



ANSTD Newsletter

Nov. 29, 2010

Volume 5, Number 1

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A Word from the Chair...

Although we have been somewhat remiss in publishing a newsletter over the past year, we have been busy and have much to report!

The ANST began as an ANS Technical Group in 2001. Through the hard work and dedication of its founding members (many of whom are still active), the ANST has grown significantly in membership and activities. In June 2009 ANST was officially approved for division status, becoming the 19th professional division of the American Nuclear Society.

Some of our key activities over the past five years include:

- Organizing three highly successful embedded topical meetings – Space Nuclear Conference 2005, Space Nuclear Conference 2007, and Nuclear and Emerging Technologies for Space 2009
- Organizing the Space Applications track for the International Congress on Advances in Nuclear Power Plants (ICAPP) in 2004, 2006, and 2008
- Supporting the organization of the Space Nuclear Systems Forum (SNSF) in 2009 and 2010 (Class IV topical meetings of the ANS)
- Providing regular and strong support of student participation at the national meetings and the student conferences, including awarding the Best Student Paper (undergraduate and graduate) at the annual student conference
- Providing regular participation at national ANS Teacher's Workshops

As we move forward as a professional division, ANSTD is holding its first stand-alone topical meeting February 7-11, 2011 in Albuquerque, New Mexico. For more information on the Nuclear and Emerging Technologies for Space (NETS-2011) meeting, see pages 2-3. The NETS meeting will cover topics that were previously covered by the embedded topical meetings, the former Space Technologies and Applications International Forum (STAIF, last held in 2008, was organized by the University of New Mexico and was a Class IV topical meeting of the ANS in 2008), and the recent SNSF discussion forums. To further bolster the aerospace content in the NETS meeting, the American Institute of Aeronautics and Astronautics (AIAA) is co-sponsoring the NETS meeting.

Over the next year, we will establish peer recognition awards to highlight significant contributions from the ANSTD membership. As we continue to grow in membership and activities, we also hope to establish sufficient funding to provide student scholarships.

For these and all the activities that make for a successful division, we need an active membership. I invite you to take an active role in furthering the success of ANSTD. Please feel free to contact me or any of the members of the ANSTD Executive Committee if you can and want to assist in division activities. To help you identify the right person to contact, we have included a "Meet the Officers" section in this newsletter.

Sincerely,

Shannon Bragg-Sitton
Chair ANSTD, 2010 - 2012

Nuclear and Emerging Technologies for Space (NETS-2011)

Feb 7-10, 2011 • Albuquerque, NM • Albuquerque Marriott

The 2011 Nuclear and Emerging Technologies for Space (NETS-2011) meeting will be the first stand-alone topical meeting organized by the Aerospace Nuclear Science and Technology Division of the ANS. Sponsored by the ANS Aerospace Nuclear Science and Technology Division, the ANS Trinity Section, and co-sponsored by the American Institute of Aeronautics and Astronautics, NETS-2011 will be the premier conference covering advanced power and propulsion systems for landed and in-space applications in 2011.

The conference will host three plenary sessions, invited panels, and numerous technical sessions organized into five technical track areas:

- [1] Missions and Architectures
- [2] Fission Power and Propulsion
- [3] Radioisotope Power Systems
- [4] Nuclear Thermal Propulsion
- [5] Advanced Concepts

With authors hailing from universities, national laboratories, NASA facilities and industry, NETS-2011 will provide an excellent communications network and forum for information exchange. The full-length contributed papers are currently being reviewed and organized into sessions; please visit <http://anstd.ans.org/NETS2011.html> for more details on the meeting program as it becomes available.

Registration is still open for NETS-2011, so sign up now by going to the "Registration" tab on the conference website. Limited student travel assistance may be available. See "Student Travel Assistance" at the bottom of the Registration page to download an application form.

In addition to technical sessions, NETS-2011 will host an Expo, and all breaks will be held in the Expo area on Monday, Tuesday, and Wednesday. A few booths are still available! See the "Exhibitors and Sponsors" tab on the meeting website for more details at to see who has already registered as an exhibitor. Details on sponsoring a specific event or activity at the meeting are also available at this page; contact Ross Radel at ross.radel@phoenixnuclearlabs.com if you are interested in becoming a sponsor.

