cleveland, OH, USA
- 11:00 am - *Returning Humans to the Moon: Comparison of Chemical Engine and Nuclear Rocket Performance as an Earth Departure Stage***  
Steven D. Howe, Center for Space Nuclear Research, Idaho Falls, ID, USA; Natasha Barra, University of California – Los Angeles, Los Angeles, CA, USA; John Bess, University of Utah, Salt Lake City, UT, USA; Emily Colvin, Nuclear and Radiological Engineering/Medical Physics Program, Georgia Institute of Technology, Atlanta, GA, USA; Paul Cummings, Department of Physics, Embry Riddle Aeronautical University, Prescott, AZ, USA; Brandon Cunningham, Department of Nuclear Engineering, University of Florida, Gainesville, FL, USA; Melissa Ghrist and Kevin Supak, Department of Nuclear Engineering, Texas A&M University, College Station, TX, USA; Ryan Johnson, College of Engineering, Boise State University, Boise, ID, USA; Rob O'Brien, Space Research Centre, University of Leicester, Leicester, United Kingdom; Jeff Perkins, Colorado School of Mines, Golden, CO, USA; Masayuki Yano, School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, GA, USA
- 11:30 am - *Mars Mission Analysis Trades Based on Legacy and Future Nuclear Propulsion Options***  
Russell Joyner, Pratt & Whitney Rocketdyne, West Palm Beach, FL, USA; Andrea Lentati, Georgia Institute of Technology, Atlanta, GA, USA; Jaclyn Cichon, University of Florida, Gainesville, FL, USA
- 12:00 pm - *Reactivity Effects and Depletion Analysis of a NERVA-Derived Nuclear Thermal Rocket***  
Benjamin W. Amiri, Michael L. Fensin and Thomas F. Marcille, Los Alamos National Laboratory, Los Alamos, NM, USA

## **[D04] Advanced Materials, Structures, and Mechanisms**

*Tuesday, February 13, 2007, 10:30 am - 12:30 pm - Alvarado Ballroom E*

- Chairs:** Laura O'Connor, NASA Langley Research Center, Hampton, VA, USA  
Robert Wegeng, NASA Headquarters, Washington, DC, USA
- 10:30 am - *Status of the Space-Rated Lithium-Ion Battery Advanced Development Project in Support of the Exploration Vision***  
Tom Miller, NASA Glenn Research Center, Cleveland, OH, USA
- 11:00 am - *Layered Metals Fabrication Technology Development for Support of Lunar Exploration at NASA/MSFC***  
Kenneth G. Cooper, NASA/ Marshall Space Flight Center, Huntsville, AL, USA; James E. Good, MEI Technologies, Inc., Houston, TX, USA; Scott D. Gilley, Tec-Masters, Inc., Huntsville, AL, USA
- 11:30 am - *Friction Stir Welded Thin Wall Cryogenic Tank Skins***  
David Potter and Mike Holguin, Lockheed Martin Space Systems, Denver, CO, USA; Jennifer Takeshita, Lockheed Martin Michoud, New Orleans, LA, USA
- 12:00 pm - *Overview and Highlights of the NASA Exploration Technology Program for Structures, Materials, and Mechanisms***  
Judith J. Watson, NASA Langley Research Center, Hampton, VA, USA

## **[E04] Space Bases on the Moon**

*Tuesday, February 13, 2007, 10:30 am - 12:30 pm - Alvarado Salon B/C*

- Chairs:** Klaus Heiss, High Frontier and The Jamestown Group, Alexandria, VA, USA  
Paul van Susante, Colorado School of Mines, Golden, CO, USA
- 10:30 am - MIC: Magnetically Deployable Structures for Power, Propulsion, Processing, Habitats, and Energy Storage at Manned Lunar Bases**  
James Powell, George Maise, John Paniagua, and John Rather, Plus Ultra Technologies, Inc., Stony Brook, NY, USA
- 11:00 am - The TPS Advanced Development Project for CEV**  
James J. Reuther, NASA Ames Research Center, Moffett Field, CA, USA; and the Orion Thermal Protection Advanced Development Project Staff, NASA Langley Research Center, Langley, VA, USA, and NASA Johnson Space Center, Houston, TX, USA
- 11:30 am - Moon Bases as Initial "Space Society" Trials: Utilizing Astrosociology to Make Space Settlements Livable**  
Jim Pass, Astrosociology.com, Huntington Beach, CA, USA
- 12:00 pm - What Will We Actually Do On the Moon?**  
Brent Sherwood, Jet Propulsion Laboratory, Pasadena, CA, USA

## **[E05] Lunar Analog Test Site Capabilities I**

*Tuesday, February 13, 2007, 10:30 am - 12:30 pm - Franciscan Room*

- Chairs:** Diane Linne, NASA Glenn Research Center, Cleveland, OH, USA  
Mark Henley, The Boeing Company, Canoga Park, CA, USA
- 10:30 am - The Simulated Lunar OPERations (SLOPE) and Soils Design Laboratory at Glenn Research Center**  
Phillip B. Abel, James J. Zakrajsek, John J. Caruso, NASA Glenn Research Center, Cleveland, OH, USA
- 11:00 am - Analog Test Sites Used by JPL**  
Brian H. Wilcox, Jet Propulsion Laboratory, Pasadena, CA, USA
- 11:30 am - PISCES: A Lunar Outpost for ISRU Partnerships**  
F.D. Schowengerdt, University of Hawaii at Hilo, Alexandria, VA, USA; M.B. Duke, Dripping Springs, TX, USA; R.A. Fox, Dept. of Physics and Astronomy, University of Hawaii at Hilo, HI, USA; M. Henley, The Boeing Company, Rocketdyne, Canoga Park, CA, USA; N.I. Marzwell, Jet Propulsion Laboratory, Pasadena, CA, USA; J. Crisafulli, Dept. of Business and Economic Development, State of Hawaii, HI, USA; S.M.D. Day, International Ventures Associates, USA
- 12:00 pm - The Nevada Test Site as a Lunar Analog Test Area**  
Sheldon H. Freid, National Security Technologies, LLC, Homeland Security Technologies, Las Vegas, NV, USA

## **[F04] Experimental Results and New Concepts within Current Physical Models I**

*Tuesday, February 13, 2007, 10:30 am - 12:30 pm - Alvarado Salon G/H*

- Chairs:** James F. Woodward, California State University, Fullerton, Fullerton, CA, USA  
R. Clive Woods, Louisiana State University, Baton Rouge, LA, USA
- 10:30 am - Mach's Principle and Propulsion: Experimental Results**  
James F. Woodward, Departments of History and Physics, California State University, Fullerton, CA, USA
- 11:00 am - Propulsion from ElectroMagnetic Nonlinear Materials**  
Glen A. Robertson, Gravi Atomic Research, Madison, AL, USA
- 11:30 am - Measurement of Gravitomagnetic and Acceleration Fields around Rotating Superconductors**  
Martin Tajmar, Florin Plesescu, B. Seifert, K. Marhold, Space Propulsion, ARC

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Seibersdorf research, A-2444 Seibersdorf, Austria

**12:00 pm - Mach-Lorentz Thruster Spacecraft Applications**

Paul March, Barrios Technology, Friendswood, TX, USA

### [C08] Dynamic Power I: < Kilowatt Class

*Tuesday, February 13, 2007, 1:45 pm - 3:45 pm - Alvarado Ballroom D*

**Chairs:** Richard K. Shaltens, NASA Glenn Research Center, Cleveland, OH, USA

Jeffrey G. Schreiber, NASA Glenn Research Center, Cleveland, OH, USA

**1:45 pm - Final Results for the GRC Supporting Technology Development Project for the 110-Watt Stirling Radioisotope Generator (SRG110)**

Lanny G. Thieme and Jeffrey G. Schreiber NASA Glenn Research Center, Cleveland, OH, USA

