

**FINAL PROGRAM**

# SPACE TECHNOLOGY & APPLICATIONS INTERNATIONAL FORUM (STAIF - 99)

*“Opportunities and Challenges for the New Millennium”*

*January 31-February 4, 1999, Albuquerque Hyatt Hotel, NM*

**CONFERENCE ON INTERNATIONAL SPACE STATION UTILIZATION**

**CONFERENCE ON GLOBAL VIRTUAL PRESENCE**

**CONFERENCE ON APPLICATION OF THERMOPHYSICS IN MICROGRAVITY &  
BREAKTHROUGH PROPULSION PHYSICS**

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**16<sup>th</sup> SYMPOSIUM ON SPACE NUCLEAR POWER AND PROPULSION**

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National Yunlin University of Science and

Technology, Taiwan

Nichols Research Corporation

Northeastern University

Ohio Aerospace Institute

Orbital Sciences Corporation

Pennsylvania State University

Photonic Associates

Pioneer Astronautics

Polaris Technologies, Moscow State

University

Quantum Devices, Inc.

RAND Corporation

Rapigen, LLC

Research Institute of Scientific Industrial

Association "Lutch", Russia

Research and Production Association of

Applied Mechanics (NPO PM), Russia

Rhenium Alloys, Inc.

SABCA-ADT/RDS, Belgium

SPACEHAB, Inc.

SRS Technologies

Safety Factor Associates, Inc.

Sandia National Laboratories

SatCom Technology Corporation

Schafer Corporation

Science Applications and Research

Associates, Inc.

Service d'Aeronomie du Centre National

de la Recherche Scientifique (CNRS),

France

Sholtis Engineering &amp; Safety Consulting

Skobel'syn Institute of Nuclear Physics,

Russia

Southwest Research Institute (SwRI)

Space Systems Loral

Space Utilization

Spar Space Systems

St.-Petersburg State Technical University,

Russia

StarGate Research Laboratory-PI, Inc.

Stirling Technology Company

Swales Aerospace  
 TDA Research, Inc.  
 TRW Space & Electronics Group  
 Te. S.R.E./CNR, Italy Teledesic  
 Texas A&M University  
 Thermacore, Inc.  
 U. S. Department of Energy  
 UCSD Cal-Space  
 Ultramet  
 United Technologies/USBI  
 United Technologies Research Center  
 Universal Space Lines  
 Universidad Nacional de Rio Cuarto,

Argentina  
 University de Ancona, Italy  
 University of California/Santa Barbara  
 University of Alabama  
 University of Bologna, Italy  
 University of Bremen, Germany  
 University of Brussels, Belgium  
 University of Colorado  
 University of Florida  
 University of Geneva, Switzerland  
 University of Houston  
 University of Illinois  
 University Koeln, Germany

University of Kiblenz-Landau, Germany  
 University Lebre de Bruxelles, Belgium  
 University of Maryland  
 University of Michigan  
 University of New Mexico  
 University of Pittsburgh Medical Center  
 University of Washington  
 Washington University  
 Westinghouse Electric Co.  
 Yerevan State University, Armenia

## INDUSTRIAL EXHIBITORS

**Albuquerque Hyatt Regency Hotel**  
 Pavilion IV, V, and VI

**SUNDAY**, January 31, 5:00 pm - 8:00 pm; **MONDAY**, February 1, 7:45 am – 8:00 pm; **TUESDAY**, February 2, 7:45 am – 10:00 pm; **WEDNESDAY**, February 3, 7:45 am - 5:00 pm; and **THURSDAY**, February 4, 7:45 am - 1:30 pm

Air Force Research Laboratory/Space and  
 Missile Test & Evaluation Directorate  
 Air Force Research Laboratory/Space  
 Vehicle Directorate  
 American Institute of Physics  
 The Boeing Company  
 Composite Optics  
 Life Sciences

Lockheed Martin Astronautics  
 NASA Ames Research Center/Life  
 Sciences  
 NASA Goddard Space Flight Center  
 NASA Langley Research Center  
 NASA Lewis Research Center  
 NASA Marshall Space Flight Center  
 Oceaneering Space & Thermal Systems

Orbital Science Corporation  
 Structural Dynamic Research Corp.  
 SPACEHAB, Inc.  
 Sterling Technologies  
 TRW  
 Teledyne Brown Engineering  
 YLA, Inc.

## SCHREIBER-SPENCE SPACE ACHIEVEMENT AWARD

**1998-1999 AWARD COMMITTEE:** **Peter Ulrich** (Chair) NASA Headquarters; **Robert Cockfield**, Lockheed Martin; **Jim Fountain**, The Boeing Company, **Paul Regeon**, White House, Office of Science & Technology Policy; and **Jess Sporable**, Universal Space Lines.

The Schreiber-Spence Space Achievement Award was established by the University of New Mexico's Institute for Space and Nuclear Power Studies (ISNPS) to recognize technology contributions that have advanced capabilities for space science and applications through excellence in original research, pioneering demonstrations, 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.) The award is given by the Institute to a worthy person (or persons contributing jointly) 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-99 Luncheon. 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

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

1988-Raemer E. Schreiber  
 1988-Roderick W. Spence  
 1990-Jerome Mullen  
 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

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 are due on or before October 15 of the award year and 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, specific, and acknowledged to be worthy of unusual recognition for excellence by those actively engaged in the field of space technology.

**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 the evidence substantiating the excellence of the contributions noted in the citation and as described in the basis for the nomination. Nominations can be submitted at any time on the Nomination Form to ISNPS.

**1999 Award:** This year's award is presented to the NSTAR (ion propulsion) Team and the SCARLET (solar concentrator array) Team of the New Millennium Deep Space 1 mission, in recognition of the first use of solar-powered ion propulsion as primary propulsion and of the first use of a multi-band-gap, concentrator array for a robotic, deep-space mission, thereby helping to open the solar system to frequent, low-cost exploration.



## MANUEL LUJAN, JR. STUDENT PAPER AWARD

AWARD COMMITTEE: **Tom Reinarts** (Chair), United Technologies; **Les Begg**, General Atomics; **Ray Bula**, University of Wisconsin; **Ron Lipinski**, Sandia National Laboratories; **Frederick Shair**, Jet Propulsion Laboratory; and **Jonathan Stabb**, NASA Kennedy Space Center.

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 awards committee.

### 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

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. The content of the paper should be based on the student's thesis or dissertation research at a recognized university.

The recipient of the Best Student Paper Award at STAIF-98 is **Jeffrey S. Allen**, University of Dayton, for his paper entitled "A Study of the Fundamental Operations of a Capillary Driven Heat Transfer Device in both Normal and Low Gravity, Part I. Liquid Slug Formation in Low Gravity." His co-author and professor advisor is Kevin Hallinan, University of Dayton. This award will be recognized at the STAIF-99 Luncheon, Monday, February 1, 1999. The award consists of \$500.00 and a certificate of recognition.

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**

## OUTSTANDING PAPER AWARD

AWARD COMMITTEE: **Dave Poston** (Chair), Los Alamos National Laboratory; **David Conrad**, Environmental Research Institute of Michigan; **Ed Cady**, The Boeing Company; **George Miley**, University of Illinois; **Nick Morley**, Air Force Research Laboratory; **Tom Reinarts**, United Technologies; **Joseph A. Sholtis, Jr.**, Sholtis Engineering and Safety Consulting; **Theodore Swanson**, NASA Goddard Space Flight Center; and **Giulio Varsi**, Jet Propulsion Laboratory.

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. The recipient(s) receives a non-monetary award consisting of a mounted Southwestern art object with a plaque identifying the contribution and award. More than one significant contribution can be recognized at each Space Technology and Applications International Forum

NOMINATION AND EVALUATION PROCEDURE: Contributions from STAIF conferences could be nominated by the session 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, the STAIF Outstanding Paper Award Committee Chair, or members prior to STAIF. For consideration, nominations must be received by the ISNPS office, STAIF Outstanding Paper Award Committee Chair, or Outstanding Paper Award Committee 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.

RECIPIENT OF 1998 AWARD: The recipients are **Jean-Michel Tournier and Mohamed S. El-Genk**, Institute for Space and Nuclear Power Studies, University of New Mexico, for their paper entitled "AMTEC Performance and Evaluation Analysis Model (APEAM); Comparison with Test Results of PX-4C, PX-5A, and PX-3A Cells."

## GENERAL ERNEST C. HARDIN, JR. 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 are offered to qualified freshman in engineering at UNM. The graduate student award has a monetary value of \$1,200 per year and tuition waivers for up to three years. Kristina A. Ross and Ruth A. Scanlan will be recognized as the recipients of the Hardin Scholarship at the STAIF luncheon for the 98/99 school year.

## OUTREACH ACTIVITIES / SECONDARY SCHOOL SPECIAL SESSION

### EDUCATION OUTREACH ADVISORY BOARD MEMBERS:

**Maureen Alaburda**, UNM-ISNPS; **Randi Buck**, UNM-Regional Science Fair; **Susan Dibble**, Desert Ridge Middle School; **Irene El-Genk, Chair**, West Mesa High School; **Mohamed S. El-Genk**, UNM-ISNPS; **Susan Ostlie**, Madison Middle School; **Steve Seiffert**, Consultant; **Gary Stiler**, Jefferson Middle School; and **Rose Thome**, Albuquerque. These sessions are organized by the University of New Mexico's Institute for Space and Nuclear Power Studies and cosponsored by the New Mexico Space Grant Consortium Program at UNM; NASA National Space Grant Colleges and Fellowship Program; and the American Nuclear Society, Trinity Section. Special session activities are coordinated by **Irene El-Genk**, West Mesa High School, Albuquerque, NM,

who is a member of the Education and Outreach Advisory Board (EOAB), at the Institute for Space and Nuclear Power Studies. Secondary school science students and teachers from New Mexico who participated in the Space Design Competition are invited to attend and participate in this session to be held Monday, February 1, 1999, from 8:00am - 11:45am. Space-related topics will be presented by members of the science and engineering community. The Space Design Competition problem is "Manned Spacecraft for Mars Mission for the Year 2017." The Design Competition judging will take place at this special session. Winners will receive prizes at the STAIF-99 luncheon, held Monday, February 1. The Space Design Competition is coordinated by **Dr. Steve Seiffert**, Consultant, and member of EOAB.

## PUBLICATIONS

Available from UNM's Institute for Space and Nuclear Power Studies (Add \$10 for shipping and handling within the U.S., \$25 outside the U.S.)

Transactions of the 2nd - 5th Symposia (1985 - 1989).....\$10.00 (each)  
Transactions of the 6th Symposium (1989)..... \$15.00

Available from the American Institute of Physics, c/o Springer-Verlag New York, Customer Service, 1-800-777-4643, or e-mail order@springer-ny.com, or mail to Springer-Verlag, P. O. Box 2485, Secaucus, NJ 07096-2485 (Add \$4.00 for shipping and handling for the first volume; plus \$1.00 for each additional volume.)

Proceedings of the 8th Symposium (1991) (3-vol. hardback set), ISBN # 0-88318-838-4 AIP Conference Proceedings #217.....\$175.00  
Proceedings of the 9th Symposium (1992) (3-vol. hardback set), ISBN # 1-56396-027-3 AIP Conference Proceedings #246..... \$225.00  
Proceedings of the 10th Symposium (1993) (3-vol. hardback set), ISBN # 156396-137-7 AIP Conference Proceedings #271..... \$275.00  
A Critical Review of Space Nuclear Power and Propulsion (1984-1993) (Anniversary Issue), AIP Press, ISBN # 1-56396-3175.....\$ 75.00  
Proc. 12th Symposium on Space Nuclear Power and Propulsion, Conf. on Alternative Power from Space, and Conf. on Accelerator-Driven Transmutation Technologies and Applications (1995) (2-vol. hardback set) ISBN # 1-56396-427-9 AIP Conf. Proc.# 324 ..... \$225.00  
Proc. 1st Conf. on NASA Centers for Commercial Development of Space (1-vol. hardback book), ISBN # 1-56396-431-7 and AIP Conference Proc. # 325.....  
\$125.00  
Proc. Space Technology and Applications International Forum (STAIF-96): 1st Conference on Commercial Development of Space; 1st Conference on Next Generation Launch Systems, 2nd Spacecraft Thermal Control Symposium, and 13th Symposium on Space Nuclear Power and Propulsion (1996) (3-vol. hardback set), ISBN # 1-56396-562-3 AIP Conf. Proc.# 361.....\$275.00  
Proc. Space Technology and Applications International Forum (STAIF-97): 1<sup>st</sup> Conference on Future Science and Earth Science Missions; 1<sup>st</sup> Conference on Synergistic Power and Propulsion Systems Technology; 1<sup>st</sup> Conference on Applications of Thermophysics in Microgravity; 2<sup>nd</sup> Conference on Commercial Development of Space; 2<sup>nd</sup> Conference on Next Generation Launch Systems; 14<sup>th</sup> Symposium on Space Nuclear Power and Propulsion (1997) (3-vol. Hardback set), ISBN # 1-56396-679-4 AIP Conf. Proc # 387..... \$295.00  
Proc. Space Technology and Applications International Forum (STAIF-98): 1<sup>st</sup> Conference on Global Virtual Presence; 1<sup>st</sup> Conference on Orbital Transfer Vehicles; 2<sup>nd</sup> Conference on Applications of Thermophysics in Microgravity; 3<sup>rd</sup> Conference on Commercial Development of Space; 3<sup>rd</sup> Conference on Next Generation Launch Systems; and 15<sup>th</sup> Symposium on Space Nuclear Power and Propulsion (1998) (3-vol. Hardback set), ISBN # 1-56396-747-2, AIP Conf. Proc. # 420.....\$320.00  
Proc. Space Technology and Applications International Forum (STAIF-99): Conference on International Space Station Utilization; Conference on Global Virtual Presence; Conference on Applications of Thermophysics in Microgravity & Breakthrough Physics; Conference on Next Generation Launch Systems; 16<sup>th</sup> Symposium on Space Nuclear Power and Propulsion (1999), AIP Conf. Proc. No. 458, (2-vol. Hardback set), ISBN # 156396-846-0 .....\$300.00  
CD-ROM Version, ISBN # 156396-879-7..... \$200.00

Publications available from Orbit Book Company, P. O. Box 9542, Melbourne, FL 32902-9542, Phone: (407) 724-9542

**CONFERENCE REGISTRATION AND FEES**

*Albuquerque Hyatt Regency Hotel, 2<sup>nd</sup> Floor*

Registration: Sunday, January 31 4:30 pm - 7:30 pm Tuesday, February 2 7:30 am- 4:30pm Thursday, February 4 7:30 am - 1:30 pm  
 Monday, February 1 7:00 am - 5:00 pm Wednesday, February 3 7:30am - 4:30pm

ALL ATTENDEES AND EXHIBITORS MUST REGISTER AND PAY A REGISTRATION FEE: We are unable to invoice your organization for payment. 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 AND NUCLEAR POWER STUDIES, STAIF-99 Conferences, Farris Engineering Center, Room 239, University of New Mexico, Albuquerque, NM 87131-1341, (505) 277-2813 or (505) 277-0446.

	<u>Early</u> (postmarked on or before 1/12/99)	<u>Late</u> (postmarked after 1/12/99)
OPEN TECHNICAL MEETING(a)	\$325.00	\$385.00
ONE DAY REGISTRATION (b)	\$200.00	\$250.00
STUDENTS (c)	\$100.00	\$100.00
ADDITIONAL LUNCHEON TICKET(d)	\$25.00	\$30.00
ADDITIONAL RECEPTION TICKET(d)	\$25.00	\$30.00

- (a) Open Technical Meeting Full Registration Fee: Includes Sessions, Sunday “Get Acquainted” Hour, Monday Luncheon and Evening Reception, Tuesday Hospitality, 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. (Luncheon tickets are extra)
- (c) Student Registration: **TO QUALIFY, INDIVIDUALS MUST SHOW PROOF OF FULL TIME ENROLLMENT** for the 1999 Spring Semester. Pre-registrants should enclose a copy of their 1999 spring schedules. Registration fee includes Sunday “Get Acquainted Hour,” Sessions, Monday evening reception, and coffee breaks. (Luncheon tickets are extra.)
- (d) Additional luncheon tickets can be purchased on-site if available.

**STAIF CANCELLATIONS AND REFUND POLICY**

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: alaburda@unm.edu no later than January 18, 1999. NO REFUNDS WILL BE ISSUED after JANUARY 18, 1999. All refunds will be made promptly by mail.

**STAIF RECEPTION, LUNCHEON and INDUSTRY HOSPITALITY**

In addition to the STAIF reception, one luncheon ticket will be included with each full registration. A name badge will be appropriate admittance to the reception. Additional tickets must be purchased in advance. Please be certain both you and your guest have registered.

**LUNCHEON:** MONDAY, February 1, 1999, 11:45 am - 1:45 pm, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel.

**LUNCHEON SPEAKER:** Alan Ladwig, Senior Advisor to the Administrator, NASA Headquarters, Washington, DC

**HOSTED RECEPTION:** MONDAY, February 1, 1999, 6:30 pm – 8:00 pm, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel.

**INDUSTRY HOSPITALITY:** TUESDAY, February 2, 1999, 7:00 pm – 10:00 pm, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel.

**SESSION CHAIRS' AND SPEAKERS' BREAKFAST**

All STAIF-99 speakers and session chairs are requested to attend the Speakers' Breakfast on the day of their session or presentation to discuss the session arrangements and guidelines. The breakfast is hosted by UNM's Institute for Space and Nuclear Power Studies. The Speakers' Breakfast will be held Monday through Wednesday at 6:45a.m. in the Enchantment Ballroom, and Thursday at 6:45-7:45a.m. in Pavilion I, II, and III at the Albuquerque Hyatt Regency Hotel.

**AUDIO VISUAL EQUIPMENT**

An overhead projector will be provided at all sessions. A slide 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) 277-2813 with special requests.