**2:15 pm - Advanced Stirling Converter (ASC) Phase III Progress Update**

J. Gary Wood, Kyle Wilson, and Andrew Buffalino, Sunpower Inc., Athens, OH, USA; Patrick Frye, and Dan Matejczyk, Pratt & Whitney Rocketdyne, Canoga Park, CA, USA; L. B. Penswick, Consultant, Stevenson, WA, USA

**2:45 pm - Palm Power Free Piston Stirling Engine Control Electronics**

Douglas E. Keiter and Ezekiel Holiday, Sunpower Inc., Athens, OH, USA

**3:15 pm - Structural Benchmark Testing for Stirling Converter Heater Heads**

David L. Krause, and Randy R. Bowman, NASA Glenn Research Center, Cleveland, OH, USA; Sreeramesh Kalluri, Ohio Aerospace Institute, NASA Glenn Research Center, Cleveland, OH, USA

### [C09] Lunar Regolith Excavation for Reactor Shielding

*Tuesday, February 13, 2007, 1:45 pm - 3:45 pm - Alvarado Salon F*

**Chairs:** John H. Scott, NASA Johnson Space Center, Houston, TX, USA

David I. Poston, Los Alamos National Laboratory, NM, USA

**1:45 pm - Using ISRU Excavation Assets to Emplace a Surface Reactor on the Moon**

Kurt R. Sacksteder, Diane L. Linne, Christopher A. Gallo, Juan H. Agui, NASA Glenn Research Center, Cleveland, OH, USA; David Zheng, Case Western Reserve University, Cleveland, OH, USA; Robert P. Mueller, Gregory M. Galloway, NASA Kennedy Space Center, Kennedy Space Center, FL, USA

**2:15 pm - Application of Artificial-Neural-Tissue Controller to Multirobot Lunar ISRU Operations**

G.M.T. D'Eleuterio, Jekanthan Thangavelautham, and Alexander Smith, Institute for Aerospace Studies, University of Toronto, Toronto, ON, Canada; Dale Boucher, Northern Centre for Advanced Technology, Sudbury, ON, Canada; Jim Richard, Electric Vehicle Controllers Ltd., Val Caron, ON, Canada

**2:45 pm - Electrostatic Dust Control on Planetary Surfaces**

Pamela Clark, Catholic University of America, Washington, DC, USA; C.I. Calle, and J.G. Mantovani, NASA/KSC, Cape Kennedy, FL, USA; S.A. Curtis, J.W. Keller, and F.A. Minetto, NASA/GSFC, Greenbelt, MD, USA

**3:15 pm - Q & A**

### [C10] Space Nuclear Electric Power Generation Technology: Reflection and Update

*Tuesday, February 13, 2007, 1:45 pm - 3:45 pm - Franciscan Room*

**Chairs:** Stanley V. Gunn, Rocketdyne (Retired), Chatsworth, CA, USA

Michael Houts, NASA Marshall Space Flight Center, AL, USA

**1:45 pm - Mission Interplanetary: Using Radioisotope Power to Explore the Solar System**

Gary L. Bennett, Metaspaces Enterprises, Emmett, ID, USA

STAIF-2007 Program

- 2:15 pm - Technology Status for Space Nuclear Power Systems**  
Sterling Bailey, Consultant, Grass Valley, CA, USA
- 2:45 pm - Systems for Nuclear Auxiliary Power (SNAP) Program: A Review of Space Reactor Power Systems SNAP 2/10A, SNAP 8, and the Adv. UZrH Reactor Program**  
William R. Determan, Hamilton Sundstrand Rocketdyne, Space Land and Sea, Canoga Park, CA, USA
- 3:15 pm - Space Nuclear Electric Power Systems: 44 Years of Russian and American Developments**  
Joseph Wetch, USA-Russian Joint Venture (INERTEK), Reno, NV, USA

### [D05] Novel Concepts

*Tuesday, February 13, 2007, 1:45 pm - 3:45 pm - Alvarado Ballroom E*

- Chairs:** Christopher Moore, NASA Headquarters, Washington, DC, USA  
Robert Wegeng, NASA Headquarters, Washington, DC, USA
- 1:45 pm - Micro-Inspector Spacecraft Testbed: Breadboard Subsystem Demonstrations**  
Juergen Mueller, Leon Alkalai, and Hannah Goldberg, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA
- 2:15 pm - Modular, Multifunctional, and Reconfigurable SuperBot for Space Technology**  
W.-M. Shen, Mark Moll, and Behnam Salemi, USC Information Sciences Institute, Marina del Rey, CA USA
- 2:45 pm - ATHLETE Rover**  
Brian Wilcox, Jet Propulsion Laboratory, Pasadena, CA, USA
- 3:15 pm - Innovative Concepts for Sustained Exploration of Space**  
Ron Turner, ANSER, Arlington, VA, USA; Diana Jennings and Robert Cassanova, NASA Institute for Advanced Concepts, Atlanta, GA, USA

### [E06] Space Resource Utilization on the Moon

*Tuesday, February 13, 2007, 1:45 pm - 3:45 pm - Alvarado Salon B/C*

- Chairs:** William E. Larson, NASA Kennedy Space Center, Kennedy Space Center, FL, USA  
Gerald B. Sanders, NASA Johnson Space Center, Houston, TX, USA
- 1:45 pm - Vacuum Pyrolysis and Related ISRU Techniques**  
Eric Cardiff, Brian R. Pomeroy, and Ian S. Banks, NASA Goddard Space Flight Center, Greenbelt, MD, USA
- 2:15 pm - Development of an integrated RVC – LWRD system for RESOLVE**  
Janine Captain and Dale Lueck, NASA-KSC, Kennedy Space Center, FL, USA; Kurt Sacksteder NASA-Glenn Research Center, Cleveland, OH, USA
- 2:30 pm - Microwave Extraction of Water from Lunar Regolith Simulant**  
Edwin C. Ethridge, NASA - Marshall Space Flight Center, Huntsville, AL, USA;  
William Kaukler, University of Alabama, Huntsville, AL,
- 3:15 pm - Drilling Results in Ice-Bound Simulated Lunar Regolith**  
Kris Zacny, David Glaser, Paul Bartlett, Kiel Davis, and Steven Gorevan, Honeybee Robotics Ltd., Moffett Field, CA, USA

### [F05] Innovative Theories and Concepts for Communication

*Tuesday, February 13, 2007, 1:45 pm - 3:45 pm - Alvarado Salon G/H*

- Chairs:** Gary Stephenson, Seculine Consulting, Bellevue, WA, USA  
Greg Meholic, The Aerospace Corporation, El Segundo, CA, USA
- 1:45 pm - The Value Estimation of an HFGW Frequency Time Standard for Telecommunications Network Optimization**  
Colby Harper, Seattle, WA, USA and Gary Stephenson, Seculine Consulting, Seattle, WA, USA
- 2:15 pm - Alternate Communications for Space Travel**

## STAIF-2007 Program

Pharis E. Williams, Williams Research, Los Alamos, NM, USA

**2:45 pm - *FTL Quantum Models of the Photon and the Electron***

Richard Gauthier, Engineering Department, Santa Rosa Junior College, Santa Rosa, CA, USA

**3:15 pm - *A Test of De Aquino's 2005 Kinetic Quantum Theory of Gravity***

Gary Stephenson, Seculine Consulting, Bellevue, WA, USA

### [A03] High-Capacity Heat Rejection Systems

*Tuesday, February 13, 2007, 4:00 pm - 6:00 pm - Alvarado Salon A*

**Chairs:** David Wolf, Swales Aerospace, Beltsville, MD, USA

Eric Silk, NASA Goddard Space Flight Center, Greenbelt, MD, USA

**4:00 pm - *Advances in High Temperature Titanium-Water Heat Pipe Technology***

John H. Rosenfeld and Nelson J. Gernert, Thermacore, Inc., Lancaster, PA, USA

**4:30 pm - *Optimized Design and Testing of a Graphite Reinforced-Fiber Reinforced Composite Heat Pipe Radiator with Tapered Fins***

R.J. Naumann, University of Alabama, Huntsville, AL, USA; Jim Barth, ATK Space Systems, San Diego, CA, USA; James Marris, Marshall Space Flight Center, AL, USA

**5:00 pm - *Optimization of Phase-Change Material Thermal Control Devices***

T. Kelvin Cheung, The Aerospace Corporation, Los Angeles, CA, USA; Benjamin A. Blake, Nifty Analysis and Design, San Francisco, CA, USA

**5:30 pm - *High Performance Titanium-Water Heat Pipes for High Temperature Applications***

David Wolf, Michael Nikitkin, Terry Miller, Swales Aerospace, Beltsville, MD, USA

### [C11] Radioisotope Power Systems Applications

*Tuesday, February 13, 2007, 4:00 pm - 6:00 pm - Alvarado Salon F*

**Chairs:** Robert Abelson, Jet Propulsion Laboratory, Pasadena, CA, USA

Robert L. Wiley, U.S. Department of Energy, Washington, DC, USA

**4:00 pm - *Curie-Montgolfiere Planetary Explorers***

Chris Taylor, Jupiter Research and Development, Houston, TX, USA; Jeremiah Hansen, Spotsylvania, VA, USA

**4:30 pm - *Titan Exploration Using a Radioisotopically-Heated Montgolfier Balloon***

John O. Elliott, Kim Reh, and Tom Spilker, Jet Propulsion Laboratory, Pasadena, CA, USA

**5:00 pm - *The Europa Explorer - A Fresh Look at Exploring Europa with an RPS-Powered Spacecraft***

Robert Abelson and Karla Clark, Jet Propulsion Laboratory, Pasadena, CA, USA

**5:30 pm - *Q & A***

### [C12] Space Nuclear Reactor Power Systems and Concepts

*Tuesday, February 13, 2007, 4:00 pm - 6:00 pm - Franciscan Room*

**Chairs:** David I. Poston, Los Alamos National Laboratory, Los Alamos, NM, USA

Bill J. Nesmith, Jet Propulsion Laboratory, Pasadena, CA, USA

**4:00 pm - *Thermal-Hydraulic Analysis of the Submersion-Subcritical, Safe Space (S<sup>4</sup>) Reactor***

Jeffrey C. King, University of New Mexico, Albuquerque, NM, and University of Missouri, Rolla, MO, USA; Mohamed S. El-Genk, University of New Mexico, Albuquerque, NM, USA

**4:30 pm - *Low Mass SCoRe-S Designs for Affordable Planetary Exploration***

Steven A. Hatton and Mohamed S. El-Genk, UNM-ISNPS, Albuquerque, NM, USA

**5:00 pm - *Methods for Determining Operation Lifetime of Space Reactors***

Timothy M. Schriener and Mohamed S. El-Genk, Institute for Space and Nuclear Power Studies and Chemical and Nuclear Engineering Dept., The University of New Mexico, Albuquerque, NM, USA

**5:30 pm - PID Control Effectiveness for Surface Reactor Concepts**

David D. Dixon, North Carolina State University, NC, USA; Christopher P. Marsh, United States Naval Academy, MD, USA; David I. Poston, Christopher L. Marsh, Los Alamos National Laboratory, Los Alamos, NM, USA

**[E07] Space Resource Utilization on Mars**

*Tuesday, February 13, 2007, 4:00 pm - 6:00 pm - Alvarado Salon B/C*

**Chairs:** Larry D. Clark, Lockheed Martin, Denver, CO, USA  
Adam P. Bruckner, University of Washington, Seattle, WA, USA

**4:00 pm - Multi-MICE: Nuclear Powered Mobile Probes to Explore Deep Interiors of the Ice Sheets on Mars and the Jovian Moons**

George Maise, James Powell, and John Paniagua, Plus Ultra Technologies, Stony Brook, NY, USA; Jesse Powell, Scripps Institution of Oceanography, San Diego, CA, USA

**4:30 pm - Lunar In Situ Materials-Based Surface Structure Technology Development Efforts at NASA/MSFC**

M. R. Fiske, Jacobs Sverdrup, Marshall Space Flight Center, Huntsville, AL, USA; W. McGregor, R. Pope, Qualis Corporation, Marshall Space Flight Center, Huntsville, AL, USA; C. A. McLemore, R. Kaul, G. Smithers, E. Ethridge, NASA Marshall Space Flight Center, Huntsville, AL, USA; H. Toutanji, Civil Engineering Department, University of Alabama in Huntsville, Huntsville, AL, USA

**5:00 pm - Martian Liquid CO<sub>2</sub> and Metabolic Heat Regenerated Temperature Swing Adsorption for Portable Life Support Systems**

Christine S. Iacomini, Tom Morin, and Taber MacCallum, Kathrine Straub-Lopez, Paragon Space Development Corporation, Tucson, AZ, USA; Heather Paul, National Aeronautics and Space Administration, Houston, TX, USA

**5:30 pm - Percussive Penetration of Unconsolidated Granular Media in a Laboratory Setting**

Leslie Gertsch, University of Missouri-Rolla, Rolla, MO, USA

**[F06] Theoretical Considerations - Warp Drives, FTL Speed Travel and Others I**

*Tuesday, February 13, 2007, 4:00 pm - 6:00 pm - Alvarado Salon G/H*

**Chairs:** John Brandenburg, Florida Space Institute, Orlando, FL, USA  
David Goodwin, U.S. Department of Energy, Washington, DC, USA

**4:00 pm - Progress on the GEMS (Gravity Electro-Magnetism-Strong) Theory of Field Unification and Its Application to Space Problems**

J.E. Brandenburg, Florida Space Institute-University of Central Florida, Kennedy Space Center, FL, USA

**4:30 pm - Hyperspace for Space Travel**

Giorgio Fontana, University of Trento, Trento, Italy; Paul Murad, Department of Defense, Vienna, VA, USA; and Robert M. L. Baker, Jr., GRAVWAVE@LLC, Playa del Rey, CA, USA

**5:00 pm - Fluid Dynamic Simulations of Warp Drive Flight Through Negative Pressure Zero-Point Vacuum**

H. David Froning Jr, Flight Unlimited, Gumeracha, SA, Australia, and Robert L. Roach, Ramat Hashron, Israel

**5:30 pm - Can the Present Technology Create Gross Amounts of Negative Energy Density?**

Mohammad Mansouryar, Karaj, Tehran, Iran

## WEDNESDAY, FEBRUARY 14, 2007

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### [A04] Thermal Control Technologies for Future Spacecraft

*Wednesday, February 14, 2007, 8:00 am - 10:00 am - Alvarado Salon A*

**Chairs:** Jeffrey R. Didion, NASA Goddard Space Flight Center, Greenbelt, MD, USA  
Kirk L. Yerkes, USAF Air Force Research Laboratory, Wright-Patterson AFB, OH, USA

**8:00 am - *Hybrid Two-Phase Mechanical/Capillary Pumped Loop for High-Capacity Heat Transport***

Triem T. Hoang, Dmitriy A. Suhkov, TTH Research, Inc., Laurel, MD, USA; Robert W. Baldauff, Kwok H. Cheung, U.S. Naval Research Laboratory, Washington, DC, USA

**8:30 am - *Cryogenic Loop Heat Pipes and Applications***

Triem T. Hoang, TTH Research, Inc., Laurel, MD, USA; Jentung Ku, NASA Goddard Space Flight Center, Greenbelt, MD, USA

**9:00 am - *Thermal Isothermalization of a Large Panel with an Embedded Loop Heat Pipe***

Triem T. Hoang, TTH Research, Inc., Laurel, MD, USA

**9:30 am - *Mathematical Modeling of Loop Heat Pipes and Test Data Verification***

Triem T. Hoang, TTH Research, Inc., Laurel, MD, USA; Jentung Ku, NASA Goddard Space Flight Center, Greenbelt, MD, USA