## SCHEDULE OF PROGRAM ACTIVITIES

### SUNDAY, January 31, 1999

- 4:30 pm - 7:30 pm **Registration**, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 5:00 pm - 6:00 pm **Schreiber-Spence Award Committee Meeting**, Fiesta III, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 6:30 pm - 7:30 pm **Steering Committee Meeting**, Sendero Ballroom I, Albuquerque Hyatt Regency Hotel
- 7:00 pm - 8:00 pm **STAIF-99 "Get Acquainted" Snack Hour**, Pavilion IV, V, and VI
- 8:00 pm - 10:00 pm **Manuel Lujan, Jr. Award Committee Meeting**, Fiesta I, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 8:00 pm - 10:00 pm **Outstanding Paper Award Committee Meeting**, Fiesta II, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel

### MONDAY, February 1, 1999

- 6:45 am - 7:45 a.m. **Speakers' Breakfast**, Enchantment Ballroom, Albuquerque Hyatt Regency Hotel
- 7:00 am - 5:00 pm **Registration**, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 7:30 am - 8:00 am **Secondary School Special Session Registration**, Fiesta Ballroom, Albuquerque Hyatt Regency Hotel
- 8:00 am - 8:15 am **Welcome and Opening Remarks**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel
- 8:00 am - 11:45 am **Secondary School Special Session**, Fiesta Ballroom, Albuquerque Hyatt Regency Hotel
- 8:15 am - 9:45 am **Plenary Session I**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel
- 9:45 am - 10:15 am **Press Conference**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel
- 9:45 am - 10:15 am **Coffee Break**, Pavilion IV, V, and VI, Albuquerque Hyatt Regency Hotel
- 10:15 am - 11:45 am **Plenary Session II**, Sendero Ballroom, Albuquerque Hyatt Regency Hotel
- 11:45 am - 1:45 pm **Conference Luncheon**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel
- 1:45 pm - 3:45 pm **Conference Opening Sessions**, (see table of contents or centerfold for time and room)
- 3:45 pm - 4:00 pm **Coffee Break**, Pavilion IV, V, and VI, Albuquerque, Hyatt Regency Hotel
- 4:00 pm - 6:00 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 6:30 pm - 8:00 pm **Conference Reception (no host bar)**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel

### TUESDAY, February 2, 1999

- 6:45 am - 7:45 am **Speakers' Breakfast**, Enchantment Ballroom, Albuquerque Hyatt Regency Hotel
- 7:30 am - 4:30 pm **Registration**, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 8:00 am - 9:45 am **Plenary Session III**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel
- 9:45 am - 10:15 am **Coffee Break**, Pavilion IV, V, and VI, Albuquerque Hyatt Regency Hotel
- 10:15 am - 12:15 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 12:15 pm - 1:15 pm **Lunch Break**
- 12:15 pm - 1:15 pm **STAIF Technical Program Committee Meetings, Albuquerque Hyatt Regency Hotel**
- **Conference on International Space Station Utilization**, Sendero III
  - **Conference on Global Virtual Presence**, Sendero I
  - **Conference on Applications of Thermophysics in Microgravity & Breakthrough Propulsion Physics**, Enchantment Ballroom E & F
  - **Conference on Next Generation Launch Systems**, Enchantment Ballroom A & B
  - **16<sup>th</sup> Symposia on Space Nuclear Power and Propulsion**, Sendero II
- 1:15 pm - 3:15 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 3:15 pm - 3:30 pm **Coffee Break**, Pavilion IV, V, and VI, Albuquerque Hyatt Regency Hotel
- 3:30 pm - 5:30 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 6:00 pm - 7:00 pm **STAIF Advisory Committee Meeting**, Sierra Vista, 19<sup>th</sup> Floor, Albuquerque Hyatt Regency Hotel
- 7:00 pm - 10:00 pm **INDUSTRIAL HOSPITALITY**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel

### WEDNESDAY, February 3, 1999

- 6:45 am - 7:45 am **Speakers' Breakfast**, Enchantment Ballroom, Albuquerque Hyatt Regency Hotel
- 7:30 am - 4:30 pm **Registration**, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 8:00 am - 9:45 am **Plenary Session IV**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel
- 9:45 am - 10:15 am **Coffee Break**, Pavilion IV, V, and VI, Albuquerque Hyatt Regency Hotel

- 10:15 am - 12:15 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 12:15 pm - 1:15 pm **Lunch**
- 12:15 pm - 1:15 pm **Executive Technical Program Committee Meeting** (Lunch will be served),  
Fiesta Room III & IV, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 1:15 pm - 3:15 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 3:15 pm - 3:30 pm **Coffee Break**, Pavilion IV, V, and VI, Albuquerque Hyatt Regency Hotel
- 3:30 pm - 5:30 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 6:30 pm - 8:00 pm **Special Session: Space Enterprise – Discussion on where we are and where we are going**,  
Sendero I and II, Albuquerque Hyatt Regency Hotel

**THURSDAY, February 4, 1999**

- 6:45 am - 7:45 am **Speakers' Breakfast**, Pavilion I, II, and III, Albuquerque Hyatt Regency Hotel
- 7:30 am - 1:30 pm **Registration**, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel
- 8:00 am - 10:00 am **Technical Sessions** (see table of contents or centerfold for time and room)
- 10:00 am - 10:15 am **Coffee Break**, Pavilion IV, V, and VI, Albuquerque Hyatt Regency Hotel
- 10:15 am - 12:15 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 12:15 pm - 1:15 pm **Lunch**
- 1:15 pm - 3:15 pm **Technical Sessions** (see table of contents or centerfold for time and room)
- 3:15 pm - 3:30 pm **Coffee Break**, Albuquerque Hyatt Regency Hotel
- 3:00 pm - 5:30 pm **Technical Sessions** (see table of contents or centerfold for time and room)

**COMMITTEE MEETINGS**

**SCHREIBER-SPENCE SPACE ACHIEVEMENT AWARD COMMITTEE**

SUNDAY, January 31, 5:00 pm - 6:00 pm, Fiesta III, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel

**STAIF STEERING COMMITTEE**

SUNDAY, January 31, 6:30 pm - 7:30 pm, Sendero Ballroom I, Albuquerque Hyatt Regency Hotel

**MANUEL LUJAN, JR. STUDENT PAPER AWARD COMMITTEE**

SUNDAY, January 31, 8:00 pm - 10:00 pm, Fiesta I, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel

**STAIF OUTSTANDING PAPER AWARD COMMITTEE**

SUNDAY, January 31, 8:00 pm - 10:00 pm, Fiesta II, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel

**STAIF TECHNICAL PROGRAM COMMITTEES**

TUESDAY, February 2, 12:15 pm - 1:15 pm, Albuquerque Hyatt Regency Hotel

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

- **Conference on International Space Station Utilization**, Sendero III, Albuquerque Hyatt Regency Hotel
- **Conference on Global Virtual Presence**, Sendero I, Albuquerque Hyatt Regency Hotel
- **Conference on Applications of Thermophysics in Microgravity & Breakthrough Propulsion Physics**,  
Enchantment Ballroom E & F, Albuquerque Hyatt Regency Hotel
- **Conference on Next Generation Launch Systems**, Enchantment Ballroom A & B, Albuquerque Hyatt Regency Hotel
- **16<sup>th</sup> Symposium on Space Nuclear Power and Propulsion**, Sendero II, Albuquerque Hyatt Regency Hotel

**STAIF ADVISORY COMMITTEE**

TUESDAY, February 2, 6:00 pm - 7:00 pm, Sierra Vista, 19<sup>th</sup> Floor, Albuquerque Hyatt Regency Hotel

**STAIF EXECUTIVE TECHNICAL PROGRAM COMMITTEE**

WEDNESDAY, February 3, 12:15 pm - 1:15 pm, Fiesta III & IV, 2<sup>nd</sup> Floor, Albuquerque Hyatt Regency Hotel  
(Hosted Lunch)

# STAIF-99 PROGRAM EVENTS

## WELCOMING AND OPENING REMARKS

*MONDAY, FEBRUARY 1, 8:00 am - 8:15 am*

Albuquerque Hyatt Regency Hotel, Pavilion I, II, and III

**Arnauld Nicogossian**  
Conference General Chair  
NASA Headquarters  
Washington, DC

**William Gordon**  
Interim President  
University of New Mexico  
Albuquerque, NM

## PLENARY SESSION I: VIEWS FROM THE TOP

*MONDAY, FEBRUARY 1, 8:15 am - 9:45 am*

Albuquerque Hyatt Regency Hotel, Pavilion I, II, and III

### **Arnauld Nicogossian, Chair**

Associate Administrator for the Office of Life and Microgravity Sciences and Applications  
NASA Headquarters  
Washington, DC

1. Randy Brinkley, NASA Johnson Space Center, Houston, TX
2. Doug Stone, The Boeing Company, Houston, TX
3. STS-88 Crew Members\*\*, NASA Johnson Space Center, Houston, TX  
(members include: Commander Robert D. Cabana, Pilot Frederick W. Sturckow, Mission Specialist Nancy Jane Currie, Jerry L. Ross, James H. Newman, and Sergei K. Krikalev\*\*)
4. Jean-Jaques Dordain, Acting Director, Strategy and Business Development, European Space Agency, Cedex, France

## PRESS CONFERENCE

*MONDAY, FEBRUARY 1, 9:45 am - 10:15 am*

Albuquerque Hyatt Regency Hotel, Pavilion I, II, and III

## PLENARY SESSION II: PROGRAMS AND TECHNOLOGY

*MONDAY, FEBRUARY 1, 10:15 am - 11:45 am*

Albuquerque Hyatt Regency Hotel, Sendero Ballroom

**Donald D. Cobb, Chair**  
Associate Laboratory Director for Threat Reduction  
Los Alamos National Laboratory  
Los Alamos, NM

**Michael Griffin, Co-Chair**  
Executive Vice President and Chief Technical Officer  
Orbital Sciences Corporation  
Dulles, VA

1. Honorable Bill Richardson\*, Secretary of Energy, Washington, DC
2. Franklin Chang-Diaz, NASA Astronaut, NASA Johnson Space Center, Houston, TX
3. Rick Bachtel, Manager, Space Transportation Programs Office, NASA Marshall Space Flight Center, Huntsville, AL

## PLENARY SESSION III: MICRO SATELLITES, Nano Satellites and MEMS Technology

*TUESDAY, FEBRUARY 2, 8:00 am - 9:45 am*

Albuquerque Hyatt Regency Hotel, Pavilion I, II, and III

**Edward J. Simburger, Chair**  
Manager, Energy Conversion and Test Section  
The Aerospace Corporation  
Los Angeles, CA

**Timothy J. Gillespie, Co-Chair**  
Lockheed Martin  
Denver, CO

1. Alok Das, Air Force Research Laboratory, Kirtland AFB, NM
2. Leon Alkalai, Jet Propulsion Laboratory, Pasadena, CA
3. Ernest Robinson, The Aerospace Corporation, Los Angeles, CA
4. Rick Fleeter, Aero Astro, Herndon, VA
5. Andy Boye, Sandia National Laboratories, Albuquerque, NM

\* Invited

\*\* Several of the crew members may not be available

# PLENARY SESSION IV: INTERNATIONAL PANEL ON COLLABORATION IN THE USE OF THE INTERNATIONAL SPACE STATION

WEDNESDAY, FEBRUARY 3, 8:00 am - 9:45 am  
Albuquerque Hyatt Regency Hotel, Pavilion I, II, and III

**Raymond F. Askew, Chair**  
International Space Station Advisor  
NASA Headquarters  
Washington, DC

1. Karl Knott, ESA/ESTEC, Noordwijk, The Netherlands
2. Andrew Eddy, Canadian Space Agency, Saint-Hubert, Quebec, Canada
3. Vladimir Utkin, Russian Academy of Sciences, Moscow Region, Russia
4. Arnauld Nicogossian, NASA Headquarters, Washington, DC
5. NASDA speaker to be determined

## SECONDARY SCHOOLS SPECIAL SESSION AND SPACE DESIGN COMPETITION

MONDAY, FEBRUARY 1, 8:00 am - 11:45 am, Fiesta Room, Albuquerque Hyatt Regency Hotel

**Irene L. El-Genk, Chair**  
West Mesa High School  
Albuquerque, NM

**Steve Seiffert, Co-Chair**  
Consultant  
Albuquerque, NM

1. **Welcome**  
Irene El-Genk, West Mesa High School, Albuquerque, NM
2. **Judging of the Secondary School Space Design Competition**  
Steve Seiffert, Consultant, Albuquerque, NM
3. **View STAIF-99 Exhibits**
4. **NASA Astronaut, NASA Johnson Space Center, Houston, TX**
5. **Announcement of Space Design Competition Winners**  
Steve Seiffert, Consultant, Albuquerque, NM

## SPECIAL SESSION: SPACE ENTERPRISE

### Discussion on where we are and where we are going

WEDNESDAY, FEBRUARY 3, 6:30 pm - 8:00 pm, Sendero Ballroom I and II, Albuquerque Hyatt Regency

**Ray Whitten, Chair**  
NASA Headquarters  
Washington, DC

The International Space Station is the next event in maturing the space frontier. It follows and complements science and commercial research opportunities that are steeped in traditional rigor and heavy government involvement and support. Today, new ideas and commercial commitments are challenging the traditional way space commerce is developing. Many companies now envision space as a place for new business and making profit. New space oriented companies are emerging. They bring with them non-traditional ideas and a thirst for new commerce. Discussion leaders during this session will present their views on where we are and where we can go in the 21<sup>st</sup> Century. Opportunities and concerns will be discussed.

1. **SpaceHab – “Our Path to True Space Commerce”**  
David A. Rossi, SPACEHAB, Inc., Vienna, VA
2. **The Role of Elastic Markets in the Development of a Commercial Space Infrastructure**  
Harvey Willenberg, Boeing Reusable Space Systems, Downey, CA
3. **Stimulation of Non-Traditional Ideas to Provide Space Access**  
Peter H. Diamandis, X-Prize Foundation, Rockville, MD
4. **Medical Applications of Space Light-Emitting Diode Technology - Space Station and Beyond**  
Harry T. Whelan, John M. Houle, Deborah L. Donohoe, Dawn M. Bajic, Meic H. Schmidt, Kenneth W. Reichert, George T. Weyenberg, David L. Larson, and Glenn A. Meyer, Medical College of Wisconsin, Milwaukee, WI, and James A. Caviness, Naval Hospital Great Lakes, Great Lakes, IL
5. **Future Space Work Force – Enabling or Limiting**  
Ronald Sega, University of Colorado, Colorado Springs, CO

# CONFERENCE OPENING SESSIONS

## CONFERENCE ON INTERNATIONAL SPACE STATION UTILIZATION

### [A01] RESEARCH CAPABILITIES OF THE INTERNATIONAL SPACE STATION

MONDAY, FEBRUARY 1, 1:45 pm – 3:45 pm, Sendero Ballroom III

**John-David Bartoe, Co-Chair**

NASA Johnson Space Center  
Houston, TX

**Mike Suffredini, Co-Chair**

NASA Johnson Space Center  
Houston, TX

**TIME**

- 1:45-2:09 *An Overview of International Space Station Utilization Preparation and Planning*  
Ned Penley, NASA Johnson Space Center, Houston, TX, and Craig P. Schafer, Dean B. Eppler, Jack Gavalas, Michael C. McEwen, and Stephen A. Voels, Science Applications International Corporation, Houston, TX
- 2:09-2:33 *International Space Station Payload Accommodations*  
Daniel W. Hartman, NASA Johnson Space Center, Houston, TX
- 2:33-2:57 *International Space Station Attached Payload Overview*  
Gene Cook, NASA Johnson Space Center, Houston, TX
- 2:57-3:21 *Payload Integration Processes*  
James S. Scheib, NASA Johnson Space Center, Houston, TX
- 3:21-3:45 *Payload Operations*  
Rickey D. Cissom, NASA Johnson Space Center, Houston, TX, and Tina Melton, Catherine C. Lapenta, and Michelle P. Schneider, NASA Marshall Space Flight Center, Huntsville, AL

## CONFERENCE ON GLOBAL VIRTUAL PRESENCE - OPENING SESSION

MONDAY, FEBRUARY 1, 1:45 pm – 3:45 pm, Sendero Ballroom I

**Christine M. Anderson, Program Chair**

Air Force Research Laboratory  
Kirtland AFB, NM

**Peter Ulrich, Program Co-Chair**

NASA Headquarters  
Washington, DC

## CONFERENCE ON APPLICATIONS OF THERMOPHYSICS IN MICROGRAVITY & BREAKTHROUGH PROPULSION PHYSICS - OPENING SESSION

MONDAY, FEBRUARY 1, 1:45 pm – 3:45 pm, Enchantment Ballroom E & F

**Ad Delil, Program Chair**

National Aerospace Laboratory NLR  
Emmeloord, Netherlands

**Marc Millis, Program Co-Chair**

NASA Lewis Research Center  
Cleveland, OH

## CONFERENCE ON NEXT GENERATION LAUNCH SYSTEMS - OPENING SESSION

MONDAY, FEBRUARY 1, 1:45 pm – 3:45 pm, Enchantment Ballroom A & B

**Harry Karasopoulos, Program Chair**

Air Force Research Laboratory  
Wright-Patterson AFB, OH

**William A. Gaubatz, Program Co-Chair**

The Boeing Company  
Huntington Beach, CA

Dick Cervisi, The Boeing Company, Seal Beach, CA

## 16<sup>TH</sup> SYMPOSIUM ON SPACE NUCLEAR POWER AND PROPULSION - OPENING SESSION PANEL DISCUSSION

MONDAY, FEBRUARY 1, 1:45 pm – 3:45 pm, Sendero Ballroom II

**Michael G. Houts, Program Chair**

LANL/MSFC  
Huntsville, AL

**William J. Emrich, Program Co-Chair**

NASA Marshall Space Flight Center  
Huntsville, AL

1. Ed Lu\*, NASA Astronaut, NASA Johnson Space Center, Houston, TX
2. John Young, NASA Astronaut, NASA Johnson Space Center, Houston, TX
3. Franklin Chang-Diaz, NASA Astronaut, NASA Johnson Space Center, Houston, TX
4. John Grunsfeld, NASA Astronaut, NASA Johnson Space Center, Houston, TX
5. Gary Bleeker\*, Air Force Research Laboratory, Kirtland AFB, NM

\* Invited

# TECHNICAL SESSIONS

## MONDAY, FEBRUARY 1, 1999

### [A02] TECHNICAL INTERCHANGE ON SPACE STATION CAPABILITIES FOR EXTERNAL PAYLOADS AND OBSERVATIONAL PAYLOADS

MONDAY, FEBRUARY 1, 4:00 pm – 6:00 pm, Sendero Ballroom I

#### Ned Penley, Co-Chair

NASA Johnson Space Center  
Houston, TX

#### Jim Duggar, Co-Chair

The Boeing Company  
Houston, TX

#### TIME

- 4:00-4:24 *Space Station GN&C Overview for Payloads*  
Alfred J. Treder, The Boeing Company, Seattle, WA
- 4:24-4:48 *International Space Station External Contamination Environment*  
Ronald R. Mikatarian, The Boeing Company, Nassau Bay, TX; Carlos E. Soares, The Boeing Company, Houston, TX; Thomas L. Farrell and Keith C. Albyn, NASA Johnson Space Center, Houston, TX
- 4:48-5:12 *An Environment Monitoring Package for the International Space Station*  
Ralph Carruth and Kenneth S. Clifton, NASA Marshall Space Flight Center, Huntsville, AL
- 5:12-5:36 *ISS Truss Attached Payload Accommodations Overview*  
Janella S. Youmans and Michael F. Olson, The Boeing Company, Houston, TX, and Mark A. Foster and Barbara S. Watkins, The Boeing Company, Huntington Beach, CA
- 5:36-6:00 *EXPRESS Service to the International Space Station: EXPRESS Pallet*  
Lowell Primm, NASA Marshall Space Flight Center, Huntsville, AL, and Alan Bergmann, Boeing Defense and Space Group, Huntsville, AL

### [A03] FLUIDS AND COMBUSTION RESEARCH ON THE ISS

MONDAY, FEBRUARY 1, 4:00 pm – 6:00 pm, Sendero Ballroom III

#### Howard Ross, Co-Chair

NASA Lewis Research Center  
Cleveland, OH

#### Frank Schowengerdt, Co-Chair

Colorado School of Mines  
Golden, CO

#### TIME

- 4:00-4:24 *Combustion Studies Aboard the International Space Station: Planned Experiments and Facilities*  
Karen J. Weiland, NASA Lewis Research Center, Cleveland, OH
- 4:24-4:48 *Recent Microgravity Results in the Synthesis of Porous Materials*  
X. Zhang, D. P. Johnson, A. R. Manerbin, J. J. Moore, and F. Schowengerdt, Colorado School of Mines, Center for Commercial Applications of Combustion in Space, Golden, CO
- 4:48-5:12 *The Interaction of Water Mists and Premixed Propane-Air Flames under Low-Gravity Conditions*  
Angel Abbud-Madrid, University of Colorado, Boulder, CO, and Edward P. Riedel and J. Thomas McKinnon, Colorado School of Mines, Golden, CO
- 5:12-5:36 *Fluid Physics and Transport Phenomena Studies aboard the International Space Station: Planned Experiments*  
Bhim S. Singh, NASA Lewis Research Center, Cleveland, OH
- 5:36-6:00 *Physics of Colloids in Space Experiment*  
Rafat R. Ansari, Subramanian Sankaran, and John M. Koudelka, NASA Lewis Research Center, Cleveland, OH; Edward A. Hovenac, Dynacs Engineering Corp., Inc., Cleveland, OH; and David A. Weitz, Luca Cipelletti, and Phillip N. Segre, University of Pennsylvania, Philadelphia, PA