### [C13] Nuclear Thermal Rocket Technology and Integration

*Wednesday, February 14, 2007, 8:00 am - 10:00 am - Alvarado Ballroom D*

**Chairs:** Stanley V. Gunn, Rocketdyne (Retired), Chatsworth, CA, USA  
Harold Finger, Consultant, Chevy Chase, MD, USA

**8:00 am - *Nuclear Thermal Rocket Reactors and Engine Systems--An Established Propulsion Technology Developed in the Rover and NERVA Programs***

Richard E. Malenfant, Los Alamos National Laboratory (retired), Albuquerque, NM, USA; Frank P. Durham, Los Alamos National Laboratory (retired), Los Alamos, NM, USA; Milton Klein, NASA/AEC Space Nuclear Systems Office (retired), Menlo Park, CA, USA

**8:30 am - *Issues Concerning the Redevelopment of a Nuclear Thermal Rocket for Application to Lunar, Mars and Deep Space Missions***

Steven D. Howe, Center for Space Nuclear Research, Idaho Falls, ID, USA

**9:00 am - *Human Missions to Mars: NASA's Planning for the Future***

Jeff Volosin, NASA Exploration Systems Mission Directorate, NASA Headquarters, Washington D.C. USA

**9:30 am - *NTP Development Activities at the NASA Marshall Space Flight Center - 2006 Accomplishments***

Richard O. Ballard, Nuclear Systems Engineering Branch, NASA Marshall Space Flight Center, AL, USA

### [C14] Advanced Energy Storage Technologies

*Wednesday, February 14, 2007, 8:00 am - 10:00 am - Alvarado Salon G/H*

**Chairs:** Subbarao (Rao) Surampudi, Jet Propulsion Laboratory, Pasadena, CA, USA  
Garry Burdick, Jet Propulsion Laboratory, Pasadena, CA, USA

**8:00 am - *Li-Ion Batteries for Aerospace Applications***

Frank Puglia, Vincent Yevoli, Yardney Technical Products, Inc./Lithion, Inc., Pawcatuck, CT, USA

**8:30 am - *Direct Methanol Fuel Cells***

S. R. Narayanan, T. Valdez, Jet Propulsion Laboratory, Pasadena, CA, USA

**9:00 am - *Low Temperature Li-ion Batteries for Planetary Missions***

Marshall Smart, Larry Whitcanack and Ratnakumar Bugga, Jet Propulsion Laboratory,

9:30 am - *Q & A*

## **[D06] Advanced Avionics and Software**

*Wednesday, February 14, 2007, 8:00 am - 10:00 am - Alvarado Ballroom E*

**Chairs:** Dana Gould, NASA Langley Research Center, Hampton, VA, USA  
Christopher Moore, NASA Headquarters, Washington, DC, USA

8:00 am - ***Radiation-Hardened Electronics for Space Exploration (RHESE)***

Michael Watson, Don Frazier, James Adams, Todd MacLeod, Clint Patrick, Andrew Keys, NASA Marshall Space Flight Center, Huntsville, AL, USA; John Cressler, Georgia Institute of Technology, Atlanta, GA, USA; Matt Hancher, NASA Ames Research Center, Moffett Field, CA, USA; Michael Johnson, NASA Goddard Space Flight Center, Greenbelt, MD, USA; Elizabeth Kolawa, Jet Propulsion Laboratory, Pasadena, CA, USA

8:30 am - ***Spacecraft Autonomy Technology: From Mission Operations to Lunar Outposts***

Ari Jonsson, NASA Ames Research Center, Moffett Field, CA, USA

9:00 am - ***The Autonomous Precision Landing and Hazard Detection and Avoidance Technology (ALHAT)***

Chirold D. Epp, NASA Johnson Space Center, Houston, TX, USA; Thomas B. Smith, NASA Johnson Space Center, Houston, TX, USA

9:30 am - ***Automated Rendezvous and Docking System Developments***

Richard T. Howard, NASA Marshall Space Flight Center, AL, USA

## **[E08] Lunar Analog Test Site Capabilities II**

*Wednesday, February 14, 2007, 8:00 am - 10:00 am - Alvarado Salon B/C*

**Chairs:** Diane Linne, NASA Glenn Research Center, Cleveland, OH, USA  
Mark Henley, The Boeing Company, Canoga Park, CA, USA

8:00 am - ***Desert Research and Technology Studies (RATS) Local and Remote Test Sites***

Barbara Janoiko, Joseph Kosmo, Crew and Thermal Systems Division, NASA Johnson Space Center, Houston, TX, USA; Dean Eppler, Constellation Advanced Projects Office, NASA Johnson Space Center, Houston, TX, USA

8:30 am - ***The Canadian Analogue Research Network (CARN): Applicability to the Global Exploration Strategy***

Alain Berinstain, Canadian Space Agency, St-Hubert, QC, Canada

9:00 am - ***Houghton-Mars Project Site, Devon Island, Arctic: Relevance to Lunar ISRU Analog Studies***

Pascal Lee, NASA Ames Research Center, Moffett Field, CA, USA

9:30 am - ***Analog Missions Supporting the Vision for Space Exploration***

Stephen J. Hoffman, Science Applications International Corporation, Houston, TX, USA

## **[C15] Dynamic Power II: > Kilowatt Class**

*Wednesday, February 14, 2007, 10:30 am - 12:30 pm - Alvarado Ballroom D*

**Chairs:** Lee S. Mason, NASA Glenn Research Center, Cleveland, OH, USA  
Tim Bauch, Hamilton Sundstrand, Rockford, IL, USA

10:30 am - ***New 5 Kilowatt Free-Piston Stirling Space Converter Developments***

Henry W. Brandhorst, Jr., Space Research Institute, Auburn University, Auburn, AL, USA

11:00 am - ***Comparison of Analytical Predictions and Experimental Results for a Dual Brayton Power System***

Paul Johnson, Analex Corp., NASA Glenn Research Center, Cleveland, OH, USA

11:30 am - ***Recent Developments in the Recovery of SNAPDYN Technical Data Base***

Greg Johnson, Bill Determan, Hamilton Sundstrand, Canoga Park, CA, USA

**12:00 pm - Compressor and Turbine Models of Brayton Units for Space Nuclear Power Systems**  
Bruno M. Gallo, Mohamed S. El-Genk, and Jean-Michel Tournier, University of New Mexico, Albuquerque, NM, USA

## **[C16] Safety and Reliability**

*Wednesday, February 14, 2007, 10:30 am - 12:30 pm - Alvarado Salon F*

**Chairs:** Joseph A. Sholtis, Sholtis Engineering & Safety Consulting, Tijeras, NM, USA  
Lawrence E. DeFillipo, SAIC, Reston, VA, USA

**10:30 am - Probabilities of Ground Impact Conditions of the New Horizons Spacecraft and RTG for Near Launch Pad Accidents**

Brian E. McGrath, Dave A. Frostbutter, and Yale Chang, The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD, USA

**11:00 am - JHU/APL Breakup Analysis Tool (APLbat) for the New Horizons Radiological Contingency**

Matthew Lear, Brian McGrath, Naruhisa Takashima, and Gene Heyler, The Johns Hopkins University Applied Physics Laboratory, Laurel, MD, USA

**11:30 pm - New Horizons Launch Contingency Effort**

Yale Chang, Matthew H. Lear, Brian E. McGrath, Gene A. Heyler, Naruhisa Takashima, and W. Donald Owings, The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD, USA

**12:00 pm - LEO Spacecraft Charging - A New NASA Design Standard**

Dale C. Ferguson, NASA Marshall Space Flight Center, Huntsville, AL, USA; G. Barry Hillard, NASA GRC, USA

## **[D07] Advanced Thermal Technologies and Systems**

*Wednesday, February 14, 2007, 10:30 am - 12:30 pm - Alvarado Ballroom E*

**Chairs:** Dana Gould, NASA Langley Research Center, Hampton, VA, USA  
Carlos S. Campos, NASA Headquarters, Washington, DC, USA

**10:30 am - Cryo Fluids Management**

Susan Motil, NASA Glenn Research Center, Cleveland, OH, USA

**11:00 am - The Potential Impact of a LEO Propellant Depot on the NASA ESAS Architecture**

Dallas Bienhoff, The Boeing Company, Arlington, VA, USA

**11:30 am - Active Thermal Control System Development for Exploration**

David Westheimer, NASA Johnson Space Center, Houston, TX, USA

**12:00 pm - Cryogenic Propellant Depot Experiments, Demonstrations and Applications**

Joe T. Howell, John Fikes, NASA, Marshall Space Flight Center, Huntsville, AL, USA;  
Mark Henley, The Boeing Company, Phantom Works, Huntington Beach, CA, USA

## **[E09] Biotechnology and Medicine for Space Colonization**

*Wednesday, February 14, 2007, 10:30 am - 12:30 pm - Alvarado Salon B/C*

**Chairs:** Diana Jennings, NASA Institute for Advanced Concepts, Kingston, MA, USA  
Ronald Turner, ANSER, Arlington, VA, USA

**10:30 am - Biotechnology Support for Space Colonization**

Edward D. McCullough, The Boeing Company, Huntington Beach, CA, USA

**11:00 am - A Minimizing Technological Approach towards Human Self Sufficiency off Earth**

Peter A. Curreri, NASA Marshall Space Flight Center, Huntsville, AL, 35812 USA

**11:30 am - The All Terrain Bio nano Gear for Space Radiation Detection System**

Ajay Ummat and Constantinos Mavroidis, Northeastern University, Boston, MA, USA

**12:00 pm - Revolutionary Architectures and Concepts for Biotechnology, Life Support and Space Settlement**

Diana E. Jennings, and Robert Cassanova, NASA Institute for Advanced Concepts, Atlanta, GA, USA; Ronald Turner, ANSER Analytic Services, Inc., Arlington, VA, USA

## **[F07] Experimental Results and New Concepts within Current Physical Models II**

*Wednesday, February 14, 2007, 10:30 am - 12:30 pm - Alvarado Salon G/H*

**Chairs:** Bernd Binder, Quanics, Salem, BW, Germany  
Richard Obousy, Baylor University, Waco, TX, USA

**10:30 am - *Supersymmetry Breaking Casimir Warp Drive***

Richard K. Obousy, and Gerald Cleaver, Baylor University, Waco, TX, USA

**11:00 am - *How a Randall-Sundrum Brane World Effective Potential  
Influences Inflation Physics***

Andrew Walcott Beckwith, APS/Fermi Laboratory Research Contractor, Menlo Park, California, USA

**11:30 am - *Towards a Self-Consistent and Controllable Graviton Flux***

Bernd Binder, Quanics, Salem, BW, Germany

**12:00 pm - *The Connection between Inertial Forces and the Vector Potential***

Mario J. Pinheiro, Instituto Superior Tecnico, Lisboa, Portugal; Alexandre A. Martins, Condensed Matter Physics Center, University of Lisbon, Lisbon, Portugal; Gama Pinto, Lisboa, Portugal

## **[A05] Thermal Control for Lunar and Deep Space Missions**

*Wednesday, February 14, 2007, 2:00 pm – 4:00 pm - Alvarado Salon A*

**Chairs:** Charles Dan Butler, NASA Goddard Space Flight Center, Greenbelt, MD, USA  
Gani B. Ganapathi, Jet Propulsion Laboratory, Pasadena, CA, USA

**2:00 pm - *Thermal Control Architecture for Planetary and Lunar Surface Exploration Micro-Robots***

Brian R. Burg and Dimos Poulidakos, Laboratory for Thermodynamics in Emerging Technologies, ETH, Zurich, Switzerland; Steven Dubowsky, Field and Space Robotics Laboratory, Massachusetts Institute of Technology, Cambridge, MA, USA, and John H. Lienhard V, W. M. Rohsenow Heat and Mass Transfer Laboratory, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA;

**2:30 pm - *Thermal Design Considerations for Designing the Next Lunar Lander***

Mathew B. Garrison, Daniel H. Nguyen, Thermal Engineering Branch, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA

**3:00 pm - *Lunar Dust on Heat Rejection System Surfaces: Problems and Prospects***

James R. Gaier, and Donald A. Jaworske NASA Glenn Research Center, Cleveland, OH, USA

**3:30 pm - *Advanced Cryogenic Propellant Storage Options Applied to Lunar Architecture Studies***

David Plachta, NASA Glenn Research Center, Cleveland, OH, USA

## **[C17] Fission Surface Power Component Technology Development I**

*Wednesday, February 14, 2007, 2:00 pm – 4:00 pm - Alvarado Ballroom D*

**Chairs:** Lee S. Mason, NASA Glenn Research Center, Cleveland, OH, USA  
Joseph Nainiger, NASA Glenn Research Center, Cleveland, OH, USA

**2:00 pm - *Heat Rejection Radiator Technology Development for High Power Space Applications***

Duane E. Beach, Cheryl L. Bowman, NASA Glenn Research Center at Lewis Field, Cleveland, OH, USA; John Siamidis, Analex Corporation, Brook Park, OH, USA; E. Eugene Shin, Mrityunjay Singh, Ohio Aerospace Institute, Brook Park, OH, USA; James L. Sanzi, Sest, Inc., Middleburg Heights, OH, USA

**2:30 pm - *Creep Property Characterization of Potential Brayton Cycle Impeller and Duct Materials***

Timothy P. Gabb, John Gayda, NASA Glenn Research Center, Cleveland, OH USA; Anita Garg, University of Toledo, Cleveland, OH

**3:00 pm - Variable Conductance Liquid Metal Heat Pipes for Use with Isotope Power Systems - Past & Present**

Donald M. Ernst, Advanced Cooling Technologies, Inc., Lancaster, PA, USA

**3:30 pm - Post Irradiation Evaluation of Thermal Control Coatings and Solid Lubricants to Support Fission Surface Power Systems**

Cheryl Bowman, Donald Jaworske, and Malcolm Stanford, NASA Glenn Research Center, Cleveland, OH, USA; Justin Persinger, and Thomas Blue, Ohio State University, Columbus, OH, USA

## **[C18] Ongoing Radioisotope-Enabled Missions**

*Wednesday, February 14, 2007, 2:00 pm – 4:00 pm - Alvarado Salon F*

**Chairs:** Ralph McNutt, The Johns Hopkins University, Laurel, MD, USA  
Jacklyn R. Green, Jet Propulsion Laboratory, Pasadena, CA, USA

**2:00 pm - Jupiter, Saturn and the Sun: Investigations Enabled by Nuclear Power**

Karla B. Clark and Richard Terrile, Jet Propulsion Laboratory, Pasadena, CA, USA

**2:30 pm - RTG's on Transit**

John Dassoulas and Ralph L. McNutt, Jr., Johns Hopkins University Applied Physics Laboratory, Laurel, MD, USA

**3:00 pm - Voyagers to the Edge of the Solar System and Beyond: Contributions from the MHW-RTGs**

Jacklyn R. Green, Jet Propulsion Laboratory, Pasadena, CA, USA

**3:30 pm - The New Horizons Mission to Pluto and the Kuiper-Bel**

David Y. Kusnierkiewicz, Yanping Guo, Chris Hersman, Glen Fountain, and Steve Vernon, Johns Hopkins University Applied Physics Laboratory, Laurel, MD, USA

## **[CE01] Education and Public Outreach**

*Wednesday, February 14, 2007, 2:00 pm – 4:00 pm – Alvarado Salon G/H*

**Chairs:** Alice Wessen, Jet Propulsion Laboratory, Pasadena, CA, USA  
Amber Trounce, Boeing-Huntington Beach, Huntington Beach, CA, USA

**2:00 pm - Successful Education Workforce Development Programs and Lessons Learned**

Barbara Hammond and Jessica Cejka, USRA, Houston, TX, USA

**2:30 pm - Share the Adventure of Mars Exploration : How to Build Lasting and Meaningful Student and Public Participation in Science and Engineering**