### [B01] LASERS IN SPACE – I

MONDAY, FEBRUARY 1, 4:00 pm – 6:00 pm, Sendero Ballroom II

#### Linda Dehainaut, Chair

Air Force Research Laboratory  
Kirtland AFB, NM

#### Barry Meredith, Co-Chair

NASA Langley Research Center  
Hampton, VA

#### TIME

- 4:00-4:24 *Optical Intersatellite Link (OISL)*  
Roberta M. Ewart, Air Force Research Laboratory, Kirtland AFB, NM

- 4:24-4:48 ***Tunnel/Underground Facility Detection***  
Paul McManamon, Air Force Research Laboratory, Wright-Patterson AFB, OH
- 4:48-5:12 ***Theoretical Modeling of Nonlinear Light Scattering in Er-Doped Fiber Amplifiers***  
Erik J. Bochove, Craig A. Denman, and Roberta M. Ewart, Air Force Research Laboratory, Kirtland AFB, NM
- 5:12-5:36 ***Space-Based Relay Mirrors for Global Virtual Presence***  
Dustin Johnston, Don Payne, Bob O'Leary, Schafer Corporation, Albuquerque, NM, and John Erkkila, Logicon RDA
- 5:36-6:00 ***Radiation Effects in Photonic Technologies Destined for Space Applications***  
E. W. Taylor and R. Ewart, Air Force Research Laboratory, Kirtland AFB, NM

## [C01] FUNDAMENTALS OF MICROGRAVITY TWO-PHASE FLOW AND HEAT TRANSFER

MONDAY, FEBRUARY 1, 4:00 pm – 6:00 pm, Fiesta Rooms I & II

### Fred Best, Chair

Texas A&M University  
College Station, TX

### Ad Delil, Co-Chair

National Aerospace Laboratory, Space Division  
Emmeloord, Netherlands

#### TIME

- 4:00-4:24 ***Thermal-Gravitational Modelling, Scaling and Flow Pattern Mapping Issues of Two-Phase Heat Transport Systems***  
A. A. M. Delil, National Aerospace Laboratory, Space Division, Emmeloord, Netherlands
- 4:24-4:48 ***Modeling of Two-Phase Flow in Manifolds Under Microgravity Conditions***  
Cale Young, Frederick Best, and Cable Kurwitz, Texas A&M University, College Station, TX
- 4:48-5:12 ***Experimental and Analytical Results of a Liquid-Gas Separator in Microgravity***  
Frederick Best and Michael Ellis, Texas A&M University, College Station, TX
- 5:12-5:36 ***Investigation on Two-Phase Flow in Small Diameter Non-Circular Channels under Low and Normal Gravity***  
Gerrit Wölk, Michael Dreyer, and Hans J. Rath, University of Bremen, Center of Applied Space Technology and Microgravity (ZARM), Bremen, Germany
- 5:36-6:00 ***Measurement of Interdiffusion Coefficient of Liquid Metal Zinc and Tin Under Convection-Less Condition***  
J. H. Zhao and W. K. Wang, Institute of Physics, Chinese Academy of Sciences, Beijing, China

## [D01] PROJECT COST, OPERATIONS, AND RISK MANAGEMENT

MONDAY, FEBRUARY 1, 4:00 pm – 6:00 pm, Enchantment Ballroom A & B

### Mel Eisman, Chair

RAND Corporation  
Santa Monica, CA

### Joe Hamaker, Co-Chair

NASA Marshall Space Flight Center  
Huntsville, AL

#### TIME

- 4:00-4:24 ***Cost Implications of Reusable Space Systems for Air Force Operations***  
Mel Eisman, RAND Corporation, Santa Monica, CA
- 4:24-4:48 ***Launch Systems Operations Cost Modeling***  
Mark K. Jacobs, Science Applications International Corporation, Schaumburg, IL
- 4:48-5:12 ***A Quantitative Method for Selecting High Pay-Off Technologies as Candidates for Investment in Space Transportation***  
Gregory N. Lepetsos and David K. Myers, Lockheed Martin Astronautics, Denver, CO
- 5:12-5:36 ***How to Build a Better Cheaper Booster Engine***  
Robert S. Bell, The Boeing Company, Huntington Beach, CA
- 5:36-6:00 ***Inventory Requirements for Reusable Launch Vehicles***  
Stephen A. Book, The Aerospace Corporation, Los Angeles, CA

## [E01] AFFORDABLE SPACE FISSION POWER AND PROPULSION

MONDAY, FEBRUARY 1, 4:00 pm – 6:00 pm, Enchantment E & F

### David I. Poston, Chair

Los Alamos National Laboratory  
Los Alamos, NM

### Jonathan Stabb, Co-Chair

NASA Kennedy Space Center  
Kennedy Space Center, FL

#### TIME

- 4:00-4:24 ***The Feasibility of Near-Term, Low-Cost Space Nuclear Power***  
B. T. Adams, M. G. Houts, D. I. Poston, and R. S. Reid, Los Alamos National Laboratory, Los Alamos, NM; Yu. V. Nikolaev, Research Institute of Scientific Industrial Association "Luch", Podolsk, Moscow Region, Russia; N. N. Ponomarev-Stepnoi, D. N. Poliakov, and M. Yermoshin, Russian Research Center Kurchatov Institute, Moscow, Russia; and V. I. Chitaykin, V. I. Ionkin, A. K. Almambetov, G. A. Kuptsov, and A. E. Rusanov, Institute of Physics and Power Engineering, Obninsk, Russia
- 4:24-4:48 ***Development Status of the Heatpipe and Bimodal Systems***  
David Poston and Mike Houts, Los Alamos National Laboratory, Los Alamos, NM
- 4:48-5:12 ***Pratt & Whitney ESCORT Derivative for Mars Surface Power***  
Gerald J. Feller and Russell Joyner, United Technologies, Pratt-Whitney, West Palm Beach, FL

- 5:12-5:36 ***Origin of How Steam Rockets can Reduce Space Transport Cost by Orders of Magnitude***  
 Anthony C. Zuppero, Thomas K. Larson, Bruce G. Schnitzler, John W. Rice, Thomas J. Hill, William D. Richins, and Garland L. Parlier, Lockheed Martin Idaho Technologies, Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID, and James E. Werner, Department of Energy, Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID
- 5:36-6:00 ***Possibilities of Increasing Service Life-Power Characteristics of Heatpipe Power and Bimodal Systems***  
 Yuri V. Nikolaev, Alexander S. Gontar, Stanislav A. Eremin, Raphael Y. Kucherov, Nikolai V. Lapochkin, and Anatoli M. Lebedev, Research Institute of Scientific Industrial Association "Lutch", Podolsk Moscow Region, Russian Federation, and Michael G. Houts and David I. Poston, Los Alamos National Laboratory, Los Alamos, NM

# TECHNICAL SESSIONS

## *TUESDAY, FEBRUARY 2, 1999*

### [A04] SPACE SCIENCES ON THE ISS - I

TUESDAY, FEBRUARY 2, 10:15 am – 12:15 pm, Sendero Ballroom I

#### Eun-Suk Seo, Co-Chair

University of Maryland  
 College Park, MD

#### Giorgio Palumbo, Co-Chair

University of Bologna  
 Bologna, Italy

#### TIME

- 10:15-10:39 ***Alpha Magnet Spectrometer (AMS)***  
 Samuel Ting, Massachusetts Institute of Technology, Cambridge, MA
- 10:39-11:03 ***Advanced Cosmic-Ray Composition Experiment for the Space Station (ACCESS)***  
 Martin H. Israel, Washington University, St. Louis, MO; Robert E. Streitmatter, NASA Goddard Space Flight Center, Greenbelt, MD; and Simon P. Swordy, University of Chicago, Chicago, IL, for the ACCESS study scientists.
- 11:03-11:27 ***ECCO: The Extremely Heavy Cosmic Ray Composition Observer***  
 A. J. Westphal, B. A. Weaver, M. Solarz, and P. B. Price, University of California, Space Sciences Laboratory, Berkeley, CA, and C.-L. Lin, HD Associates, Emeryville, CA
- 11:27-11:51 ***Measurement of TeV Electrons on ISS/JEM***  
 S. Torii, N. Tateyama, T. Tamura, T. Ouchi, K. Kashiwagi, K. Yoshida, and K. Hibino, Kanagawa University, Institute of Computer Science, Kanagawa, Japan; T. Yamagami and Y. Saito, Institute of Space and Astronautical Science, Kanagawa, Japan; H. Murakami, Rikkyo University, Tokyo, Japan; T. Kobayashi, Aoyama-gakuin University, Tokyo, Japan; Y. Komori, Kanagawa Prefectural College of Nursing, Kanagawa, Japan; K. Kasahara, Shibaura Institute of Technology, Saitama, Japan; T. Yuda and M. Ohnishi, Institute for Cosmic Ray Research, University of Tokyo, Tokyo, Japan; M. Shibata, Yokohama National University, Kanagawa, Japan; and J. Nishimura, Yamagata Institute of Technology, Yamagata, Japan
- 11:51-12:15 ***The International Space Station as an Observatory for Cosmic-Ray Physics and Astrophysics***  
 W. Vernon Jones, NASA Headquarters, Washington, DC

### [A05] EARTH SCIENCES AND REMOTE SENSING ON THE ISS - I: OVERVIEW AND WINDOW USE

TUESDAY, FEBRUARY 2, 10:15 am – 12:15 pm, Sendero Ballroom III

#### Jack Kaye, Co-Chair

NASA Headquarters  
 Washington, DC

#### George May, Co-Chair

NASA Stennis Space Center  
 Stennis Space Center, MS

#### TIME

- 10:15-10:39 ***The Role of the Space Station in Earth Science Research***  
 Jack A. Kaye, NASA Headquarters, Washington, DC
- 10:39-11:03 ***Capabilities of the Window Observational Research Facility***  
 Dean Eppler, Science Applications International Corporation, Houston, TX; Karen P. Scott, The Aerospace Corporation, Houston, TX; Sharon Conover, NASA Johnson Space Center, Houston, TX; and Rick Turner, NASA Marshall Space Flight Center, Huntsville, AL
- 11:03-11:27 ***The Space Station Window Observational Research Facility; A High Altitude Imaging Laboratory***  
 Susan K. Runco, NASA Johnson Space Center, Houston, TX; Dean B. Eppler, Science Applications International Corporation, Houston, TX; and Karen P. Scott, The Aerospace Corporation, Houston, TX
- 11:27-11:51 ***Validation of Earth Observations Using International Space Station***  
 Jennifer Gebelein and John E. Estes, University of California, Remote Sensing Research Unit, Santa Barbara, CA

11:51-12:15 **Hyperspectral Imaging Support on ISS**  
George May, Chengye Mao, Jerry Heitschmidt, and Mark Lanoue, Space Remote Sensing Center, NASA Stennis Space Center, Stennis Space Center, MS

**[B03] LASERS IN SPACE – II**

TUESDAY, FEBRUARY 2, 10:15 am – 12:15 pm, Sendero Ballroom II

**Barry Meredith, Chair**

NASA Langley Research Center  
Hampton, VA

**Linda Dehainaut, Co-Chair**

Air Force Research Laboratory  
Kirtland AFB, NM

**TIME**

- 10:15-10:39 ***The Direct Observation of Gain on the 1.315 $\mu$ m Transition of Atomic Iodine Produced by the Energy Transfer from NCI( $a^1D$ ) to I( $^2P_{3/2}$ )***  
John M. Herbelin, Thomas L. Henshaw, Brent D. Rafferty, Brian T. Anderson, Ralph F. Tate, Timothy J. Madden, Gerald C. Manke, II, and Gordon D. Hager, Air Force Research Laboratory, Kirtland AFB, NM
- 10:39-11:03 ***Space-Based Laser for a Cloud and Aerosol Backscatter Lidar***  
John H. Stadler, Chris A. Hostetler, and Julie Williams-Byrd, NASA Langley Research Center, Hampton, VA; Floyd Hovis, Fibertek, Inc., Herndon, VA; and Charles M. Bradford and Ron Schwiesow, Ball Aerospace & Technologies Corporation, Boulder, CO
- 11:03-11:27 ***Research and Development of Laser Diode Based Instruments for Applications in Space***  
Michael Krainak, James Abshire, and Don Cornwell, NASA Goddard Space Flight Center, Greenbelt, MD; Peter Dragic, University of Illinois, Urbana, IL; Gary Duerksen, University of Maryland, College Park, MD; and Gregg Switzer, Montana State University, Bozeman, MT
- 11:27-11:51 ***Advances in Ultra-Violet Lidar Transmitter Technology***  
Julie Williams-Byrd and William Edwards, NASA Langley Research Center, Hampton, VA
- 11:51-12:15 ***Solid-State Laser System for Wind Lidar Applications***  
David W. Mordaunt, James Zamel, Daniel Hall, Eric C. Cheung, James G. Ho, and Stephen P. Palese, TRW Space and Electronics Group, Redondo Beach, CA

**[B04] COMMUNICATIONS AND SOLAR ENERGY COLLECTION TECHNOLOGIES – II**

TUESDAY, FEBRUARY 2, 10:15 am – 12:15 pm, Enchantment Ballroom C & D

**Michael Piszczor, Jr., Chair**

NASA Lewis Research Center  
Cleveland, OH

**Paul Gierow, Co-Chair**

SRS Technologies  
Huntsville, AL

**Valerie J. Lyons, Co-Chair**

NASA Lewis Research Center  
Cleveland, OH

**TIME**

- 10:15-10:39 ***Performance and Mass Estimates for an Advanced Closed Cycle Gas Turbine System for Space Solar Power Generation***  
Albert J. Juhasz, NASA Lewis Research Center, Cleveland, OH
- 10:39-11:03 ***Impact of Radiation Hardness and Operating Temperatures of Silicon Carbide Electronics on Space Power System Mass***  
Albert J. Juhasz, Roy C. Tew, and Gene E. Schwarze, NASA Lewis Research Center, Cleveland, OH
- 11:03-11:27 ***Design and Analysis Code for Stirling Power System Radiators with GPHS (General Purpose Heat Sources) for Deep Space Probes***  
Albert J. Juhasz, NASA Lewis Research Center, Cleveland, OH
- 11:27-11:51 ***Thermophotovoltaic Technology for Radioisotope, Nuclear or Solar Energy Conversion Systems for Space Applications***  
David Wilt and Donald Chubb, NASA Lewis Research Center, Cleveland, OH
- 11:51-12:15 ***Advanced, High Efficiency, Lightweight, Flexible Thin Film Solar Cells for Space Solar Arrays***  
Henry Curtis, NASA Lewis Research Center, Cleveland, OH

**[C02] APPLICATIONS OF TWO-PHASE THERMAL CONTROL SYSTEMS FOR SPACE**

TUESDAY, FEBRUARY 2, 10:15 am – 12:15 pm, Fiesta Rooms I & II

**Ted Swanson, Chair**

NASA Goddard Space Flight Center  
Greenbelt, MD

**Neil Dunbar, Co-Chair**

Matra Marconi Space Systems  
Stevenage, UK

**TIME**

- 10:15-10:39 ***Overview of CPL and LHP Applications on NASA Missions***  
Dan Butler, NASA Goddard Space Flight Center, Greenbelt, MD
- 10:39-11:03 ***Investigation of Low Power Start-Up Characteristics of a Loop Heat Pipe***  
Tarik Kaya and Jentung Ku, NASA Goddard Space Flight Center, Greenbelt, MD; Triem T. Hoang, TTH Research Inc., Clifton, VA; and Mark K. Cheung, U. S. Naval Research Laboratory, Washington, DC

- 11:03-11:27 ***Comparison Between Analytical Predictions and Experimental Data for a Loop Heat Pipe***  
George Mulholland, Texas A&M University, College Station, TX; Charlotte Gerhart and Scott Stanley, Air Force Research Laboratory, Kirtland AFB, NM; and Donald Gluck, Nichols Research Corporation, Albuquerque, NM
- 11:27-11:51 ***MARS98; CPL Lessons Learned***  
Dave Martin, Lockheed Martin Aerospace, Denver, CO; Dave Wolf and Edward Kroliczek, Swales Aerospace, Beltsville, MD, and Jentung Ku, NASA Goddard Space Flight Center, Greenbelt, MD
- 11:51-12:15 ***Miniature Loop Heat Pipes – First Aid for Thermal Subsystems***  
Neil Dunbar, Matra Marconi Space Systems, Stevenage, UK, and Wolfgang Supper, European Space Agency, ESTEC, Noordwijk, Netherlands

**[D02] LAUNCH VEHICLE TECHNOLOGIES – I**

TUESDAY, FEBRUARY 2, 10:15 am – 12:15 pm, Enchantment Ballroom A & B

**Chris Clay, Chair**

Air Force Research Laboratory  
Wright-Patterson AFB, OH

**Phil Best, Co-Chair**

NASA Marshall Space Flight Center  
Huntsville, AL

**TIME**

- 10:15-10:39 ***Conformal Cryogenic Tank Trade Study for Reusable Launch Vehicles***  
H. Kevin Rivers, NASA Langley Research Center, Hampton, VA
- 10:39-11:03 ***Aerothermal Test of Thermal Protection Systems for X-33 Reusable Launch Vehicle***  
James Wayne Sawyer and Jefferson Hodge, NASA Langley Research Center, Hampton, VA, and Brad Moore and Kevin Snyder, B. F. Goodrich Aerospace, Chula Vista, CA
- 11:03-11:27 ***H-IIA Launch Vehicle and its Avionics System***  
Toshikazu Kawabe, National Space Development Agency of Japan, Tokyo, Japan
- 11:27-11:51 ***Airframe Integration Trade Studies for a Reusable Launch Vehicle***  
John T. Dorsey, Chauncey Wu, Kevin Rivers, Carl Martin and Russell Smith, NASA Langley Research Center, Hampton, VA

**[E02] ADVANCED CONCEPTS**

TUESDAY, FEBRUARY 2, 10:15 am – 12:15 pm, Enchantment Ballroom E & F

**Jonathan Campbell, Chair**

NASA Marshall Space Flight Center  
Huntsville, AL

**TIME**

- 10:15-10:39 ***Co-Linear Deuterium Propulsion: An Attainable Variant to the Bussard Ramscoop***  
Jonathan A. Greenspon, StarGate Research Laboratory, Apple Valley, CA
- 10:39-11:03 ***Emerging Physics for a Breakthrough Thin-Film Electrolytic Cell Power Unit***  
G. H. Miley, University of Illinois, Fusion Studies Laboratory, Urbana, IL
- 11:03-11:27 ***Light Propulsion for Space Flight***  
Victor Ya. Poupko, Peter P. Dyachenko, Andrey V. Gulevich, Michael K. Ovcharenko, and Anatoly V. Zrodnikov, Federal Scientific Center, Institute for Physics & Power Engineering, Obninsk, Russia
- 11:27-11:51 ***A Laser Approach for Orbital Debris and Asteroid Meteoroid Comet Deflection***  
Jonathan Campbell, NASA Marshall Space Flight Center, Huntsville, AL
- 11:51-12:15 ***A Fission-Powered Interstellar Precursor Mission***  
Ronald J. Lipinski, Roger X. Lenard, and Steven A. Wright, Sandia National Laboratories, Albuquerque, NM, and John L. West, Jet Propulsion Laboratory, Pasadena, CA