Michelle A. Viotti, Jet Propulsion Laboratory, Pasadena, CA, USA

**3:00 pm - Virtual Presence for Mission Simulation: Serious Games Provide a New Approach**

Kevin Hussey, Jet Propulsion Laboratory, Pasadena, CA, USA

**3:30 pm - Q & A**

## **[D08] Environmental Control and Life Support Technologies and Systems**

*Wednesday, February 14, 2007, 2:00 pm – 4:00 pm - Alvarado Ballroom E*

**Chairs:** Jitendra Joshi, NASA Headquarters, Washington, DC, USA  
Steve Davison, NASA Headquarters, Washington, DC, USA

**2:00 pm - Exploration Life Support**

B. M. Lawson, NASA Johnson Space Center, Houston, TX, USA

**2:30 pm - Water Recovery Systems for Exploration Missions**

Karen Pickering, NASA Johnson Space Center, Houston, TX, USA

**3:00 pm - Key Technologies for Environmental Monitoring for CEV and LSAM**

Gregory Bearman, Jet Propulsion Laboratory, Pasadena, CA, USA

**3:30 pm - Atmosphere Revitalization Process Technology Maturation for NASA's Constellation Projects**

Jay L. Perry, NASA George C. Marshall Space Flight Center, Marshall Space Flight

## **[E10] Large Scale Processes and Technologies for Colonization**

*Wednesday, February 14, 2007, 2:00 pm – 4:00 pm - Alvarado Salon B/C*

- Chairs:** Roger X. Lenard, Sandia National Laboratories, Albuquerque, NM, USA  
John Brandenburg, Florida Space Institute, Orlando, FL, USA
- 2:00 pm - *The CI Carbonaceous Chondrites as the Missing Old Meteorites of Mars***  
John Brandenburg, Florida Space Institute-University of Central Florida, Kennedy Space Center, FL, USA
- 2:30 pm - *Establishing Large Scale Colony Infrastructure On The Moon And Mars***  
Edward McCullough, The Boeing Company, Huntington Beach, CA, USA
- 3:00 pm - *A Discrete Event Simulation of Crewed Lunar Surface Operations***  
Dean Davis, Analysis, Modeling, Simulation, & Experimentation (AMSE), Los Angeles, CA, USA; Martin Bayer, Advanced Space Exploration, Huntington Beach, CA, USA; Ashok Iyer, Strategic Development & Analysis (SD&A), Huntington Beach, CA, USA; Andrew Born, Strategic Development & Analysis (SD&A), Huntington Beach, CA, USA
- 3:30 pm - *On the Possibility of a Persistent Mars Greenhouse, or, Mars and Venus Find Something in Common***  
John Brandenburg, Florida Space Institute-University of Central Florida, Kennedy Space Center, FL, USA

## **[A06] Advances in Spray Cooling**

*Wednesday, February 14, 2007, 4:15 pm – 6:15 pm - Alvarado Salon A*

- Chairs:** Eric Silk, NASA Goddard Space Flight Center, Greenbelt, MD, USA  
Kirk L. Yerkes, USAF / Air Force Research Laboratory, Wright-Patterson AFB, OH, USA
- 4:15 pm - *Influence of the Coulomb Force on Spray Cooling***  
John M. Kuhlman, Paul J. Kreitzer, Deepak Mehra, and Donald D. Gray, West Virginia University, Morgantown, WV, USA; Kirk L. Yerkes, U.S. Air Force Research Laboratory, Wright-Patterson Air Force Base, OH, USA
- 4:45 pm - *Energy Model Based Spray Cooling Heat Flux Correlation with Emphasis on Spray Characteristics***  
Eric A. Silk, NASA Goddard Space Flight Center, Greenbelt, MD, USA
- 5:15 pm - *Mathematical Model of Two-Phase Flow in Advanced Micro Cooling Modules Incorporating Flow Pattern Phenomena***  
Jerry K. Keska and William E. Simon, University of Louisiana, Lafayette, LA, USA
- 5:45 pm - *Spray Cooling Modeling: Liquid Film Thickness Effect on Heat Transfer***  
R. Paneer Selvam, and Matthew Hamilton, University of Arkansas, Fayetteville, AR, USA; Eric A. Silk, NASA Goddard Space Flight Center, Greenbelt, MD, USA

## **[C19] Non-Nuclear Testing and Evaluation II**

*Wednesday, February 14, 2007, 4:15 pm – 6:15 pm - Alvarado Ballroom D*

- Chairs:** Bernard Wernsman, Bechtel Bettis, Inc., West Mifflin, PA, USA  
Patrick McDaniel, Sandia National Laboratories, Albuquerque, NM, USA
- 4:15 pm - *Supercritical Brayton Cycle Nuclear Power System Concepts***  
Steven A. Wright, Sandia National Laboratories, Albuquerque, NM, USA
- 4:45 pm - *Testing in Support of Fission Surface Power System Qualification***  
Michael Houts, Shannon Bragg-Sitton, Tom Godfroy, Jim Martin, J. Boise Pearson, Melissa Van Dyke, NASA Marshall Space Flight Center, AL, USA
- 5:15 pm - *Initial Testing of the Stainless Steel NaK-Cooled Circuit (SNaKC)***  
Anne Garber, NASA Marshall Space Flight Center, Nuclear & Advanced Propulsion

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Branch, Huntsville, AL, USA; Thomas J. Godfroy, Los Alamos National Laboratory, Los Alamos, NM, USA

**5:45 pm - *Development of High Fidelity, Fuel-Like Thermal Simulators for Non-Nuclear Testing***

Shannon M. Bragg-Sitton, J. Farmer, R. Dickens, M. Adams, and J. Davis, NASA Marshall Space Flight Center, Nuclear and Advanced Propulsion Branch, Huntsville, AL, USA; D. Dixon, and R. Kapernick, Los Alamos National Laboratory, Nuclear Design and Risk Analysis, Los Alamos, NM, USA

**[C20] Radioisotope Power Systems Technology and Development**

*Wednesday, February 14, 2007, 4:15 pm – 6:15 pm - Alvarado Salon G/H*

**Chairs:** Patrick E. Frye, Pratt & Whitney Rocketdyne, Canoga Park, CA, USA  
Jaime Reyes, Lockheed Martin, Phoenixville, PA, USA

**4:15 pm - *Development of Advanced Stirling Radioisotope Generator for Space Exploration***

Jack Chan, Lockheed Martin Space Systems Company, Philadelphia, PA, USA; J. Gary Wood, Sunpower Inc., Athens, OH, USA; Jeffrey G. Schreiber, NASA Glenn Research Center, Cleveland, OH, USA

**4:45 pm - *Multi-Watt Small Radioisotope Thermoelectric Generator Conceptual Design Study***

Patrick Frye, William Otting, and William R. Determan, Pratt & Whitney Rocketdyne Inc., Canoga Park, CA, USA

**5:15 pm - *Modeling of the Thermal Performance of an Advanced Stirling Converter Concept***

Brian G. Woods, Jiani Wang, John T. DeNoma, Oregon State University, Department of Nuclear Engineering and Radiation Health Physics, Corvallis, OR, USA

**5:45 pm - *NASA'S RPS Design Reference Mission Set for Solar System Exploration***

Tibor Balint, Jet Propulsion Laboratory, California Institute of technology, Pasadena, CA, USA

**[D09] Advanced Power and Propulsion Technologies and Systems**

*Wednesday, February 14, 2007, 4:15 pm – 6:15 pm - Alvarado Ballroom E*

**Chairs:** Diane Hope, NASA Langley Research Center, Hampton, VA,  
Nantel Suzuki, NASA Headquarters, Washington, DC, USA

**4:15 pm - *Novel Rock Detection Intelligence for Space Exploration Based on Non-Symbolic Algorithms and Concepts***

Sule Yildirim, and Ronald L. Beachell, Computer Science Department, Hedmark University College, Norway, Henning Veflingstad, Computer Science Department, Norwegian University of Science and Technology, Trondheim, Norway

**4:45 pm - *Fuel Cells***

Mark A. Hoberecht, NASA Glenn Research Center, Cleveland, OH, USA

**5:15 pm - *Propulsion and Cryogenics Advanced Development***

Mark Klem, NASA Glenn Research Center, Cleveland, OH, USA

**5:45 pm - *Where Space Comes Down to Earth: Test Facilities for Exploration Systems***

Jeffrey Woytach, Jeffrey Chambers, Brian Willis, Gerald Carek, NASA Glenn Research Center, Plum Brook Station, Cleveland, OH, USA; Diane Linne, NASA Glen Research Center, Cleveland, OH USA

**[E11] Terraforming, Domed Ecosystems and Planetary**

*Wednesday, February 14, 2007, 4:15 pm – 6:15 pm - Alvarado Salon B/C*

**Chairs:** Eric Rice, Orbital Technologies Corporation (ORBITEC), Madison, WI, USA  
Edward McCullough, The Boeing Company, Huntington Beach, CA, USA

**4:15 pm - *Life on Mars and Relationship to Terraforming Mars***

David S. McKay, NASA Johnson Space Flight Center, Houston, TX, USA

**4:45 pm - *Lunar Atmosphere Development***

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Richard R. Vondrak, NASA Goddard Space Flight Center, Greenbelt, MD, USA; Dana H. Crider, Catholic University, Gibsonville, NC, USA

**5:15 pm - *Domes: The Moon and Mars***

John C. Mankins, Artemis Innovation Management Solutions LLC, Ashburn, VA, USA

**5:45 pm - *Constructing an Observatory Condominium on the Moon for Climate Change Data Measurements***

Klaus P. Heiss, High Frontier and The Jamestown Group, Alexandria, VA, USA

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## THURSDAY, FEBRUARY 15, 2007

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### [A07] Advanced Heat Pipes and Other Emerging Technologies

*Thursday, February 15, 2007, 8:00 am - 10:00 am - Alvarado Salon A*

**Chairs:** Robert S. Reid, Los Alamos National Laboratory, Los Alamos, NM, USA  
D. Angirasa, Goodrich Corporation, Power Systems Division, Twinsburg, OH, USA

**8:00 am - *Intermediate Temperature Fluids Life Tests – Theory***

Calin Tarau, David B. Sarraf, and William G. Anderson, Advanced Cooling Technologies, Inc., Lancaster, PA, USA; Ivan E. Locci, NASA Glenn Research Center, Cleveland, OH, USA

**8:30 am - *Reversible Electrochemical Mirror (REM) Device for Satellite Thermal Control***

Michael A. Cunningham, D. Morgan Tench and Leslie F. Warren, Jr., Teledyne Scientific Company, Thousand Oaks, CA, USA

**9:00 am - *Fabrication and Testing of a Passive Re-Deployable Radiator for Autonomous Thermal Control***

Hosei Nagano, Akira Ohnishi, and Ken Higuchi, Japan Aerospace Exploration Agency/Institute of Space and Astronautical Science, Sagamihara, Kanagawa, Japan; Kan Matsumoto, Tokai University, Hiratsuka, Kanagawa, Japan; Yuji Nagasaka, Keio University, Kanagawa, Japan

**9:30 am - *Compatibility Studies of Inconel 625 with Lunar Regolith Simulant***

Donald Gillies, Sandor Lehoczy, NASA, Marshall Spaceflight Center, Huntsville, AL, USA; Witold Palosz, Paul Carpenter, BAE Systems, MSFC, Huntsville, AL, USA; Pat Salvail, STS, MSFC, Huntsville, AL, USA

### [C21] Fission Surface Power Component Technology Development II

*Thursday, February 15, 2007, 8:00 am - 10:00 am - Alvarado Ballroom D*

**Chairs:** Lee S. Mason, NASA Glenn Research Center, Cleveland, OH, USA  
Joseph Nainiger, NASA Glenn Research Center, Cleveland, OH, USA

**8:00 am - *High Temperature Stability of Dissimilar Metal Joints in Fission Surface Power Systems***

Ivan Locci, University of Toledo, Toledo, OH, USA; Cheryl Bowman, James Nesbitt, and Frank Ritzert, NASA Glenn Research Center, Cleveland, OH, USA

**8:30 am - *Thermal Performance of High Temperature Titanium - Water Heat Pipes by Multiple Heat Pipe Manufacturers***

James Sanzi, SEST Inc., NASA Glenn Research Center, Cleveland, OH, USA

**9:00 am - *Gas Foil Bearing Technology Advancements for Closed Brayton Cycle Turbines***

Samuel A. Howard, Christopher DellaCorte, Robert J. Bruckner, and Malcolm Stanford, NASA Glenn Research Center, Cleveland, OH, USA; Kevin Radil, US Army Research Laboratory, Adelphi, MD, USA

**9:30 am - *Operational Results from a High Power Alternator Test Bed***

Arthur Birchenough, and David Hervol, NASA Glenn Research Center, Cleveland, OH, USA

## [C22] Thermoelectric Power Conversion Technology and Applications

*Thursday, February 15, 2007, 8:00 am - 10:00 am - Alvarado Salon F*

- Chairs:** Bahman Heshmatpour, Teledyne Energy Systems, Inc., Hunt Valley, MD, USA  
Jean-Pierre Fleurial, Jet Propulsion Laboratory, Pasadena, CA, USA
- 8:00 am - *Special Application Thermoelectric Micro Isotope Power Sources***  
B. Heshmatpour, A. Lieberman, M. Khayat, A. Leanna, T. Dobry, Teledyne Energy Systems, Inc., Hunt Valley, MD, USA
- 8:30 am - *A Look Back at Assembly and Test of the New Horizons Radioisotope Power System***  
B. Alan Harmon, and William A. Bohne, Space and Defense Power Systems, U.S. Department of Energy, Washington, DC, USA
- 9:00 am - *Small Thermoelectric Radioisotope Power Sources***  
A. Lieberman, A. Leanna, M. McAlonan, B. Heshmatpour, Teledyne Energy Systems, Inc., Hunt Valley, MD, USA
- 9:30 am - *Q & A***

## [E12] Space Resource Utilization on the Moon II

*Thursday, February 15, 2007, 8:00 am - 10:00 am - Alvarado Salon B/C*

- Chairs:** Kevin Payne, Lockheed Martin Space Systems Company, Denver, CO, USA  
Timothy Chen, The Boeing Company, Huntington Beach, CA, USA
- 8:00 am - *Oxygen Production System Models for Lunar ISRU***  
Edgardo Santiago-Maldonado, NASA Kennedy Space Center, FL, USA; Jim Kennedy, Teledyne Brown Engineering, NASA Marshall Space Flight Center, AL, USA
- 8:30 am - *High-Efficiency Extraction and Utilization of Lunar Solar Wind Volatiles***  
David E. Petrick, and Steven J. Nieczkoski, Technology Applications Inc., Boulder, CO, USA; Tracy Q. Gardner, Colorado School of Mines, Golden, CO, USA
- 9:00 am - *Development of a Reactor Model for Chemical Conversion of Lunar Regolith***  
Uday Hegde, Suleyman Gokoglu, and R. Balasubramaniam, National Center for Space Exploration Research, NASA Glenn Research Center, Cleveland, OH, USA
- 9:30 am - *Tribocharging Lunar Simulant in Vacuum for Electrostatic Beneficiation***  
James Captain, University of Central Florida, FL, USA; Steve Trigwell, ASRC Aerospace, FL, USA; Ellen Arens, Janine Captain, Carlos Calle, Jacqueline Quinn, NASA Kennedy Space Flight Center, FL, USA; Alex Biris, University of Arkansas at Little Rock, Little Rock, AR, USA