**[A06] SPACE SCIENCES ON THE ISS - II**

TUESDAY, FEBRUARY 2, 1:15 pm – 3:15 pm, Sendero Ballroom I

**Eun-Suk Seo, Co-Chair**

University of Maryland  
College Park, MD

**Giorgio Palumbo, Co-Chair**

University of Bologna  
Bologna, Italy

**TIME**

- 1:15-1:39 ***MAXI Mission for the Space Station***  
M. Matsuoka, N. Kawai, T. Mihara, A. Yoshida, T. Kotani, H. Kubo, H. Matsumoto, H. Negoro, B. C. Rubin, I. Sakurai, and Y. Shirasaki, The Institute of Physical and Chemical Research (RIKEN), Saitama, Japan; H. Tsunemi, E. Miyata, and K. Torii, Tsukuba Space Center, National Space Development Agency of Japan, Japan; K. Hayashida and S. Kitamoto, Osaka University, Department of Earth and Space Science, Japan; and M. Yamauchi, Miyazaki University, Faculty of Engineering, Japan
- 1:39-2:03 ***Implementing an All-sky X-ray Camera on Space Station***  
W. Friedhorsky, S. Brandt, K. Borozdin, Los Alamos National Laboratory, Los Alamos, NM, and K. Black, NASA Goddard Space Flight Center, Greenbelt, MD

- 2:03-2:27 ***A New Tracking Satellite-borne Solar Neutron Detector***  
Yasushi Muraki, Solar-Terrestrial Environment Laboratory, Nagoya University, Nagoya, Japan
- 2:27-2:51 ***A One-Meter Aperture Wide-Field Camera for the Japanese Exposure Module on Space Station***  
Carl Pennypacker, Peter Nugent, Greg Aldering, Don Groom, Maria Isaac, Gerson Goldhaber, and Saul Perlmutter, University of California, Berkeley, CA; Toshi Ebisuzaki and Ken Nomoto, University of Tokyo, Tokyo, Japan; Toshihiro Handa, University of Tokyo, Tokyo, Japan; Andrew Fruchter and John MacKenty, Space Telescope Science Institute, Baltimore, MD; Reynald Pain and Francois Hammer, University of Paris, Paris, France; Yoshi Takahashi and James Hadaway, University of Alabama, Huntsville, AL; Ariel Goobar, University of Stockholm, Stockholm, Sweden; David Branch, University of Oklahoma, Norman, Oklahoma; Olga Tsiopa and Yuri Gnedin, Ulkovo Observatory, Central Observatory of the Russian Academy of Sciences, St. Petersburg, Russia; Josef Jochum, Technical University of Munich, Garching, Germany
- 2:51-3:15 ***Space Hands-On Universe Telescope and Orbiting Wide-angle Light-collector Telescope to be built on the Japanese Experiment Module Exposure Facility of the International Space Station***  
Yoshiyuki Takahashi, University of Alabama, Huntsville, AL; Toshi Ebisuzaki, Institute of Physical and Chemical Research (RIKEN), Wako, Japan; and Carlton Pennypacker, Lawrence Berkeley Laboratory, University of California, Berkeley, CA

## [A07] EARTH SCIENCES AND REMOTE SENSING ON THE ISS - II: ATMOSPHERIC CHEMISTRY AND RADIATION

TUESDAY, FEBRUARY 2, 1:15 pm – 3:15 pm, Sendero Ballroom III

**Jack Kaye, Co-Chair**

NASA Headquarters  
Washington, DC

**George May, Co-Chair**

NASA Stennis Space Center  
Stennis Space Center, MS

### TIME

- 1:15-1:39 ***Demonstration of Superconducting Sub-Millimeter-wave Limb Emission Sounder (SMILES) for Observing Trace Gases in the Middle Atmosphere Using the Exposed Facility of the Japanese Experimental Module (JEM) of the International Space Station***  
Harunobu Masuko, Takeshi Manabe, Masumichi Seta, Yasuko Kasai, Satoshi Ochiai, and Yoshihisa Iramajiri, Communications Research Laboratory, Tokyo, Japan, and Junji Inatani, Naomi Ikeda, Toshiyuki Nishibori, Yukie Iida, and Yasunori Fujii, National Space Development Agency (NASDA) of Japan, Ibaraki, Japan
- 1:39-2:03 ***Observations of Atmospheric Pollution, Aerosol, and Chemistry from Space Station***  
Ernest Hilsenrath and Pawan K. Bhartia, NASA Goddard Space Flight Center, Greenbelt, MD, and Gerald Waldberg, North Carolina State University, Raleigh, NC
- 2:03-2:27 ***Solar Occultation Observations from the International Space Station: Deployment of a FTS for Atmospheric Chemistry and Trend Studies***  
C. P. Rinsland and W. P. Chu, NASA Langley Research Center, Hampton, VA, and D. M. Cunnold, Georgia Institute of Technology, Atlanta, GA
- 2:27-2:51 ***The Flight of SAGE III on ISS***  
M. Patrick McCormick, Hampton University, Hampton, VA, and W. P. Chu and L. E. Mauldin, NASA Langley Research Center, Hampton, VA
- 2:51-3:15 ***The SOLSPEC Experiment: Recent Results and Future Investigations on Board the International Space Station Alpha***  
G. Thuillier, M. Herse, and T. Foujols, Service d'Aéronomie du CNRS, Verrieres le Buisson, France; P. C. Simon, D. Gillotay, and W. Peetermans, Institut d'Aéronomie Spatiale de Belgique, Bruxelles, Belgium; and D. Labs and H. Mandel, Landessternwarte, Heidelberg, Germany

## [A08] OVERVIEW OF SOME ISS BUSINESS INVESTMENTS AND COMMITMENTS THROUGH THE COMMERCIAL SPACE CENTER PROGRAM

TUESDAY, FEBRUARY 2, 1:15 pm – 3:15 pm, Sendero Ballroom II

**Mark Nall, Co-Chair**

NASA Marshall Space Flight Center  
Huntsville, AL

**Mark Deuser, Co-Chair**

Space Hardware Optimization Technology, Inc.  
Floyd Knobs, IN

### TIME

- 1:15-1:39 ***Protein Crystal Growth in Microgravity: Status and Commercial Implications***  
Karen M. Moore, Marianna M. Long, and Lawrence J. DeLucas, University of Alabama, Center for Macromolecular Crystallography, Birmingham, AL
- 1:39-2:03 ***Commercial Potential of Space-Based Plant Research***  
Raymond J. Bula and Eric Christophersen, Rapigen, LLC, Cross Plains, WI
- 2:03-2:27 ***Materials Development Opportunities***  
Charles A. Lundquist, University of Alabama, Consortium for Materials Development in Space, Huntsville, AL
- 2:27-2:51 ***Commercial Combustion Research Aboard the International Space Station***  
F. D. Schowengerdt, Colorado School of Mines, Center for Commercial Applications of Combustion in Space, Golden, CO

2:51-3:15

*Potential Commercial Use of the International Space Station by the Biotechnology/Pharmaceutical/Biomedical Sector*  
George W. Morgenthaler and Louis Stodieck, University of Colorado, BioServe Space Technologies, Boulder, CO

## [B05] COMMUNICATIONS AND SOLAR ENERGY COLLECTION TECHNOLOGIES – III

TUESDAY, FEBRUARY 2, 1:15 pm – 3:15 pm, Enchantment Ballroom C & D

**Michael Piszczor, Jr., Chair**  
NASA Lewis Research Center  
Cleveland, OH

**Paul Gierow, Co-Chair**  
SRS Technologies  
Huntsville, AL

**Valerie J. Lyons, Co-Chair**  
NASA Lewis Research Center  
Cleveland, OH

### TIME

- 1:15-1:39 ***Multi-bandgap Solar Cells for Space***  
Sheila Bailey, NASA Lewis Research Center, Cleveland, OH
- 1:39-2:03 ***Concentrator Space Solar Arrays***  
Michael F. Piszczor, Jr., NASA Lewis Research Center, Cleveland, OH
- 2:03-2:27 ***High-Bandgap Solar Cells for Near Sun Missions***  
David A. Scheiman and Geoffrey A. Landis, Ohio Aerospace Institute, NASA Lewis Research Center, Cleveland, OH, and Victor G. Weizer, Essential Research, NASA Lewis Research Center, Cleveland, OH
- 2:27-2:51 ***Optical Evaluation of an As-Manufactured Compound Secondary Concentrator***  
Donald A. Jaworske, NASA Lewis Research Center, Cleveland, OH; Timothy J. Skowronski, Cleveland State University, Cleveland, OH; and Barry J. Miles, BWX Technologies, Inc., Lynchburg, VA
- 2:51-3:15 ***Effects of Ambient High Temperature Exposure on Alumina-Titania High Emittance Surfaces for Solar Dynamic Systems***  
Kim K. de Groh and Donald R. Wheeler, NASA Lewis Research Center, Cleveland, OH; Daniela C. Smith, Cleveland State University, Cleveland, OH; and Brian J. MacLachlan, Ohio Aerospace Institute, Cleveland, OH

## [C03] IN-ORBIT EXPERIMENTS WITH CAPILLARY PUMPED LOOPS AND LOOP HEAT PIPES

TUESDAY, FEBRUARY 2, 1:15 pm – 3:15 pm, Fiesta Rooms I & II

**Walter Bienert, Chair**  
Dynatherm-DTX  
Cockeysville, MD

**Ad Delil, Co-Chair**  
National Aerospace Laboratory, Space Division  
Emmeloord, Netherlands

### TIME

- 1:15-1:39 ***A Study of the Fundamental Operation of a Capillary-Driven Heat Transfer Device in Both Normal and Low Gravity; Part 2. Effect of Evaporator Meniscus Oscillations***  
Jeffrey S. Allen, NASA Lewis Research Center, Cleveland, OH, and Kevin P. Hallinan, University of Dayton, Dayton, OH
- 1:39-2:03 ***Design and Testing of a Cryogenic Capillary Pumped Loop Flight Experiment***  
David C. Bugby and Edward J. Krolczek, Swales Aerospace, Beltsville, MD; Jentung Ku and Ted Swanson, NASA Goddard Space Flight Center, Greenbelt, MD; B. J. Tomlinson and Thomas M. Davis, Air Force Research Laboratory, Kirtland AFB, NM; Jane Baumann and Brent Cullimore, Cullimore & Ring Technologies, Inc., Littleton, CO
- 2:03-2:27 ***Development and Testing of the CRYOTSU Flight Experiment***  
David C. Bugby, Charles J. Stouffer, and Robert M. Hagood, Swales Aerospace, Beltsville, MD; Michael Rich, B. J. Tomlinson, and Thomas M. Davis, Air Force Research Laboratory, Kirtland AFB, NM; and Jentung Ku and Theodore D. Swanson, NASA Goddard Space Flight Center, Greenbelt, MD
- 2:27-2:51 ***Flight Test Performance of a Loop Heat Pipe – Focus on a Long Steady State with No Apparent Subcooling***  
Michelle L. Parker and Bruce Drolen, Hughes Space and Communications Company, Los Angeles, CA, and P. S. Ayyaswamy, University of Pennsylvania, Philadelphia, PA

## [E03] REDUCING THE COST OF MARS EXPLORATION

TUESDAY, FEBRUARY 2, 1:15 pm – 3:15 pm, Enchantment Ballroom E & F

**Stan Borowski, Chair**  
NASA Lewis Research Center  
Cleveland, OH

**Dennis Pelaccio, Co-Chair**  
Pioneer Astronautics  
Lakewood, CO

### TIME

- 1:15-1:39 ***LANTR-Based Mars Missions: Go to Phobos for Propellant?***  
Michael L. Stancati, Mark K. Jacobs, and Gerald A. Rauwolf, Science Applications International Corporation, Schaumburg, IL
- 1:39-2:03 ***“Bimodal” NTR and LANTR Propulsion for Human Missions to Mars/Phobos***  
Stanley K. Borowski, NASA Lewis Research Center, Cleveland, OH
- 2:03-2:27 ***A Minimum Cost Approach to Human Mars Exploration***  
Robert Zubrin, Pioneer Astronautics, Lakewood, CO
- 2:27-2:51 ***Manned Mars Mission Enhancements using Pratt & Whitney ESCORT Combined Propulsion and Power System***  
Russell Joyner and Gerald J., United Technologies, Pratt-Whitney, West Palm Beach, FL

2:51-3:15 ***Options for the Human Exploration of Mars using Solar Electric Propulsion***  
Kurt J. Hack, Leon P. Gefert, and Thomas Kerslake, NASA Lewis Research Center, Cleveland, OH, and Jeffrey A. George, NASA Johnson Space Center, Houston, TX

**[E04] ENERGY CONVERSION: AMTEC TECHNOLOGY – I**  
TUESDAY, FEBRUARY 2, 1:15 pm – 3:15 pm, Enchantment Ballroom A & B

**Jean-Michel Tournier, Chair**

Institute for Space & Nuclear Power Studies  
University of New Mexico  
Albuquerque, NM

**Mike Schuller, Co-Chair**

Texas A&M University  
College Park, TX

**TIME**

1:15-1:39 ***Joining of Niobium-1%Zirconium to Incoloy 909 for Possible Application in a Refractory AMTEC Cell Wall***  
Daniel P. Kramer, James R. McDougal, Dennis C. McNeil, Joseph D. Ruhkamp, and Edwin I. Howell, Mound, Babcock & Wilcox of Ohio, Miamisburg, OH, and Joseph J. Kwiatkowski, Precision Joining Technologies, Inc., Miamisburg, OH

1:39-2:03 ***AMTEC Material Studies***  
Michael Schuller, Brad Fiebig, and Patricia Hudson, Texas A&M University, College Station, TX, and Robert Svedberg, Advanced Modular Power Systems, Ann Arbor, MI

2:03-2:27 ***Super-Alloy, AMTEC Cells for the Pluto/Express Mission***  
Mohamed S. El-Genk and Jean-Michel Tournier, University of New Mexico, Institute for Space and Nuclear Power Studies, Albuquerque, NM

2:27-2:51 ***Design of the EPX-I AMTEC Cell for the Advanced Radioisotope Power System***  
M. E. Carlson, Advanced Modular Power Systems, Inc., Ann Arbor, MI

**[A09] SPACE SCIENCES ON THE ISS - III**  
TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Sendero Ballroom I

**Eun-Suk Seo, Co-Chair**

University of Maryland  
College Park, MD

**Giorgio Palumbo, Co-Chair**

University of Bologna  
Bologna, Italy

**TIME**

3:30-3:54 ***Advanced Cosmic-ray Composition Experiment for Space Station: ISS Accommodation Study***  
John P. Wefel, Louisiana State University, Baton Rouge, LA, for the ACCESS Accommodation Study Team.

3:54-4:18 ***Ultra Heavy ( $Z > 30$ ) and Heavy ( $10 \leq Z \leq 30$ ) Cosmic-Ray Measurements on ACCESS with the Charge (Z) Identification Module (ZIM)***  
W. R. Binns, J. R. Cummings, P. L. Hink, M. H. Israel, and S. H. Sposato, Washington University, McDonnell Center for the Space Sciences, St. Louis, MO; J. H. Adams, Naval Research Laboratory, Washington, DC; L. M. Barbier, E. R. Christian, J. F. Krizmanic, and J. W. Mitchell, NASA Goddard Space Flight Center, Greenbelt, MD; G. A. DeNolfo, R. A. Leske, R. A. Mewaldt, and S. M. Schindler, Caltech, Space Radiation Laboratory, Pasadena, CA; W. Menn and M. Simon, University of Siegen, Siegen, Germany; C. J. Waddington, University of Minnesota, Minneapolis, MN; and M. E. Wiedenbeck, Jet Propulsion Laboratory, Pasadena, CA

4:18-4:42 ***Optimizing the TRD Design for ACCESS***  
M. L. Cherry, T. G. Guzik, J. Isbert, and J. P. Wefel, Louisiana State University, Baton Rouge, LA

4:42-5:06 ***ATIC as a Testbed for the ACCESS Baseline Calorimeter***  
J. Isbert, J. Authement, J. Coleman, T. G. Guzik, D. Granger, R. Lockwood, A. McMorris, L. Mock, C. Oubre, J. Peck, and J. P. Wefel, Louisiana State University, Baton Rouge, LA; O. Ganel, K. C. Kim, E. S. Seo, R. Sina, J. Z. Wang, and J. Wu, University of Maryland, College Park, MD; J. H. Adams, Jr., P. R. Boberg, C. Dion-Schwarz, and R. Kroeger, Naval Research Laboratory, Washington, DC; G. B. Bashindzhagyan, L. Khein, M. Panasyuk, G. A. Samsonov, and V. I. Zatsopin, Moscow State University, Skobeltsyn Institute of Nuclear Physics, Moscow, Russia; S. Dong, A. R. Fazely, and R. Gunasingha, Southern University, Baton Rouge, LA; H. J. Kim, S. K. Kim, I. M. Koo, Y. I. Kwon, S. H. Lee, and E. I. Won, Seoul National University, Seoul, South Korea; and W. K. H. Schmidt, Max-Planck Institut fur Aeronomie, Katlenburg-Lindau, Germany

5:06-5:30 ***A Guide for ACCESS Design Considerations***  
Opher Ganel, Eun-Suk Seo, Jian-Zhong Wang, and Jayoung Wu, University of Maryland, College Park, MD

## [A10] A COMMERCIAL COMMUNICATIONS SYSTEM FOR THE ISS

TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Sendero Ballroom III

### John S. Baras, Co-Chair

University of Maryland  
College Park, MD

### Kul Bhasin, Co-Chair

NASA Lewis Research Center  
Cleveland, OH

#### TIME

- 3:30-3:54 ***Commercial Communications for the ISS: System Considerations***  
Thomas A. Brackey, Hughes Space & Communications Company, Los Angeles, CA
- 3:54-4:18 ***The Application of a Commercial Wideband Constellation for ISS Communications***  
Joseph Bravman and Greg Giffin, Orbital Sciences Corporation, Reston, VA
- 4:18-4:42 ***Adjunct Payload for ISS High-Rate Communications***  
W. Carl Mitchell, Robert Cleave, and David Ford, Space Systems/Loral, Palo Alto, CA
- 4:42-5:06 ***Development and Evolution of Boeing Wideband Communication Services***  
Matthew H. Appleby, Boeing Aviation Information Services, Huntsville, AL; Thomas L. Blakeney, Mark A. Ludwig, Michael G. Lynch, and Joseph E. Ward, Boeing Aviation Information Services, Kent, WA; and James B. Duggar, Boeing ISS, Houston, TX
- 5:06-5:30 ***ISS Migration to Commercial Standards Wide-Band Data Link***  
Marty Skudlarek, Lockheed Martin Space Systems and Services, Houston, TX