## [F08] Theoretical Considerations - Warp Drives, FTL Speed Travel and Others II

*Thursday, February 15, 2007, 8:00 am - 10:00 am - Alvarado Salon G/H*

- Chairs:** David Maker, Photon Research Associates, Huntsville, AL, USA  
Glen A. (Tony) Robertson, Gravi Atomic Research, Madison, AL, USA
- 8:00 am - *Exploring Gravity and Gravitational Wave Dynamics Part II: Gravity Models***  
Paul A. Murad, Vienna, VA, USA
- 8:30 am - *The Schwarzschild Metric Violates the Weak Principle of Equivalence***  
Raymond Jensen, University of Notre Dame, Notre Dame, IN, USA
- 9:00 am - *Electrostatic 512kV Rotator/Oscillator Propulsion System***  
David Maker, Huntsville, AL, USA
- 9:30 am - *Why Should a Superconductor Generate Large Gravitomagnetic Fields***  
Martin Tajmar, Space Propulsion, ARC Seibersdorf research, A-2444 Seibersdorf, Austria

## **[A08] Smart Materials and Coatings for Thermal Control**

*Thursday, February 15, 2007, 10:30 am - 12:30 pm - Alvarado Salon A*

**Chairs:** Donya M. Douglas, NASA Goddard Space Flight Center, Greenbelt, MD, USA  
William J. Biter, Sensortex, Inc., Kennett Square, PA, USA

**10:30 am - Variable Emittance Electrochromic Devices for Satellite Thermal Control**  
Hulya Demiryont, Kenneth C. Shannon III, Eclipse Energy Systems, Inc., St. Petersburg, FL, USA

**11:00 am - Performance Results of the ESR from the Space Technology 5 Satellites**  
William J. Biter, and Sung Oh, Sensortex Inc., Kennett Square, PA, USA

**11:30 am - MEMS Shutters for Thermal Control – Flight Validation and Lessons Learned**  
Dawnielle Farrar, Ann Darrin, and Robert Oslander, The John Hopkins University Applied Physics Laboratory, Laurel, MD, USA; Donya M. Douglas, Ted D. Swanson, and Christine Collins, NASA Goddard Space Flight Center, Greenbelt, MD, USA

**12:00 pm - A Space-Based Experiment to Evaluate Performance of Electrostatic Switched Radiator (ESR)**

Saeed Moghaddam, John Lawler, and Joseph Currano, ATEC, Inc., College Park, MD, USA; Jungho Kim, University of Maryland, College Park, MD, USA

## **[C23] Reactor Systems Concepts for Surface Power**

*Thursday, February 15, 2007, 10:30 am - 12:30 pm - Alvarado Ballroom E*

**Chairs:** Robert L. Cataldo, NASA Glenn Research Center, Cleveland, OH, USA  
Steven B. Dron, Sandia National Laboratories, Albuquerque, NM, USA

**10:30 am - Non-Nuclear Validation Test Results of a Closed Brayton Cycle Test-Loop**  
Steven Wright, Sandia National Laboratories, Albuquerque, NM, USA

**11:00 am - Benefit of Lunar Regolith on Reflector Mass Savings**

Steven A. Hatton and Mohamed S. El-Genk, University of New Mexico, Albuquerque, NM, USA

**11:30 pm - Hot Hydrogen Test Facility**

W. David Swank, Jon Carmack, James E. Werner, Robert J. Pink, DeLon C. Haggard, and Ryan Johnson, Idaho National Laboratory, Idaho Falls, ID, USA

**12:00 pm - Evaluation of Metal-Fueled Surface Reactor Concepts**

David I. Poston, Thomas F. Marcille, Richard J. Kapernick, and Matthew T. Hiatt, and Benjamin Amiri, Los Alamos National Laboratory, Los Alamos, NM, USA

## **[CE02] Lunar Environmental Effects & Mitigation**

*Thursday, February 15, 2007, 10:30 am - 12:30 pm - Alvarado Ballroom D*

**Chairs:** Insoo Jun, Jet Propulsion Laboratory, Pasadena, CA, USA

Narayanan Ramachandran, Jacobs Engineering, NASA Marshall Space Flight Center, AL, USA

**10:30 am - Radiation Environments for Lunar Programs**

Joseph I. Minow, NASA Marshall Space Flight Center, AL, USA; Richard L. Altstatt, William C. Blackwell, Jr., Jacobs Engineering, MSFC Group, NASA Marshall Space Flight Center, AL, USA; and Katherine J. Harine, Raytheon ITS, NASA Marshall Space Flight Center, AL, USA

**11:00 am - Plasma Environments for Lunar Programs**

Joseph I. Minow, NASA Marshall Space Flight Center, AL, USA; Richard L. Altstatt, William C. Blackwell, Jr., Jacobs Engineering, MSFC Group, NASA Marshall Space Flight Center, AL, USA

**11:30 am - Modeling Charged Dust Particle Interactions with Spacecraft on Lunar Surface**

Joseph Wang, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

**12:00 pm - The Lunar Meteoroid Environment for the Constellation Program**

Rob Suggs and William J. Cooke, NASA Marshall Space Flight Center, AL, USA

### [E13] Space Settlements/Colonies

*Thursday, February 15, 2007, 10:30 am - 12:30 pm - Alvarado Salon B/C*

**Chairs:** Anita Gale, Space Settlement Design Competitions, Nassau Bay, TX, USA  
Richard Edwards, Space Settlement Design Competitions, Nassau Bay, TX, USA

**10:30 am - Atlas V: Reliable Human Space Transportation for Space Colonization**  
Michael Holguin, Lockheed Martin, Denver, CO, USA

**11:00 am - Symbiotic Relationship of Man and Machine in Space Colonization**  
Roy Nielsen, r-bok tech, Los Alamos, NM, USA

**11:30 pm - Large-Scale Nuclear Power Generation**  
Roger X. Lenard, Sandia National Laboratories, Albuquerque, NM, USA

**12:00 pm - Optimal Architecture for an Asteroid Mining Mission: System Components and Project Execution**  
Ken R. Erickson, Good Samaritan Hospital and Medical Center, Corvallis, OR, USA

### [E14] Panel Discussion: Requirements for Lunar Analog Test Sites for ISRU

*Thursday, February 15, 2007, 10:30 am - 12:30 pm - Alvarado Salon F*

**Chairs:** Diane Linne, NASA Glenn Research Center, Cleveland, OH, USA  
Edward McCullough, The Boeing Company, Huntington Beach, CA, USA

**10:30 am - Panel Discussion: Requirements For Lunar Analog Test Sites For ISRU**  
Alain Berinstain, Canadian Space Agency, St-Hubert, QC, Canada; John Caruso, NASA Johnson Space Center, Houston, TX, USA; Leslie Gertsch, University of Missouri-Rolla, Rolla, MO, USA; Brian Glass, NASA Ames Research Center, Moffett Field, CA, USA; Edward McCullough, The Boeing Company, Huntington Beach, CA, USA; Jeff Plescia, The Johns Hopkins University Applied Physics Laboratory, Laurel, MD, USA

### [F09] An International Outlook on Far Term Propulsion and Power

*Thursday, February 15, 2007, 10:30 am - 12:30 pm - Alvarado Salon G/H*

**Chairs:** Martin Tajmar, ARC Seibersdorf Research GmbH, Seibersdorf, , Austria  
Charles Suchomel, Air Force Research Laboratory, Wright-Patterson AFB, OH, USA

**10:30 am - Coupling of an Open Cavity to Microwave Beam: A Possible New Scheme of Detecting High-Frequency Gravitational Waves**  
Fangyu Li, Zhenyun Fang, University of Chongqing, Peoples Republic of China; R.M.L. Baker, Jr., GRAVWAVE LLC and Transportation Sciences Corporation, Playa Del Rey, CA, USA

**11:00 am - CasimirSim - A Tool to Compute Casimir Polder Forces for Nontrivial 3D Geometries**  
René Sedmik, Martin Tajmar, ARC Seibersdorf research GmbH., Seibersdorf, A-2444, Austria

**11:30 am - High-Frequency Gravitational Wave Induced Nuclear Fusion**  
Giorgio Fontana, University of Trento, Trento, Italy; and Robert M. L. Baker, Jr., GRAVWAVE, LLC, Playa del Rey, CA, USA

**12:00 pm - Chinese High-Frequency Gravitational Wave Program**  
Robert M. L. Baker, GRAVWAVE, LLC, Playa del Rey, CA, USA

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