## [B06] SPACECRAFT AUTONOMY

TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Sendero Ballroom II

### Alok Das, Chair

Air Force Research Laboratory  
Kirtland AFB, NM

### Richard Doyle, Co-Chair

Jet Propulsion Laboratory  
Pasadena, CA

#### TIME

- 3:30-3:54 ***Increasing Autonomy of Precision Spacecraft Using Neural Network Adaptive Control***  
Keith K. Denoyer and R. Rory Ninneman, Air Force Research Laboratory, Kirtland AFB, NM
- 3:54-4:18 ***A Concept for Cost-Effective, Satellite Servicing***  
Richard W. Madison, Air Force Research Laboratory, Kirtland AFB, NM
- 4:18-4:42 ***A Step Towards an Autonomous Planetary Rover***  
Gregg Rabideau, Steve Chien, Paul Backes, and Gene Chalfant, Jet Propulsion Laboratory, Pasadena, CA, and Kam Tso, IA Tech, Inc., Los Angeles, CA
- 4:42-5:06 ***Verification of Autonomous Systems Using Embedded Behavior Auditors***  
Dan Dvorak and Eric Tailor, Jet Propulsion Laboratory, Pasadena, CA
- 5:06-5:30 ***Non-Linear Sequencing and Cognizant Failure***  
Erann Gat, Jet Propulsion Laboratory, Pasadena, CA

## [B07] ENERGY CONVERSION AND HIGH TEMPERATURE MATERIALS

TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Enchantment Ballroom C & D

### Barry Miles, Chair

BWX Technologies, Inc.  
Lynchburg, VA

### Ray Nelson, Co-Chair

Air Force Research Laboratory  
Kirtland AFB, NM

#### TIME

- 3:30-3:54 ***Evaluation of the ISUS Power Management and Distribution System Under Operational Conditions***  
S. Michael Luker and F. J. Wyant, Sandia National Laboratories, Albuquerque, NM; R. C. Nelson, Defense Threat Reduction Agency, Kirtland AFB, NM; and Robert M. Button, NASA Lewis Research Center, Cleveland, OH
- 3:54-4:18 ***START-3: Operational Evaluations of the ISUS Engine Ground Demonstration Thermionic Power System***  
Francis J. Wyant, Sandia National Laboratories, Albuquerque, NM; James R. Luke, New Mexico Engineering Research Institute, Albuquerque, NM; and David W. Luchau, TEAM Specialty Services, Inc., Albuquerque, NM
- 4:18-4:42 ***An Analysis on Diffusion of Rhenium in Poco Graphite at 1373K***  
Jinglong Li and Ralph H. Zee, Auburn University, Materials Research & Education Center, Auburn, AL
- 4:42-5:06 ***Investigation of Mechanical Properties and Microstructure of Various Molybdenum-Rhenium Alloys***  
Todd Leonhardt, Jan-C. Carlen, and Martin Buck, Rhenium Alloys, Inc., Elyria, OH, and Charles R. Brinkman, Weiju Ren, and C. O. Stevens, Lockheed Martin Energy Research Corporation, Oak Ridge, TN
- 5:06-5:30 ***The Next Step in Chemical Propulsion: Oxide-Iridium/Rhenium Combustion Chambers***  
Arthur J. Fortini and Robert H. Tuffias, Ultramet, Pacoima, CA

**[C04] MICROGRAVITY FLUID PHYSICS RESEARCH**  
*TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Fiesta Rooms I & II*

**Michael Dreyer, Chair**

Bremen University, Center of Applied Space  
Technology and Microgravity ZARM  
Bremen, Germany

**Mohamed S. El-Genk, Co-Chair**

Institute for Space and Nuclear Power Studies  
University of New Mexico  
Albuquerque, NM

**TIME**

- 3:30-3:54 ***Stability of Liquid Bridges with Non-Flat Free Surface***  
V. M. Shevtsova, M. S. Ermakova, and J. C. Legros, University Lebre de Bruxelles, Brussels, Belgium
- 3:54-4:18 ***Rheological Measurements in Reduced Gravity***  
Sayavur I. Bakhtiyarov and Ruel A. Overfelt, Auburn University, Auburn, AL
- 4:18-4:42 ***Simulation of Liquid Dynamics Onboard Sloshsat FLEVO***  
J. P. B. Vreeburg, National Aerospace Laboratory NLR, Amsterdam, Netherlands
- 4:42-5:06 ***Critical Velocities in Open Capillary Vanes***  
Uwe Rosendahl, Michael E. Dreyer, and Hans J. Rath, University of Bremen, Center for Applied Space Technology and  
Microgravity (ZARM), Bremen, Germany
- 5:06-5:30 ***Thermal Conductivity of Abnormally Behaving Liquids: Prediction Methods and their Applicability in Microgravity  
Conditions***  
G. Latini and G. Passerini, Universita di Ancona, Ancona, Italy

**[D03] LAUNCH VEHICLE PROPULSION**

*TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Enchantment Ballroom A & B*

**B. David Goracke, Chair**

The Boeing Company  
Canoga Park, CA

**Matt Jones, Co-Chair**

Air Force Research Laboratory  
Edwards AFB, CA

**TIME**

- 3:30-3:54 ***X-33 Flight Visualization***  
Jay H. Laue, Science Applications International Corporation, Huntsville, AL
- 3:54-4:18 ***Lox/Hydrogen Full Flow Staged Combustion Cycle***  
Robert Brengle, The Boeing Company, Canoga Park, CA
- 4:18-4:42 ***A Systematic Collaborative Process for Assessing Launch Vehicle Propulsion Technologies***  
Pat R. Odom, Science Applications International Corporation, Huntsville, AL
- 4:42-5:06 ***A Comparison of Selected Air-Breathing Propulsion Choices for an Aerospace Plane***  
R. L. Chase, ANSER, Arlington, VA; L. E. McKinney, McKinney Associates, St. Louis, MO; H. D. Froning, Jr., Flight  
Unlimited, Flagstaff, AZ; P. Czysz, St. Louis University, St. Louis, MO; R. Boyd, Lockheed Martin Skunk Works,  
Palmdale, CA; and Mark Lewis, University of Maryland, College Park, MD
- 5:06-5:30 ***Propulsion Options for Global Presence***  
Steve Mozes, Air Force Research Laboratory, Wright-Patterson AFB, OH

**[E05] STUDIES OF COMPONENTS OF THE AMTEC ELECTRO-CHEMICAL CELL: ELECTRODES,  
ELECTROLYTE AND CURRENT COLLECTOR**

*TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Enchantment Ballroom E & F*

**Amy Ryan, Chair**

Jet Propulsion Laboratory  
Pasadena, CA

**John Merrill, Co-Chair**

Nichols Research Corporation  
Albuquerque, NM

**TIME**

- 3:30-3:54 ***T:N AMTEC Electrode Performance Parameters***  
M. A. Ryan, L. Lara, M. Homer, R. M. Williams, R. Cortez, K. Manatt, and V. B. Shields, Jet Propulsion Laboratory,  
Pasadena, CA
- 3:54-4:18 ***High Performance AMTEC Electrodes – Use of Current Collecting Grids***  
M. Schuller, B. Fiebig, and I. Kakwan, Texas A&M University, College Station, TX, and M. A. Ryan, M. L. Homer, and R. M.  
Williams, Jet Propulsion Laboratory, Pasadena, CA
- 4:18-4:42 ***Post Test Analysis of 3000-Hour AMTEC Test Cells***  
John Merrill, Nichols Research Corporation, Albuquerque, NM, and Clay Mayberry, Air Force Research Laboratory, Kirtland  
AFB, NM

- 4:42-5:06 ***B-Alumina Solid Electrolyte Stability Under AMTEC Operating Conditions***  
R. M. Williams, R. H. Cortez, L. Lara, V. B. Shields, M. L. Homer, K. Manatt, and J. Kulleck, Jet Propulsion Laboratory, Pasadena, CA
- 5:06-5:30 ***Advanced Electrodes for AMTEC***  
Brad Fiebig, Michael Schuller, and Patricia Hudson, Texas A&M University, Center for Space Power, College Station, TX, and Margaret Amy Ryan and Roger Williams, Jet Propulsion Laboratory, Pasadena, CA

**[E06] FUSION**

TUESDAY, FEBRUARY 2, 3:30 pm – 5:30 pm, Fiesta Rooms III & IV

**Terry Kammash, Chair**  
University of Michigan  
Ann Arbor, MI

**Bill Emrich, Co-Chair**  
NASA Marshall Space Flight Center  
Huntsville, AL

**TIME**

- 3:30-3:54 ***Magnetized Target Fusion and Propulsion: An Update***  
Kurt Schoenberg, Los Alamos National Laboratory, Los Alamos, NM
- 3:54-4:18 ***A Spherical Torus Nuclear Fusion Reactor Space Propulsion Vehicle Concept for Fast Interplanetary Travel***  
Craig H. Williams, Stanley K. Borowski, Leonard A. Dudzinski, and Albert J. Juhasz, NASA Lewis Research Center, Cleveland, OH
- 4:18-4:42 ***A D<sup>3</sup>He IEC Power Unit for Space Applications***  
G. H. Miley, University of Illinois, Fusion Studies Laboratory, Urbana, IL
- 4:42-5:06 ***Antiproton Triggered Fusion Propulsion for Interstellar Missions***  
Brice N. Cassenti, United Technologies Research Center, East Hartford, CT, and Terry Kammash, University of Michigan, Ann Arbor, MI
- 5:06-5:30 ***A Field-Reversed Gasdynamic Mirror Fusion Propulsion System***  
T. Kammash, University of Michigan, Ann Arbor, MI

# TECHNICAL SESSIONS

## WEDNESDAY, FEBRUARY 3, 1999

**[A11] SPACE SCIENCES ON THE ISS - IV**

WEDNESDAY, FEBRUARY 3, 10:15 am – 12:15 pm, Sendero Ballroom I

**Eun-Suk Seo, Co-Chair**  
University of Maryland  
College Park, MD

**Giorgio Palumbo, Co-Chair**  
University of Bologna  
Bologna, Italy

**TIME**

- 10:15-10:39 ***Opportunities for NASA Office of Space Science Funding of ISS Payloads***  
W. Vernon Jones, NASA Headquarters, Washington, DC
- 10:39-11:03 ***Future Space Experiments on Cosmic Rays and Radiation on Russian Segments of ISS***  
Mikhail Panasyuk, Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russia; Arkady Galper, Moscow State Engineering Physics Institute, Moscow, Russia; and Yurii Stozhkov, Lebedev Physics Institute, Russian Academy of Science, Moscow, Russia
- 11:03-11:27 ***ESA Early Utilization of Space Station***  
Giorgio Palumbo, University of Bologna, Bologna, Italy
- 11:27-11:51 ***The SPORt Mission on ISSA***  
S. Cortiglioni, S. Cecchini, M. Orsini, I. Te. S.R.E./CNR, Bologna, Italy; G. Boella, M. Gervasi, and G. Sironi, University of Milano, Milano, Italy; J. Monari and A. Orfei, I.R.A./CNR, Bologna, Italy; K.-W. Ng, Institute of Physics, Academia Sinica, Taipei, Taiwan.; L. Nicastro, I.F.C.A.I./CNR, Palermo, Italy; U. Pisani, Dip. Elettronica Politecnico di Torino, Torino, Italy; R. Tascone, CESPACNR, Torino, Italy; L. Popa, Institute of Space Sciences, Bucharest-Magurele, Romania; and I. A. Strukov, space Research Institute, Moscow, Russia
- 11:51-12:15 ***SWUIS – A Compact Astronomical UV/VIS/IR Imaging System for Manned Space-Based Platforms including the Space Shuttle and the International Space Station***  
D. C. Slater, W. M. Tomlinson, and D. E. Mahoney, Southwest Research Institute, San Antonio, TX; S. A. Stern, J. Wm. Parker, P. M. Tamblyn, W. B. Colwell, and D. D. Durda, Southwest Research Institute, Space Studies, Boulder, CO; P. R. Weissman, Jet Propulsion Laboratory, Pasadena, CA; and F. Vilas, NASA Johnson Space Center, Houston, TX

## [A12] EARTH SCIENCES AND REMOTE SENSING ON THE ISS - III: LIDAR OBSERVATIONS

WEDNESDAY, FEBRUARY 3, 10:15 am – 12:15 pm, Sendero Ballroom III

### Jack Kaye, Co-Chair

NASA Headquarters  
Washington, DC

### George May, Co-Chair

NASA Stennis Space Center  
Stennis Space Center, MS

#### TIME

- 10:15-10:39 *Prospects of Measuring Atmospheric Winds with a 2-Micron Coherent Doppler Lidar from the International Space Station*  
Timothy L. Miller and Michael J. Kavaya, NASA Marshall Space Flight Center, Huntsville, LA, and G. David Emmitt, Simpson Weather Associates, Charlottesville, VA
- 10:39-11:03 *The Atmospheric Dynamics Mission on the International Space Station – A New Technique for Observing Winds in the Atmosphere*  
P. Ingmann, C. J. Readings, and K. Knott, European Space Research and Technology Centre, Noordwijk, The Netherlands
- 11:03-11:27 *Surface LIDAR Facility System for the International Space Station*  
J. B. Garvin, J. L. Bufton, D. J. Harding, and J. B. Blair, NASA Goddard Space Flight Center, Greenbelt, MD; D. Rabine, SSIA, Greenbelt, MD; and D. B. Coyle, American University, Greenbelt, MD
- 11:27-11:51 *Wind Lidar Science Mission as an International Space Station Attached Payload*  
Robert Atlas, NASA Goddard Space Flight Center, Greenbelt, MD
- 11:51-12:15 *Cloud and Radiation Mission with Active and Passive Sensing from the Space Station*  
James D. Spinhirne, NASA Goddard Space Flight Center, Greenbelt, MD

## [B08] MINIATURIZATION TECHNOLOGIES – I

WEDNESDAY, FEBRUARY 3, 10:15 am – 12:15 pm, Sendero Ballroom II

### John Comtois, Chair

Air Force Research Laboratory  
Kirtland AFB, NM

### Leon Alkalai, Co-Chair

Jet Propulsion Laboratory  
Pasadena, CA

#### TIME

- 10:15-10:39 *Miniature Star Tracker using AFRL Silicon Eye*  
Natalie Clark, Air Force Research Laboratory, Kirtland AFB, NM
- 10:39-11:03 *Optimized Micromirror Arrays for Adaptive Optics*  
M. Adrian Michalick, University of Colorado, Boulder, CO; John H. Comtois, Air Force Research Laboratory, Kirtland AFB, NM; and Dale L. Hetherington, Sandia National Laboratories, Albuquerque, NM
- 11:03-11:27 *High Speed Spin Valve Magnetoresistive Isolated Signal Transceiver*  
R. Virgil Otero, Air Force Research Laboratory, Kirtland AFB, NM, and Erik H. Lange, Nonvolatile Electronics, Inc., Eden Prairie, MN
- 11:27-11:51 *Sensor Node Development of a Low Power, High Data Rate Multi-Parameter Sensor (MPS) System*  
Sherwin Amimoto, Brett Brown, Eric Fournier, Jon Osborn, Bruce Weiller, Brice Williams, and Ernest Yohnsee, The Aerospace Corporation, Los Angeles, CA

## MARS '98 CPL – LESSONS LEARNED ROUNDTABLE DISCUSSIONS

WEDNESDAY, FEBRUARY 3, 10:15 am – 12:15 pm, Enchantment Ballroom E & F

### Ted Swanson, Chair

NASA Goddard Space Flight Center  
Greenbelt, MD

### Ad Delil, Chair

National Aerospace Laboratory, Space Division  
Emmeloord, Netherlands

## [D04] COMMERCIALIZATION OF LAUNCH SYSTEMS

WEDNESDAY, FEBRUARY 3, 10:15 am – 12:15 pm, Enchantment Ballroom A & B

### Gerald N. Stenovec, Chair

Boeing Information Defense & Space Group  
Seal Beach, CA

#### TIME

- 10:15-10:39 *Scheduled vs. On-Demand Service for a Fast Package Delivery System*  
Jared Martin, Anand Karasi, and Dylan Glas, Massachusetts Institute of Technology, Cambridge, MA; Kurt Palmer, Adroit Systems, Alexandria, VA; and Martin Chan, Stanford University, Stanford, CA
- 10:39-11:03 *A Process to Help Assure Successful Commercial Space Ventures*  
Sam K. Mihara, Mihara Associates, Huntington Beach, CA
- 11:03-11:27 *Economic Considerations of Two-Stage vs. Single Stage Launch Systems*  
Dana G. Andrews, Boeing Information, Space and Defense Systems, Seal Beach, CA

- 11:27-11:51 ***Athena Alternative Launch Site Selection***  
Stein Cass, Ball Aerospace and Technologies Corp., Boulder, CO, and Richard M. Schooff, US Air Force Academy, CO
- 11:51-12:15 ***ROCKOT – The Commercial Answer to Small and Medium Satellite Launch Requirements***  
P. Schiebener, P. Freeborn, M. Kinnersley, EUROCKET Launch Services GbH, Bremen, Germany

**[E07] SAFETY AND LAUNCH APPROVAL PROCESS**

WEDNESDAY, FEBRUARY 3, 10:15 am – 12:15 pm, Fiesta Rooms I & II

**Lyle L. Rutger, Chair**

U. S. Department of Energy  
Germantown, MD

**Joseph A. Sholtis, Jr., Co-Chair**

Sholtis Engineering & Safety Consulting  
Tijeras, NM

**TIME**

- 10:15-10:39 ***Evolving the Launch Approval Process***  
Jonathan Stabb, NASA Kennedy Space Center, Kennedy Space Center, FL
- 10:39-11:03 ***Analysis of the Inadvertent Reentry of the Cassini Spacecraft's Radioisotope Thermoelectric Generators***  
James E. Daywitt, Daniel J. Vacek, William R. Letts, and E. Wayne Tobery, Lockheed Martin King of Prussia, PA, and Bilal A. Bhutta, AeroTechnologies, Inc., Yorktown, VA
- 11:03-11:27 ***Analysis of the Inadvertent Reentry of the Cassini Spacecraft's Radioisotope Thermoelectric Generators***  
Michael V. Frank, Safety Factor Associates, Inc., Encinitas, CA, and William H. Sailor, The Aerospace Corporation, El Segued, CA
- 11:27-11:51 ***Health Physics Innovations Developed During Cassini for Future Space Applications***  
Rod Nickell, Theresa Rutherford, and George Marmaro, NASA Kennedy Space Center, Kennedy Space Center, FL
- 11:51-12:15 ***ARAC's Operational Support of the Cassini Launch***  
John C. Pace and Ronald L. Baskett, Lawrence Livermore National Laboratory, Livermore, CA

**[E08] ENERGY CONVERSION: AMTEC TECHNOLOGY – II**

WEDNESDAY, FEBRUARY 3, 10:15 am – 12:15 pm, Enchantment Ballroom C & D

**Robert Sievers, Chair**

Advanced Modular Power Systems, Inc.  
Ann Arbor, MI

**Mark Underwood, Co-Chair**

Jet Propulsion Laboratory  
Pasadena, CA

**TIME**

- 10:15-10:39 ***AMTEC Electrode Performance Modelling***  
M. L. Homer, M. A. Ryan, R. M. Williams, V. B. Shields, L. Lara, and R. H. Cortez, Jet Propulsion Laboratory, Pasadena, CA
- 10:39-11:03 ***Thermal Characteristics of a Single Tube AMTEC Cell***  
S. Wright, V. B. Shields, K. Manatt, R. Cortez, M. A. Ryan, and R. M. Williams, Jet Propulsion Laboratory, Pasadena, CA
- 11:03-11:27 ***Experimental Investigation of Multi-AMTEC Cell Ground Demonstration Converter Systems Based on PX-3 and PX-5 Series AMTEC Cells***  
John M. Merrill, Nichols Research Corporation, Albuquerque, NM, and Clay Mayberry, Air Force Research Laboratory, Kirtland AFB, NM
- 11:27-11:51 ***Generalized AMTEC Cell Design via Temperature and Pressure-Defined Parameters***  
Terry Hendricks, Advanced Modular Power Systems, Ann Arbor, MI

**[A13] SPACE SCIENCES ON THE ISS - V**

WEDNESDAY, FEBRUARY 3, 1:15 pm – 3:15 pm, Sendero Ballroom I

**Eun-Suk Seo, Co-Chair**

University of Maryland  
College Park, MD

**Giorgio Palumbo, Co-Chair**

University of Bologna  
Bologna, Italy

**TIME**

- 1:15-1:39 ***Grand Observatories and Multiple-OWL for High Energy Neutrino Astrophysics***  
Yoshiyuki Takahashi, John O. Dimmock, Lloyd W. Hillman, James B. Hadaway, David J. Lamb, and Mamoru Mohri, University of Alabama, Huntsville, AL, and Toshikazu Ebisuzaki, Computational Science Laboratory, Saitama, Japan
- 1:39-2:03 ***A Lobster-Eye on the X-Ray Sky***  
A. G. Peele, W. Zhang, K. C. Gendreau, R. Petre, and N. E. White, NASA Goddard Space Flight Center, Greenbelt, MD
- 2:03-2:27 ***Developing a Space Radiation Simulation and Analysis Package***  
Lawrence Pinsky, University of Houston, Houston, TX; Federico Carminati, CERN-EP Division, Geneva, Switzerland; Rene Brun, CERN-IP Division, Geneva, Switzerland; Alfredo Ferrari and Paola Sala, Istituto Nazionale di Fisica Nucleare, Milan, Italy; Alan Sill, Texas Tech University, Lubbock, TX; and Gautam Badhwar, Jane MacGibbon, and Thomas Wilson, NASA Johnson Space Center, Houston, TX
- 2:27-2:51 ***Cosmic Dust Intact Capture Experiment***  
Peter Tsou, Jet Propulsion Laboratory, Pasadena, CA
- 2:51-3:15 ***Astrobiology Experiments in Earth Orbits***  
T. Saito, Japan

**[A14] EARTH SCIENCES AND REMOTE SENSING ON THE ISS - IV: SURFACE OBSERVATIONS**

WEDNESDAY, FEBRUARY 3, 1:15 pm – 3:15 pm, Sendero Ballroom III

**Jack Kaye, Co-Chair**

NASA Headquarters  
Washington, DC

**George May, Co-Chair**

NASA Stennis Space Center  
Stennis Space Center, MS

**TIME**

- 1:15-1:39 ***Russian Earth Science Research Program on ISS***  
N. A. Armand and Yu. G. Tishchenko, Institute of Radioengineering and Electronics RAS, Moscow, Russia
- 1:39-2:03 ***Advanced Fire Observation by the Intelligent Infrared Sensor Prototype FOCUS on the International Space Station***  
D. Oertel, P. Haschberger, V. Tank, and F. Lanzl, DLR-Institute of Optoelectronics, Wessling, Germany; H. Jahn, K. Briess, E. Lorenz, and H.-P. Roeser, DLR-Institute of Space Sensor Technology, Berlin, Germany; A. Ginati and C. Tobehn, OHB-System GmbH, Bremen, Germany; J. Schulte in den Bäumen and U. Christmann, Carl Zeiss, Oberkochen, Germany; and B. Zhukov, Space Research Institute, Moscow, Russia
- 2:03-2:27 ***Next Generation SAR Demonstration on Space Station***  
Wendy Edelstein, Yunjin Kim, Anthony Freeman, and Rolando Jordan, Jet Propulsion Laboratory, Pasadena, CA
- 2:27-2:51 ***Potential for Remote Sensing of Agriculture from the International Space Station***  
George W. Morgenthaler and Nader Khatib, University of Colorado, Boulder, CO
- 2:51-3:15 ***EarthKAM***  
Katie Jacikas, University of California, La Jolla, CA

**[B09] MINIATURIZATION TECHNOLOGIES – II**

WEDNESDAY, FEBRUARY 3, 1:15 pm – 3:15 pm, Sendero Ballroom II

**John Comtois, Chair**

Air Force Research Laboratory  
Kirtland AFB, NM

**Leon Alkalai, Co-Chair**

Jet Propulsion Laboratory  
Pasadena, CA

**TIME**

- 1:15-1:39 ***Optical Interconnects for Space Applications***  
H. Schöne, A. H. Paxton, and E. W. Taylor, Air Force Research Laboratory, Kirtland AFB, NM
- 1:39-2:03 ***Recent Progress in Cutting Edge Packaging Technology at AFRL***  
James C. Lyke, Air Force Research Laboratory, Kirtland AFB, NM
- 2:03-2:27 ***Technology Transfer of Military Space Microprocessor Developments***  
C. Gordon and D. King, Air Force Research Laboratory, Kirtland AFB, NM; L. Byington, The Aerospace Corporation, Albuquerque, NM; and D. Lanza, Maxwell Technologies, Albuquerque, NM
- 2:27-2:51 ***Avionics Systems on a Chip for Space Exploration***  
Leon Alkalai and Elizabeth Kolawa, Jet Propulsion Laboratory, Pasadena, CA

**[C05] FUTURE MICROGRAVITY THERMOPHYSICS R&D**

WEDNESDAY, FEBRUARY 3, 1:15 pm – 3:15 pm, Enchantment Ballroom E & F

**Ad Delil, Chair**

National Aerospace Laboratory NLR, Space Division  
Emmeloord, Netherlands

**Thomas Reinarts, Co-Chair**

United Technologies  
Kennedy Space Center, FL

**TIME**

- 1:15-1:39 ***Development and Analysis of Control Methods of the International Space Station “ALPHA” Russian Segment Central Two-Phase Thermal Control System Parameters***  
V. M. Cykhotsky, A. N. Sementsov, Y. I. Grigoriev, and Y. M. Prokhorov, Rocket-Space Corporation “ENERGIA,” Coroliov, Russia, and G. A. Gorbenko, C. A. Malukhin, and E. P. Ganja, Kharkov Aviation Institute, Kharkov, Ukraine
- 1:39-2:03 ***Japanese-US Thermal Science Accelerometer Project (JUSTSAP)***  
Robert J. Naumann and Glen Haulenbeek, University of Alabama, Consortium for Materials Development in Space, Huntsville, AL
- 2:03-2:27 ***Microgravity Measurement of the Soret Coefficients in Oil for an Improved Reservoir Compositional Grading Modeling***  
Ph. Georis and J. C. Legros, Université Libre de Bruxelles, Microgravity Research Center, Brussels, Belgium, and F. Montel, EIF Exploration Production, Cedex, France
- 2:27-2:51 ***The Study of Passive Flow Control Device Performance at Low Inlet Subcooling***  
S. G. Liou, I. Y. Chen, and S. K. Chang, National Yunlin University of Science and Technology, Yunlin, Taiwan
- 2:51-3:15 ***Spatialisation of Flow Metering Assemblies for Spacecraft Thermal Control and Propellant Systems***  
A. A. M. Delil, National Aerospace Laboratory NLR, Space Division, Emmeloord, Netherlands

## [D05] ADVANCED/NOVEL CONCEPTS

WEDNESDAY, FEBRUARY 3, 1:15 pm – 3:15 pm, Enchantment Ballroom A & B

### J. Larry Hunt, Chair

NASA Langley Research Center  
Hampton, VA

### Don Stava, Co-Chair

Air Force Research Laboratory  
Wright-Patterson AFB, OH

#### TIME

- 1:15-1:39 ***Mach 10 Dual Role Vehicle Concept***  
Lee Scuderi and George Orton, The Boeing Company, Berkeley, MO
- 1:39-2:03 ***Portable Neural Flight Control System for Hypersonic and Earth-to-Orbit Vehicles Transportation***  
Chad Cox and Richard Saeks, Accurate Automation Corporation, Chattanooga, TN
- 2:03-2:27 ***Electromagnetic Wave Momentum Transmission Propulsion***  
Noriki Iwanaga, Ibaraki, Japan
- 2:27-2:51 ***Oscillatory Trajectory Assessment for Hypersonic Cruise***  
Gregory Moster, NASA Langley Research Center, Hampton, VA
- 2:51-3:15 ***The Reusable First Stage (RFS) Vehicle – An Enabler for Future Launch Systems***  
Robert B. Spencer, Lockheed Martin Astronautics, Denver, CO

## [E09] ADVANCED RADIOISOTOPE POWER SYSTEMS

WEDNESDAY, FEBRUARY 3, 1:15 pm – 3:15 pm, Fiesta Rooms I & II

### Lisa Herrera, Chair

U. S. Department of Energy  
Germantown, MD

### Richard Hemler, Co-Chair

Lockheed Martin Astronautics  
Philadelphia, PA

#### TIME

- 1:15-1:39 ***Conceptual Design for an Advanced Radioisotope Power System***  
Robert D. Cockfield and R. Anthony Kull, Lockheed Martin Astronautics, King of Prussia, PA
- 1:39-2:03 ***Performance of SiGe RTG Power Sources on Planetary Spacecraft***  
Edward Kelly, Lockheed Martin Corporation, Philadelphia, PA
- 2:03-2:27 ***Coated Particle Fuel for Radioisotope Power Systems (RPSs) and Radioisotope Heater Units (RHUs)***  
Joseph A. Sholtis, Jr., Sholtis Engineering & Safety Consulting, Tijeras, NM; Ronald J. Lipinski, Sandia National Laboratories, Albuquerque, NM; and Mohamed S. El-Genk, University of New Mexico, Institute for Space and Nuclear Power Studies, Albuquerque, NM
- 2:27-2:51 ***Radioisotope Power System Based on Improved Derivative of Existing Stirling Engine and Alternator***  
Alfred Schock, Chuen Or, and Vasanth Kumar, Orbital Sciences Corporation, Germantown, MD

## [E10] ENERGY CONVERSION: TERRESTRIAL APPLICATIONS OF SPACE TECHNOLOGY

WEDNESDAY, FEBRUARY 3, 1:15 pm – 3:15 pm, Enchantment Ballroom C & D

### Dmitry V. Paramonov, Chair

Westinghouse Electric Co.  
Pittsburgh, PA

### Gary O. Fitzpatrick, Co-Chair

Space Power, Inc.  
San Jose, CA

#### TIME

- 1:15-1:39 ***Development of Power Devices Based on Lyophobic Working Bodies***  
A. P. Sorokin, A. G. Portianoy, E. N. Serdun, V. S. Egorov, A. N. Moliavkin, and G. A. Portianoy, State Scientific Center of Russian Federation Institute of Physics and Power Engineering, Kaluga Region, Russia
- 1:39-2:03 ***TEC Rectifier – A New Possible Terrestrial Application of the Thermionic Converters***  
Artemy M. Martsinovskiy, A. F. Ioffe Physical-Technical Institute of RAS, St. Petersburg, Russia
- 2:03-2:27 ***Plasma Switch with Developed Emitter***  
Alexandr N. Andronov, Sergey A. Voronin, and Valentin K. Shigalev, St. Petersburg State Technical University, St. Petersburg, Russia, and Artemy M. Martsinovskiy, Fazlitdin N. Rasulov, and Igor I. Stolyarov, A. F. Ioffe Physical-Technical Institute of RAS, St. Petersburg, Russia
- 2:27-2:51 ***Progress in the Development of High Efficiency Segmented Thermoelectric Generators***  
T. Caillat, J.-P. Fleurial, G. J. Snyder, A. Zoltan, D. Zoltan, and A. Borshchevskiy, Jet Propulsion Laboratory, Pasadena, CA
- 2:51-3:15 ***Terrestrial Solar Power System Based on Cs-Ba Thermionic Converter***  
A. Ya. Ender, V. I. Kuznetsov, and V. I. Sitnov, Ioffe Physico-Technical Institute, St. Petersburg, Russia; E. M. Kushner and E. P. Malamed, LOMO, St. Petersburg, Russia; and D. V. Paramonov, Westinghouse Science and Technology Center, Pittsburgh, PA

## [A15] GRAVITATIONAL BIOLOGY ON THE ISS

WEDNESDAY, FEBRUARY 3, 3:30 pm – 5:30 pm, Sendero Ballroom I

**Gary Jahns, Co-Chair**

NASA Ames Research Center  
Moffett Field, CA

### TIME

- 3:30-3:54 ***NASA's Gravitational Biology Research Laboratory for the International Space Station***  
George L. Sarver III, Robert P. Hanel, and John J. Givens, NASA Ames Research Center, Moffett Field, CA
- 3:54-4:18 ***New Approaches to Space Station Science Operations***  
Bonnie P. Dalton, NASA Ames Research Center, Life Sciences Division, Moffett Field, CA; Gary C. Jahns, NASA Ames Research Center, Gravitational Biology and Ecology Programs, Moffett Field, CA; and Randall W. Berthold, NASA Ames Research Center, Science Payloads Operations Branch, Moffett Field, CA
- 4:18-4:42 ***Development of Resistance to Chemical Disinfection by Pseudomonas aeruginosa during Long-Term Space Flight***  
George L. Marchin, Kansas State University, Biology and Bioserve Space Technologies, Manhattan, KS
- 4:42-5:06 ***Microgravity Study of In Vivo Formation of Calcium Oxalate Crystals in Higher Plants and its Commercial Potential***  
Norman A. Draeger, University of Wisconsin-Madison, Center for Space Automation and Robotics, Madison, WI
- 5:06-5:30 ***Reproduction on Orbit by Plants in the Brassicaceae Family***  
Mary E. Musgrave, Anxiu Kuang, Ying Xiao, and Sharon W. Matthews, Louisiana State University, Louisiana Agricultural Experiment Station, Baton Rouge, LA

## [A16] INNOVATIVE APPROACHES TO COMMERCIAL ACTIVITIES ON THE INTERNATIONAL SPACE STATION: WHAT CAN THE PRIVATE SECTOR DO?

WEDNESDAY, FEBRUARY 3, 3:30 pm – 5:30 pm, Sendero Ballroom III

**J. Jeffrey Irons, Co-Chair**

The Boeing Company  
Huntsville, AL

**Michael Kearney, Co-Chair**

SPACEHAB, Inc.  
College Station, TX

### TIME

- 3:30-3:54 **TOPIC I – ISS Commercial Market Development: Two Views of the Big Picture**  
(a) ***The International Space Station: A Flagship of the Space Industry, the Leading Sector of the 21<sup>st</sup> Century?***  
Burkard Bratke, Space Utilization, Bremen, Germany  
(b) ***Commercial ISS Utilization Market Environment***  
Ralph Moslener, The Boeing Company, Huntington Beach, CA
- 3:54-4:18 **TOPIC II – ISS Commercial Assessments: Two Discipline-Focused Case Studies**  
(a) ***Market Potential for Protein Crystal Growth***  
Kimberly Campbell, SPACEHAB, Inc., Houston, TX, and Mike Harrington, UAB/CMC, Birmingham, AL  
(b) ***The Venture Space Alliance Commercial Application of Microgravity Research***  
Dave Whitton, Spar Space Systems, Quebec, Canada
- 4:18-4:42 **TOPIC III – ISS as a Staging/Service Area for Commercial Users: Two Case Studies on Free Flyers**  
(a) ***The International Space Station As a Free Flyer Servicing Node***  
Jeffrey Antol, NASA Langley Research Center, Hampton, VA, and David E. Headley, The Boeing Company, Titusville, FL  
(b) ***Commercial Wake Shield Facility Space Laboratory***  
Mike Chewing, SPACEHAB, Inc., Huntsville, AL, and Mark Sterling, University of Houston, Space Vacuum Epitaxy Center, Houston, TX
- 4:42-5:06 **TOPIC IV – Opportunities in Education Derived from the ISS**  
(a) ***The International Space Station: An Opportunity for Industry-Sponsored Global Education***  
Cathleen E. Shields, The Boeing Company, Titusville, FL  
(b) ***S\*T\*A\*R\*S – Utilizing Space and Space Research for Educational Initiatives***  
Kimberly A. Campbell, SPACEHAB, Inc., Houston, TX
- 5:06-5:30 **TOPIC V – Opportunities in Education Derived from the ISS (Part 2), including an Innovative Concept from the World of Art**  
(a) ***Corporate Sponsored Education Initiatives on Board the ISS***  
Ian T. Durham, SAIC/GSC, Beltsville, MD; Alyson S. Durham, Crofton, MD; James A. Pawelczyk, Pennsylvania State University, University Park, PA; Lawrence D. Brod, Queens Teacher Center, Long Island City, NY; and Thomas F. Durham, Iroquois Central High School, Elma, NY  
(b) ***Art Module “MICHELANGELO” A Private Sector Initiative to Promote Art on the ISS***  
Charles Wilp, Art and Space, Düsseldorf, Germany, and Burkhard Bratke, INTOSPACE GmbH, Hannover, Germany

## [B10] SPACE WEATHER

WEDNESDAY, FEBRUARY 3, 3:30 pm – 5:30 pm, Sendero Ballroom II

**Bill Blumberg, Chair**

Air Force Research Laboratory  
Hanscom AFB, MA

### TIME

- 3:30-3:54 ***Air Force Space Radiation and Plasma Models***  
G. Ginet, R. Hilmer, S. Gussenhoven, and D. Brautigam, Air Force Research Laboratory, Hanscom AFB, MA
- 3:54-4:18 ***Specification and Forecast of Ionospheric Disturbances that Disrupt Satellite Communications, Navigation, and Surveillance Systems***  
E. J. Weber, K. M. Groves, S. Basu, and M. C. Smitham, Air Force Research Laboratory, Hanscom AFB, MA
- 4:18-4:42 ***Infrared Background Models***  
W. Blumberg, L. Jeong, G. Anderson, and R. Shipman, Air Force Research Laboratory, Hanscom AFB, MA
- 4:42-5:06 ***Solar and Interplanetary Observations: The Key to Space Weather Forecasting***  
S. Keil, D. Neidig, R. Altmock, S. Kahler, R. Radick, P. Wiborg, and G. Ginet, Air Force Research Laboratory, Hanscom, AFB, MA
- 5:06-5:30 ***The Midcourse Space Experiment (MSX): Selected MWIR Terrestrial and Earth Limb Background Measurements***  
Robert R. O'Neil, Harold A. B. Gardiner, and James J. Gibson, Air Force Research Laboratory, Hanscom AFB, MA

## [C06] EMERGING PHYSICS TOWARD HYPER-FAST SPACE TRAVEL-I

WEDNESDAY, FEBRUARY 3, 3:30 pm – 5:30 pm, Enchantment Ballroom E & F

**Catherine Asaro, Chair**

Molecudyne Research  
Columbia, MD

**Claudio Maccone, Co-Chair**

Alenia Spazio  
Torino, Italy

### TIME

- 3:30-3:54 ***Superluminal Signal Velocity***  
Günter Nimtz, Universität zu Köln, Köln, Germany
- 3:54-4:18 ***Experimental Evidence of Superluminal Velocities in Astrophysics and Proposed Experiments***  
Simone Giani, CERN, European Organization for Nuclear Research, Geneva, Switzerland
- 4:18-4:42 ***Front Propagation in Tunneling Processes***  
M. Buttiker, University of Geneva, Geneva, Switzerland
- 4:42-5:06 ***How to Build a Space Machine?***  
Serguei Krasnikov, The Central Astronomical Observatory at Pulkovo, St. Petersburg, Russia
- 5:06-5:30 ***Telecommunications with a Relativistic Spacecraft Optimized via the Karhunen-Loève Transform (KLT)***  
Claudio Maccone, Alenia Spazio, Torino, Italy

## [D06] NEXT GENERATION LAUNCH SYSTEMS SPECIAL SESSION - I

WEDNESDAY, FEBRUARY 3, 3:30 pm – 5:30 pm, Enchantment Ballroom A & B

## [E11] THERMAL TO ELECTRIC CONVERSION TECHNOLOGIES

WEDNESDAY, FEBRUARY 3, 3:30 pm – 5:30 pm, Fiesta Rooms I & II

**James E. Dudenhofer, Chair**

NASA Lewis Research Center  
Cleveland, OH

**Richard K. Shaltens, Co-Chair**

NASA Lewis Research Center  
Cleveland, OH

### TIME

- 3:30-3:54 ***Technology Demonstration of a Free-Piston Stirling Advanced Radioisotope Space Power System***  
Maurice A. White, Songgang Qiu, Ronald W. Olan, and Raymond M. Erbeznik, Stirling Technology Company, Kennewick, WA
- 3:54-4:18 ***Design and Analysis Code for Stirling Power System Radiators with GPHS (General Purpose Heat Sources) for Deep Space Probes***  
Albert J. Juhasz and Lanny G. Thieme, NASA Lewis Research Center, Cleveland, OH
- 4:18-4:42 ***Technology Projections for Solar Dynamic Power***  
Lee S. Mason, NASA Lewis Research Center, Cleveland, OH
- 4:42-5:06 ***800 Hours of Operation Experience from a 2 Kwe Solar Dynamic System***  
Richard K. Shaltens and Lee S. Mason, NASA Lewis Research Center, Cleveland, OH

**[E12] THERMIONIC TECHNOLOGY AND APPLICATIONS – I**  
WEDNESDAY, FEBRUARY 3, 3:30 pm – 5:30 pm, Enchantment Ballroom C & D

**Les Begg, Chair**  
General Atomics  
San Diego, CA

**Yuri Nikolaev, Co-Chair**  
Research Institute of SIA LUCH  
Podolsk, Russia

**TIME**

- 3:30-3:54 ***Results from the Microminiature Thermionic Converter Demonstration Testing Program***  
Donald B. King and Francis J. Wyant, Sandia National Laboratories, Albuquerque, NM, and James R. Luke, New Mexico Engineering Research Institute, Albuquerque, NM
- 3:54-4:18 ***Characterization of Sputter Deposited Thin Film Scandate Cathodes for Miniaturized Thermionic Converter Applications***  
Kevin R. Zavadil, Judith H. Ruffner, and Donald B. King, Sandia National Laboratories, Albuquerque, NM
- 4:18-4:42 ***Development of the Oxygenated Thermionic Energy Converters Utilizing the Sputtered Metal Oxides as a Collector***  
Ryuzo Fukuda, Yasuhiro Kasuga, Ken Kato, and Sadaaki Shimizu, Electrotechnical Laboratory, Ibaraki, Japan
- 4:42-5:06 ***Evaluation of Oxygen-Dispensing Collectors for Thermionics***  
Jean-Louis Desplat, General Atomics, San Diego, CA
- 5:06-5:30 ***Design of Conductively Coupled Multi-Cell Thermionic Fuel Element***  
Holger Streckert, Lester Begg, and Daniele Pelessone, General Atomics, San Diego, CA

## TECHNICAL SESSIONS

### THURSDAY, FEBRUARY 4, 1999

**[A17] BIOMEDICAL RESEARCH ON THE ISS**  
THURSDAY, FEBRUARY 4, 8:00 am – 10:00 am, Sendero Ballroom I

**Charles Sawin, Co-Chair**  
NASA Johnson Space Center  
Houston, TX

**Suzanne Schneider, Co-Chair**  
NASA Johnson Space Center  
Houston, TX

**TIME**

- 8:00-8:24 ***The Human Research Facility***  
Dennis Grounds, NASA Johnson Space Center, Houston, TX
- 8:24-8:48 ***Analysis of Biological Biomarkers by Miniature TOF Mass Spectrometry***  
Richard S. Potember, Johns Hopkins University, Applied Physics Laboratory, Laurel, MD
- 8:48-9:12 ***Diagnostic Ultrasound and Telemedicine Utilization in the International Space Station***  
Stephen J. Carter, Brent K. Stewart, Martin J. Kushmerick, Steve G. Langer, Udo P. Schmiedl, Thomas C. Winter, Kevin E. Conley, and Sharon A. Jubrias, University of Washington, School of Medicine, Seattle, WA
- 9:12-9:36 ***Portable Real Time Neutron Spectrometry***  
R. H. Maurer, D. R. Roth, R. Fainchtein, J. O. Goldsten, and J. D. Kinnison, The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD and A. K. Thompson, NIST, Gaithersburg, MD
- 9:36-10:00 ***Applying Lessons Learned to Enhance Human Performance and Reduce Human Error for ISS Operations***  
William R. Nelson, Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID

**[A18] ENGINEERING RESEARCH AND TECHNOLOGY DEVELOPMENT: ISS AS AN ENGINEERING TESTBED**  
THURSDAY, FEBRUARY 4, 8:00 am – 10:00 am, Sendero Ballroom III

**Frank Buzzard, Co-Chair**  
NASA Johnson Space Center  
Houston, TX

**David Boyle, Co-Chair**  
Texas A&M University  
College Station, TX

**TIME**

- 8:00-8:24 ***ISS Evolution Strategy***  
Jeffrey Antol, NASA Langley Research Center, Hampton, VA
- 8:24-8:48 ***Consideration of Adding a Commercial Module to the International Space Station***  
J. Friefeld, D. Fugleberg, J. Patel, and G. Subbaraman, The Boeing Company, Canoga Park, CA
- 8:48-9:12 ***Optical Communication Demonstration and High-Rate Link Facility***  
John Sandusky, Muthu Jeganathan, Gerry Ortiz, Abi Biswas, Shinhak Lee, Keith Wilson, George Parker, and James Lesh, Jet Propulsion Laboratory, Pasadena, CA

- 9:12-9:36 ***An Engineering Research Testbed for Photovoltaics***  
Geoffrey A. Landis, Ohio Aerospace Institute, NASA Lewis Research Center, Cleveland, OH, and Andrew Sexton, Dynacs, Inc., Brook Park, OH
- 9:36-10:00 ***Testbed Space Station: Competitive Advantage for Commercial Satellite Equipment Supplier***  
Juergen K. vonder Lippe, INTOSPACE GmbH, Hannover, Germany

### [B11] SPACE PROTECTION – I

THURSDAY, FEBRUARY 4, 8:00 am – 10:00 am, Sendero Ballroom II

#### R. Virgil Otero, Chair

Air Force Research Laboratory  
Kirtland AFB, NM

#### Steve Pearson, Co-Chair

NASA Marshall Space Flight Center  
Huntsville, AL

#### TIME

- 8:00-8:24 ***Commercial Radiation-Tolerant Deep Sub-Micron Microelectronics***  
Steven Clark, Air Force Research Laboratory, Kirtland AFB, NM
- 8:24-8:48 ***Compact Environmental Anomaly Sensor (CEASE): A New Spacecraft Instrument for the Measurement of the Local Space Environment***  
B. K. Dichter, G. Ginet, and M. S. Gussenhoven, Air Force Research Laboratory, Hanscom AFB, MA; J. O. McGarity, M. R. Oberhardt, D. J. Sperry, A. C. Huber, and J. A. Pantazis, Amptek, Inc., Bedford, MA; V. T. Jordanov, Yantra, LLC, Durham, NH; and E. G. Mullen, Assurance Technology Corporation, Carlisle, MA
- 8:48-9:12 ***Space Protection Materials***  
Jill E. Johnson, Air Force Research Laboratory, Wright-Patterson AFB, OH
- 9:12-9:36 ***Satellite Threat Warning/Attack Reporting***  
David H. Hilland, Air Force Research Laboratory, Kirtland AFB, NM

### [C07] EMERGING PHYSICS TOWARD HYPER-FAST SPACE TRAVEL-II

THURSDAY, FEBRUARY 4, 8:00 am – 10:00 am, Enchantment Ballroom E & F

#### Catherine Asaro, Chair

Molecudyne Research  
Columbia, MD

#### Claudio Maccone, Co-Chair

Alenia Spazio  
Torino, Italy

#### TIME

- 8:00-8:24 ***Theory of the Common Field***  
Luca Pinter, Vipiteno(Bz), Italy
- 8:24-8:48 ***On the Mass of Empty Space (An Experiment Proposed)***  
D. J. Kroeger, The Boeing Company, Patuxent River, MD
- 8:48-9:12 ***Fast Space Travel by Vacuum Zero-Point Field Perturbations***  
H. D. Froning, Jr., Flight Unlimited, Flagstaff, AZ
- 9:12-9:36 ***Superluminal Energy and Information Transport?***  
A. A. Stahlhofen and H. Druxes, University of Koblenz, Institute of Physik, Koblenz, Germany
- 9:36-10:00 ***On the Application of the Kramers—Kronig Relations to the Barrier Interaction Time Problem***  
V. Gasparian, Yerevan State University, Yerevan, Armenia, and G. Schön, Institut für Anorganische Chemie, Universität-GH Essen, Germany

### [C08] SPECIAL HEAT PIPES

THURSDAY, FEBRUARY 4, 8:00 am – 10:00 am, Enchantment Ballroom C & D

#### Jay Ochterbeck, Chair

Clemson University  
Clemson, SC

#### Marc Dubois, Co-Chair

SABCA-ADT/RDS  
Brussels, Belgium

#### TIME

- 8:00-8:24 ***Initial Characterization Results of Metal Wick Capillary Pumps***  
Charlotte Gerhart and Scott Stanley, Air Force Research Laboratory, Kirtland AFB, NM, and Donald Gluck, Nichols Research Corporation, Albuquerque, NM
- 8:24-8:48 ***Two-Phase System for an Active Thermal Control in the Case of Emergency in Space with a Loop Heat Pipe and Solid Sorption Cooler***  
A. A. Antuh, L. L. Vasiliev, and L. L. Vasiliev, Jr., Luikov Heat & Mass Transfer Institute, Minsk, Belarus
- 8:48-9:12 ***Characterization of a High Capacity, Dual Compensation Chamber Loop Heat Pipe***  
Donald Gluck, Nichols Research Corporation, Albuquerque, NM, and Charlotte Gerhart and Scott Stanley, Air Force Research Laboratory, Kirtland AFB, NM

- 9:12-9:36 ***Startup of a Titanium Wick Loop Heat Pipe***  
Donald Gluck and Charlotte Gerhart, Nichols Research, Albuquerque, NM, and Scott Stanley, Air Force Research Laboratory, Kirtland AFB, NM
- 9:36-10:00 ***Aluminum Variable-Conductive Heat Pipes of the Communication Satellites***  
V. Dvirnyi, O. Zagar, Yu. Golovanov, S. Ermilov, K. Smirnov-Vasiliev, V. Khalimanovich, A. Lekanov, G. Panov, G. Ovechkin, A. Kozlov, and F. Sinkovsky, Scientific & Production Association of Applied Mechanics (NPO PM), Krasnoyarsky Krai, Russia

### [E13] NUCLEAR SURFACE POWER SYSTEMS

THURSDAY, FEBRUARY 4, 8:00 am – 10:00 am, Fiesta Rooms I & II

#### Jack Wheeler, Chair

U. S. Department of Energy  
Germantown, MD

#### Bob Cataldo, Co-Chair

NASA Lewis Research Center  
Cleveland, OH

#### TIME

- 8:00-8:24 ***Surface Nuclear Power for Human Mars Missions***  
Lee Mason, NASA Lewis Research Center, Cleveland, OH
- 8:24-8:48 ***A Gas-Cooled Reactor Surface Power System***  
Ronald J. Lipinski, Steven A. Wright, Roger X. Lenard, and G. A. Harms, Sandia National Laboratories, Albuquerque, NM
- 8:48-9:12 ***Water-Cooled Reactor Surface Power System***  
S. A. Wright, R. X. Lenard, and R. J. Lipinski, Sandia National Laboratories, Albuquerque, NM
- 9:12-9:36 ***Multi-Megawatt Vapor Core Reactor – MHD System for Space and Surface Power Generation***  
Samim Anghaie, University of Florida, Innovative Nuclear Space Power and Propulsion Institute, Gainesville, FL
- 9:36-10:00 ***Martian Surface Reactor Shielding using Indigenous Materials***  
Mike Houts, Los Alamos National Laboratory, Los Alamos, NM

### [E14] THERMAL PROPULSION

THURSDAY, FEBRUARY 4, 8:00 am – 10:00 am, Fiesta Rooms III & IV

#### Samim Anghaie, Chair

University of Florida  
Gainesville, FL

#### Steve Richards, Co-Chair

NASA Marshall Space Flight Center  
Huntsville, AL

#### TIME

- 8:00-8:24 ***On the Validity of Field Directed Propulsion***  
Noriki Iwanaga, Ibaraki, Japan
- 8:24-8:48 ***Processing of Pseudo-Ternary Carbide Fuels for High Temperature Space Nuclear Reactors***  
Travis Knight and Samim Anghaie, University of Florida, Innovative Nuclear Space Power and Propulsion Institute, Gainesville, FL
- 8:48-9:12 ***ESCORT: A Pratt & Whitney Nuclear Thermal Propulsion and Power System for Manned Mars Missions***  
Gerald J. Feller and Russell Joyner, United Technologies, Pratt & Whitney, West Palm Beach, FL
- 9:12-9:36 ***Thermal Hydraulic Design Analysis of the Ternary Carbide Fueled Square-Lattice Honeycomb Nuclear Rocket Engine***  
Eric M. Furman, Samim Anghaie, and Gary Chen, University of Florida, Innovative Nuclear Space Power and Propulsion Institute, Gainesville, FL
- 9:36-10:00 ***Nuclear Design Analysis of Square-Lattice Honeycomb Space Nuclear Rocket Engine***  
Reza Widargo and Samim Anghaie, University of Florida, Innovative Nuclear Space Power and Propulsion Institute, Gainesville, FL

### [A19] BIOTECHNOLOGY ON THE ISS

THURSDAY, FEBRUARY 4, 10:15 am – 12:15 pm, Sendero Ballroom I

#### Neal Pellis, Co-Chair

NASA Johnson Space Center  
Houston, TX

#### Terry Johnson, Co-Chair

Kansas State University  
Manhattan, KS

#### TIME

- 10:15-10:39 ***Biotechnology Considerations for Human Colonization of Space***  
J. Milburn Jessup, University of Pittsburgh Medical Center, Pittsburgh, PA
- 10:39-11:03 ***The Bioreactor: A Model for Refining Cell and Tissue Research on the International Space Station***  
Neal R. Pellis, NASA Johnson Space Center, Houston, TX

- 11:03-11:27 ***Microgravity Studies on Cells and Tissues: from MIR to the ISS***  
Gordana Vunjak-Novakovi, Carmen Preda, Julie Bordonaro, and Lisa E. Freed, Massachusetts Institute of Technology, Cambridge, MA; Neal Pellis, NASA Johnson Space Center, Houston, TX; and Javier de Luis, Payload Systems, Inc., Cambridge, MA
- 11:27-11:51 ***The BioDyn Facility on ISS: Advancing Biomaterial Production in Microgravity for Commercial Applications***  
Niki Myers, Francis Wessling, and Marian Lewis, University of Alabama, Consortium for Materials Development in Space, Huntsville, AL; Mark Deuser, Space Hardware Optimization Technology, Floyd Knobs, IN; and C. D. Anderson, Synthecon, Inc., Houston, TX
- 11:51-12:15 ***Commercial Plant Biotechnology Facility: An Advanced Environment Control Technology Available to the Seed Industry***  
Weijia Zhou and Raymond J. Bula, University of Wisconsin, Center for Space Automation and Robotics, Madison, WI

### [B12] SPACE PROTECTION – II

THURSDAY, FEBRUARY 4, 10:15 am – 12:15 pm, Sendero Ballroom II

#### R. Virgil Otero, Chair

Air Force Research Laboratory  
Kirtland AFB, NM

#### Steve Pearson, Co-Chair

NASA Marshall Space Flight Center  
Huntsville, AL

#### TIME

- 10:15-10:39 ***Electromagnetic Shielding Effectiveness of Composite Material***  
Patrick J. Serna and Gary H. Liechty, Air Force Research Laboratory, Kirtland AFB, NM
- 10:39-11:03 ***Air Force Research Laboratory Initiatives in Space Electronics***  
Dan King, Air Force Research Laboratory, Kirtland AFB, NM
- 11:03-11:27 ***Enabling Radiation Tolerant Systems for Space***  
Bill Kauffman and Donna Hardage, NASA Marshall Space Flight Center, Huntsville, AL
- 11:27-11:51 ***Leonid 1998: Lessons Learned***  
Bill Cooke, NASA Marshall Space Flight Center, Huntsville, AL

### [C09] EMERGING PHYSICS TOWARD BREAKTHROUGH SPACECRAFT POWER

THURSDAY, FEBRUARY 4, 10:15 am – 12:15 pm, Enchantment Ballroom E & F

#### Dave Goodwin, Chair

U. S. Department of Energy  
Germantown, MD

#### F. Michael Serry, Co-Chair

Digital Instruments, Inc.  
Santa Barbara, CA

#### TIME

- 10:15-10:39 ***AIMStar: Antimatter Initiated Microfusion for Pre-cursor Interstellar Missions***  
Gerard Gaidos, Raymond A. Lewis, Kirby Meyer, Thomas Schmidt, and Gerald A. Smith, The Pennsylvania State University, Laboratory for Elementary Particle Science, University Park, PA
- 10:39-11:03 ***Energy and Thermodynamic Considerations Involving Electromagnetic Zero-Point Radiation***  
Daniel C. Cole, Boston University, Boston, MA
- 11:03-11:27 ***Unusual Properties of Conductive Rectangular Cavities in the Zero Point Electromagnetic Field: Resolving Forward's Casimir Energy Extraction Cycle Paradox***  
G. Jordan Maclay, University of Illinois, Richland Center, WI
- 11:27-11:51 ***Hybrid Nuclear Light Bulb – Nuclear-Pumped Laser Propulsion for Advanced Missions***  
G. H. Miley, University of Illinois, Fusion Studies Laboratory, Urbana, IL
- 11:51-12:15 ***Stimulated Topological Condensation of “Vapour Phase” Photons and Possible Implications for Space Power Technology***  
M. Dudziak, MODIS Corporation, Washington, DC, and M. Pitkänen, University of Helsinki, Helsinki, Finland

### [D08] LAUNCH VEHICLE TECHNOLOGIES – II

THURSDAY, FEBRUARY 4, 10:15 am – 12:15 pm, Enchantment Ballroom A & B

#### Dave Perkins, Chair

Air Force Research Laboratory  
Edwards AFB, CA

#### Jim Guerrero, Co-Chair

Air Force Research Laboratory  
Kirtland AFB, NM

#### TIME

- 10:39-11:03 ***The Space Transportation Resources (STR) Database Description***  
Jeffrey A. Sandubrae and Heather A. Roberts, Science Applications International Corporation, San Diego, CA, and C. Lee Varnado, Science Applications International Corporation, Huntsville, AL
- 11:03-11:27 ***Thermo-Mechanical Cyclic Testing of Carbon-Carbon Primary Structure for an SSTO Vehicle***  
Harold C. Croop, Kenneth B. Leger, and Holland B. Lowndes, III, Air Force Research Laboratory, Wright-Patterson AFB, OH, and Steven E. Hahn and Chris A. Barthel, The Boeing Company, Seattle, WA

- 11:27-11:51 ***Trends in Hypersonic Boundary Layer Stability and Transition Research***  
Roger L. Kimmel, Air Force Research Laboratory, Wright-Patterson AFB, OH
- 11:51-12:15 ***Non-Autoclave Processing for Large Tanks/Structures***  
Janis Brown, Air Force Research Laboratory, Wright-Patterson AFB, OH

**[E15] POWER BEAMING – I**

THURSDAY, FEBRUARY 4, 10:15 am – 12:15 pm, Fiesta Rooms I & II

**George H. Miley, Chair**  
University of Illinois  
Urbana, IL

**Dave Criswell, Co-Chair**  
University of Houston  
Houston, TX

**TIME**

- 10:15-10:39 ***Space/Lunar Solar Power Systems Research and Needs (1999)***  
David R. Criswell, University of Houston, Institute for Space Systems Operations, Houston, TX, and Robert D. Waldron, Hacienda Heights, CA
- 10:39-11:03 ***JCM: Scenarios for Space Solar Power***  
John C. Mankins, NASA Headquarters, Washington, DC
- 11:03-11:27 ***Results of Studies of the Solar Tower Reference System***  
Mike Stancati and Harvey Feingold, Science Applications International Corporation, Schaumburg, IL
- 11:27-11:51 ***Economic Market Analysis for Space Solar Power***  
Neville I. Marzwell, Jet Propulsion Laboratory, Pasadena, CA
- 11:51-12:15 ***End-to-End Space Solar Power Architecture Study***  
Harvey I. Willenberg, The Boeing Company, Downey, CA

**[E16] ENERGY CONVERSION: GENERAL**

THURSDAY, FEBRUARY 4, 10:15 am – 12:15 pm, Enchantment Ballroom C & D

**Clay Mayberry, Chair**  
Air Force Research Laboratory  
Kirtland AFB, NM

**Mohamed S. El-Genk, Co-Chair**  
University of New Mexico  
Albuquerque, NM

**TIME**

- 10:15-10:39 ***A Thermionic Converter with a Macro-Grooved Emitter and 0.5 mm GAP***  
Yoichi Momozaki and Mohamed S. El-Genk, University of New Mexico, Institute for Space and Nuclear Power Studies, Albuquerque, NM
- 10:39-11:03 ***Ground Tests of Solar HP/TES Stirling Power System for ISS-JEM Experiment Program***  
T. Hoshino, T. Fujihara, S. Ogiwara, and K. Eguchi, National Aerospace Laboratory, Tokyo, Japan, and A. Yamada and M. Fujiwara, Mitsubishi Heavy Industries, Ltd., Tokyo, Japan
- 11:03-11:27 ***Multijunction Solar Cell Space Power Technology***  
Kitt Reinhardt, Air Force Research Laboratory, Kirtland AFB, NM
- 11:27-11:51 ***A Thermal Model of the Conical Evaporator in Pluto/Express, Multitube AMTEC Cells***  
Jean-Michel Tournier and Mohamed S. El-Genk, University of New Mexico, Institute for Space and Nuclear Power Studies, Albuquerque, NM
- 11:51-12:15 ***Recommended OSC Design and Analysis of AMTEC Power System for Outer-Planet Missions***  
Alfred Schock, Heros Noravian, Chuen Or, and Vasanth Kumar, Orbital Sciences Corporation, Germantown, MD

**[A20] MATERIALS RESEARCH ON THE ISS**

THURSDAY, FEBRUARY 4, 1:15 pm – 3:15 pm, Sendero Ballroom I

**Donald Gillies, Co-Chair**  
NASA Marshall Space Flight Center  
Huntsville, AL

**Al Sacco, Co-Chair**  
Northeastern University  
Boston, MA

**TIME**

- 1:15-1:39 ***Preliminary Concepts for the Materials Science Research Facility on the International Space Station***  
Sharon D. Cobb, F. R. Szofran, and David A. Schaefer, NASA Marshall Space Flight Center, Huntsville, AL
- 1:39-2:03 ***International Space Station Microgravity Environment Design and Verification***  
Steve Del Basso, Boeing North American, Houston, TX
- 2:03-2:27 ***Thermophysical Property Measurements on International Space Station***  
R. Michael Banish and Lyle B. Jalbert, University of Alabama, Center for Microgravity and Materials Research, Huntsville, AL

- 2:27-2:51 ***Space Product Development Experiment Module Utilizing the ISS***  
Christine Watson, Charles Lundquist, Francis Wessling, James Smith, and Robert Naumann, University of Alabama, Consortium for Materials Development in Space, Huntsville, AL
- 2:51-3:15 ***ISS as a Test Bed for In-Situ Development and Use of Advanced Solar Cell Materials and Devices***  
Alexander Freundlich, Mauro Vilela, Cedric Monier, Fred Newman, Lisandro Aguiar, and Alex Ignatiev, University of Houston, Space Vacuum Epitaxy Center, Houston, TX

**[A21] ENGINEERING RESEARCH AND TECHNOLOGY DEVELOPMENT: ENGINEERING EXPERIMENTS ON THE ISS**

THURSDAY, FEBRUARY 4, 1:15 pm – 3:15 pm, Sendero Ballroom III

**Frank Buzzard, Co-Chair**  
NASA Johnson Space Center  
Houston, TX

**David Boyle, Co-Chair**  
Texas A&M University  
College Station, TX

**TIME**

- 1:15-1:39 ***Micron Accuracy Deployment Experiments (MADE): A Space Station Laboratory for Actively Controlled Precision Deployable Structures Technology***  
Lee D. Peterson and Lisa R. Hardaway, University of Colorado, Boulder, CO, and Mark S. Lake, NASA Langley Research Center, Hampton, VA
- 1:39-2:03 ***International Space Station Electrodynamic Tether Reboost***  
Les Johnson and Melody Herrmann, NASA Marshall Space Flight Center, Huntsville, AL
- 2:03-2:27 ***Analysis of the Data from a Distributed Set of Accelerometers, for Reconstruction of Set Geometry and its Rigid Body Motion***  
J. P. B. Vreeburg, National Aerospace Laboratory, The Netherlands
- 2:27-2:51 ***ISS Command and Data Handling for International Space Station Utilization on Orbit, Today and Tomorrow***  
Robert W. Mortonson, The Boeing Company, Nassau Bay, TX

**[B13] REMOTE SENSING**

THURSDAY, FEBRUARY 4, 1:15 pm – 3:15 pm, Sendero Ballroom II

**Tom Cooley, Chair**  
Air Force Research Laboratory  
Kirtland AFB, NM

**Virendra Sarohio, Co-Chair**  
Jet Propulsion Laboratory  
Pasadena, CA

**TIME**

- 1:15-1:39 ***Hyperspectral Imaging from Space: Warfighter-1***  
Thomas Cooley, Gary Seigel, and Ivan Thorsos, Air Force Research Laboratory, Kirtland AFB, NM
- 1:39-2:03 ***Releasable to Dod and Dod Contractors Only Novel Distributed Array Concept for Space Based Radar***  
John Garnham, Air Force Research Laboratory, Kirtland AFB, NM
- 2:03-2:27 ***A Quick Look at the Expected Thermal Environment Extremes for SBR LEO Concepts***  
F. M. Jonas, Air Force Research Laboratory/Nichols Research, Kirtland AFB, NM
- 2:27-2:51 ***Active Pixel Sensor Based Imager for Remote Sensing***  
B. Pain, Jet Propulsion Laboratory, Pasadena, CA

**[C10] EMERGING PHYSICS TOWARD PROPELLANTLESS PROPULSION – I**

THURSDAY, FEBRUARY 4, 1:15 pm – 3:15 pm, Enchantment Ballroom E & F

**Alan Holt, Chair**  
NASA Johnson Space Center  
Houston, TX

**Daniel C. Cole, Co-Chair**  
Boston University  
Boston, MA

**TIME**

- 1:15-1:39 ***Progress in Establishing a Connection Between the Electromagnetic Zero-Point Field and Inertia***  
Bernhard Haisch, Lockheed Martin, Solar & Astrophysics Laboratory, Palo Alto, CA, and Alfonso Rueda, California State University, Long Beach, CA
- 1:39-2:03 ***Propellantless Propulsion by Electromagnetic Inertia Manipulation: Theory and Experiment***  
Hector Hugo Brito, Instituto Universitario Aeronautico and Universidad Nacional de Rio Cuarto, Argentina
- 2:03-2:27 ***Stimulated Forces Demonstrated: Why the Trouton-Noble Experiment Failed and how to Make it Succeed***  
Patrick Cornille, Santeny, France; Jean-Louis Naudin, Samoreau, France; and Alexandre Szames, Boulogne, France
- 2:27-2:51 ***Propellantless Propulsion: Recent Experimental Results Exploiting Transient Mass Modification***  
Thomas L. Mahood, California State University, Fullerton, CA

2:51-3:15

***International Space Station Advanced Propulsion Technology R&D***

Alan C. Holt, NASA Johnson Space Center, Houston, TX

**[E17] RADIOISOTOPE POWER SYSTEM PRODUCTION**  
*THURSDAY, FEBRUARY 4, 1:15 pm – 3:15 pm, Fiesta Rooms I & II*

**Art Mehner, Chair**

U. S. Department for Energy  
Germantown, MD

**Robert Carpenter, Co-Chair**

Orbital Sciences Corporation  
Germantown, MD

**TIME**

- 1:15-1:39 ***Nitrate Anion Exchange in <sup>238</sup>Pu Aqueous Scrap Recovery Operations***  
M. E. Pansoy-Hjelvik, G. L. Silver, M. A. H. Reimus, and K. B. Ramsey, Los Alamos National Laboratory, Los Alamos, NM
- 1:39-2:03 ***Containment of Nitric Acid Solutions of Plutonium-238***  
M. A. H. Reimus, G. L. Silver, L. Pansoy-Hjelvik, and K. B. Ramsey, Los Alamos National Laboratory, Los Alamos, NM
- 2:03-2:27 ***Potential Improvements in SiGe Radioisotope Thermoelectric Generator Performance***  
Alfred L. Mowery, DOE Space Nuclear Systems (Ret.), Hilton Head Island, SC
- 2:27-2:51 ***Launch Site Radiological Emergency Response for the Cassini Mission***  
George M. Marmaro, NASA Kennedy Space Center, Kennedy Space Center, FL

**[E18] THERMIONIC TECHNOLOGY AND APPLICATIONS – II**  
*THURSDAY, FEBRUARY 4, 1:15 pm – 3:15 pm, Enchantment Ballroom C & D*

**Les Begg, Chair**

General Atomics  
San Diego, CA

**Yuri Nikolaev, Co-Chair**

Research Institute of SIA LUCH  
Podolsk, Russia

**TIME**

- 1:15-1:39 ***Thermionic Converters with Planar Electrodes for Solar Power and Propulsion Systems***  
Yuri V. Nikolaev, Alexander S. Gontar, Stanislav A. Eriymin, Oleg L. Izhvanov, Sergrei S. Kalmykov, Yuri D. Karpechenko, Valentin S. Kolesov, Vladimir U. Koroliev, Rafail Ya. Kucherov, and Nikolai V. Lapochkin, State Research Institute of Scientific Industrial Association LUTCH, Moscow Region, Russian Federation, and Thomas D. Lechtenberg and Lester L. Begg, General Atomics, San Diego, CA
- 1:39-2:03 ***Multi-Cell Thermionic Fuel Element for Nuclear Electric Power and Propulsion System***  
Yuri V. Nikolaev, Pavel V. Andrev, and Eugeny E. Zhatvliny, State Research Institute of Scientific Industrial Association LUTCH, Moscow Region, Russian Federation
- 2:03-2:27 ***Potential Distributions into Grid Mesh of Plasma Switches***  
Alexandr N. Andronov, Sergey A. Voronin, Mihail N. Lyashenko, and Valentin K. Shigalev, St. Petersburg State Technical University, St. Petersburg, Russia, and Artemy M. Martsinovsky and I. Stolyarov, A. F. Ioffe Physical-Technical Institute of RAS, St. Petersburg, Russia
- 2:27-2:51 ***Grid Design and Placement in a Cs-Ba Tacitron***  
James R. Luke, University of New Mexico, New Mexico Engineering Research Institute, Albuquerque, NM, and Mohamed S. El-Genk, University of New Mexico, Institute for Space and Nuclear Power Studies, Albuquerque, NM
- 2:51-3:15 ***Emitter Tri-Layer Technology***  
Emilio Giraldez and Jean-Louis Desplat, General Atomics, San Diego, CA

**[A22] SPECIAL TOPICS IN ISS UTILIZATION: SOME PROPOSED INDUSTRY APPROACHES**  
*THURSDAY, FEBRUARY 4, 3:30 pm – 5:30 pm, Sendero Ballroom I*

**Mario Cardano, Co-Chair**

Alenia Aerospazio  
Torino, Italy

**Mary Lynne Dittmar, Co-Chair**

The Boeing Company  
Huntsville, AL

**TIME**

- 3:30-3:54 ***International Approach to Training for the Space Station***  
Mario Cardano, Alenia Aerospazio, Torino, Italy; Mary Lynne Dittmar, The Boeing Company, Huntsville, AL; Henning Buchholz, Daimler-Benz Aerospace, Bremen, Germany; Kaoru Otsuji, Mitsubishi Heavy Industries, Ltd., Nagoya, Japan; and Jack Dueckman, Spar Aerospace Limited, Ontario, Canada
- 3:54-4:18 ***Space Operations & Training – Paradigm Shift Between Previous Manned Flights and ISS***  
John Morrow, The Boeing Company, Huntsville, AL
- 4:18-4:42 ***Standard Payload Computer for the International Space Station***  
Karl Knott, Chris Taylor, and Horst Koenig, ESA, ESTEC, Noordwijk, The Netherlands, and Uwe Schlosstein, Daimler-Benz Aerospace AG, Bremen, Germany
- 4:42-5:30 ***EXPRESS Rack Technology for Space Station***  
Ted B. Davis, J. Brian Adams, Edward M. Fisher, Jr., Guy B. Prickett, and Timothy G. Smith, The Boeing Company, Huntsville, AL

**[A23] SPACE STATION PLANNING – NASA’s SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM HIGHLIGHTS**

THURSDAY, FEBRUARY 4, 3:30 pm – 5:30 pm, Sendero Ballroom III

**Vita Cevenini, Co-Chair**

NASA Headquarters  
Washington, DC

**Helen Stinson, Co-Chair**

NASA Marshall Space Flight Center  
Huntsville, AL

**TIME**

- 3:30-3:54 ***Training Hardware Management System***  
Jerry L. Udy
- 3:54-4:18 ***Survey of Approaches for Teleoperating Flight Payloads Utilizing Internet Technology***  
James Chamberlain, AZ Technology, Inc., Huntsville, AL
- 4:18-4:42 ***Wireless Environmental Data Acquisition for the International Space Station (for Mission Flights 3A, 4A, 5A, and 7A.1)***  
Karl Kiefer and Kevin Champaigne, Invocon, Inc., Conroe, TX
- 4:42-5:06 ***Enhanced Thermal Conductance of ORU Radiant Fin Thermal Interface using Carbon Brush Materials***  
Christopher L. Seaman, Brett M. Ellman, and Timothy R. Knowles, Energy Science Laboratories, Inc., San Diego, CA
- 5:06-5:30 ***A Magnetostrictive Water Pump for Use in Extra-Vehicular Activity***  
Mike Gerver, SatCon Technology Corporation, Cambridge, MA

**[C11] EMERGING PHYSICS TOWARD PROPELLANTLESS PROPULSION – II**

THURSDAY, FEBRUARY 4, 3:30 pm – 5:30 pm, Enchantment Ballroom E & F

**Alan Holt, Chair**

NASA Johnson Space Center  
Houston, TX

**Daniel C. Cole, Co-Chair**

Boston University  
Boston, MA

**TIME**

- 3:30-3:54 ***EM Stress-Tensor Space Drive***  
James F. Corum, John P. Dering, Philip Pesavento, and Alessana Donne, SARA, Inc., Huntington Beach, CA
- 3:54-4:18 ***Non-Machian, Lorentz-Invariant Inertia: The First Step Towards the Theory of GravitoElectroMagnetism***  
Shahriar S. Afshar, IRIMS, Brookline, MA
- 4:18-4:42 ***Repulsive Force Generation Due to Topological Effect of Circulating Magnetic Fluids***  
Hideo Hayasaka, Tohoku University (Ret.), Sendai, Japan, and Yoshinari Minami, NEC Corporation, Tokyo, Japan
- 4:42-5:06 ***Reviews of Some Field Propulsion Methods from the General Relativistic Standpoint***  
Noriki Iwanaga, Ibaraki, Japan

**[E19] POWER BEAMING – II**

THURSDAY, FEBRUARY 4, 3:30 pm – 5:30 pm, Fiesta Rooms I & II

**George H. Miley, Chair**

University of Illinois  
Urbana, IL

**Dave Criswell, Co-Chair**

University of Houston  
Houston, TX

**TIME**

- 3:30-3:54 ***Synergy Between Space Solar Power Launch Options***  
Jay P. Penn, The Aerospace Corporation, Los Angeles, CA
- 3:54-4:18 ***In Situ Production of Solar Power Systems for Exploration: Potential for In Situ Rectenna Production on Mars***  
Peter A. Curreri, NASA Marshall Space Flight Center, Huntsville, AL, and David R. Criswell, University of Houston, Institute for Space Systems Operations, Houston, TX
- 4:18-4:42 ***Concept of the Power Reactor Pumped Laser for Space Energetic Needs***  
Andrey V. Gulevich, Alexander P. Barzilov, Peter P. Dyachenko, Oleg F. Kukharchuk, Eugeny A. Pashin, Victor Ya. Poupko, and Anatoly V. Zrodnikov, Federal Scientific Center, Institute for Physics and Power Engineering, Obninsk, Russia
- 4:42-5:06 ***Impulse Coupling Measurements for an ORION Demonstration***  
Claude Phipps, Photonic Associates, Santa Fe, NM; Daniel Siebert II, Robert Royse, and Micheal Lander, Anteon Corporation, Dayton, OH; Jonathan W. Campbell, NASA Marshall Space Flight Center, Huntsville, AL; and James P. Reilly, Northeast Science and Technology, East Sandwich, MA
- 5:06-5:30 ***Preliminary Demonstration of Power Beaming with Non-Coherent Laser Diode Arrays***  
Jordin T. Kare, Kare Technical Consulting, San Ramon, CA, and Fred Mitlitsky and Andrew Weisberg, Lawrence Livermore National Laboratory, Livermore, CA

**[E20] COMMERCIAL ISSUES WITH THE USE OF SPACE NUCLEAR POWER**

THURSDAY, FEBRUARY 4, 3:30 pm – 5:30 pm, Enchantment Ballroom C & D

**Roger X. Lenard, Chair**

Sandia National Laboratories

Albuquerque, NM

**TIME**

- 3:30-3:54 ***Nuclear Power System Requirements for a Commercial Lunar Base***  
Alan Binder, Lunar Research Institute, Gilroy, CA
- 3:54-4:18 ***Commercial Viability of Low Thrust Orbit to Orbit Missions***  
Jared E. Smith, The Boeing Company, Seattle, WA
- 4:18-4:42 ***Commercial Issues with the Use of Space Nuclear Power Nuclear Regulatory Needs for Commercial Space Nuclear Systems***  
Roger X. Lenard, Sandia National Laboratories, Albuquerque, NM
- 4:42-5:06 ***Aerospace Power System Automation – Using Everett Method***  
James A. Momoh and Jizhong Zhu, Howard University, Washington, DC, and James L. Dolce, NASA Lewis Research Center, Cleveland, OH
- 5:06-5:30 ***Design and Analysis of Power System Architectures for Small Spacecraft***  
James A. Momoh and Jizhong Zhu, Howard University, Washington, DC, and J. L. Dolce and Joe Nainigier, NASA Lewis Research Center, Cleveland, OH