MEETING CHAIRS

Honorary General Chairs:

John Casani, *NASA Jet Propulsion Laboratory, Special Assistant to the Director*
Harold Finger, *retired, formerly held several key positions within AEC and NASA*

General Chair: Shannon Bragg-Sitton, *Idaho National Laboratory, Shannon.Bragg-Sitton@inl.gov*

General Co-Chair: Michael Houts, *NASA Marshall Space Flight Center, Michael.Houts@nasa.gov*

Technical Program Chair: Martin Sattison, *Idaho National Laboratory, Martin.Sattison@inl.gov*

Local Chair: Tracy Radel, *Sandia National Laboratories, tradel@sandia.gov*

Key Sessions & Events

MONDAY, FEBRUARY 7, 2011

8:00 – 10:00 A.M.

Opening Plenary Session

Chairs: S. Bragg-Sitton, INL and M. Houts, NASA MSFC

Key Speakers:

H. Finger, *retired, formerly held several key positions within AEC and NASA*

J. Casani, *NASA Jet Propulsion Laboratory, Special Assistant to the Director*

C. Scolese, *NASA, Associate Administrator*

R. Lange, *U.S. DOE, Deputy Assistant Secretary for Business and Technical Support*

*Aerospace
Nuclear
Science &
Technology
Division*

*A
Professional
Division of
the
American
Nuclear
Society*

MONDAY, FEBRUARY 7, 2011, cont.

10:30 A.M. – 12:30 P.M.

Plenary II: Science Missions Enabled by Nuclear Power and Propulsion

Chair / Organizer: Steve Howe, Center for Space Nuclear Research / INL

Panelists

Dr. Steven D. Howe, Center for Space Nuclear Research / INL

Dr. Ralph L. McNutt, Jr., Applied Physics Laboratory / Johns Hopkins University

Dr. Karla Clark, Jet Propulsion Laboratory / California Institute of Technology

Dr. Richard Ambrosi, University of Leicester / UK

2:00 – 4:00 P.M.

Special Session / Open Forum:

Addressing Non-Technical Challenges of Developing Space Nuclear Technology

Chair: Dr. Michael Griffin, former NASA Administrator

Mediator: Dr. Elizabeth Newton, University of Alabama at Huntsville, Policy Research Program Director

Fluctuations in space exploration goals are a significant, non-technical obstacle for the end-to-end development and implementation of nuclear and emerging technologies for space exploration. These goals are usually the premise upon which research is conducted, serving as the "foundation" from which all other "downstream" decision making stems. When goals change mid-stream, research and development progress and accomplishments may become partially or completely inapplicable with respect to the new goals. If goal fluctuations are more rapid than the time it takes for research efforts to manifest, then the capabilities the technology would have provided are not obtained. The historical record indicates a cyclic nature in these fluctuations. While research documentation can help to cumulatively build progress between cycles, in many cases at least some portion of the acquired knowledge and capability is lost during off-times, leading to a sometimes significant loss of progress.

Explicitly addressing problems stemming from these cycles could be the first step in facilitating the implementation of space nuclear systems and other technologies to completion. This session will involve description of the policy making and technical development work environments; identification of problems, their causes, and possible solutions; and discussion of possible implementation strategies.

Panelists are currently being confirmed. Check the conference website for updates.

2:00 – 4:00 P.M. Opening Dinner at the Albuquerque Marriott

(included in registration)

Keynote Address: Dr. Glen Schmidt (ret.), former SNAP-10a Test Engineer

TUESDAY, FEBRUARY 8, 2011

8:00 A.M. – 5:00 P.M. Exhibit Hall Open for Expo
Technical Sessions (all tracks)

WEDNESDAY, FEBRUARY 9, 2011

8:00 A.M. – 5:00 P.M. Exhibit Hall Open
Technical Sessions (all tracks)

6:30 P.M. – 9:00 P.M. Banquet Dinner

National Museum of Nuclear Science and History

(requires advance registration at additional cost; see

<http://anstd.ans.org/NETS2011/RegistrationNETS2011.htm> for details)

THURSDAY, FEBRUARY 10, 2011

8:00 A.M. – 12:00 P.M. Technical Sessions

1:00 P.M. – 5:00 P.M. Technical Tours at Sandia National Laboratories
(requires advance registration)

ISSUE HIGHLIGHT: Curiosity?

By Kelly Lively

MMRTG Project Manager, Idaho National Laboratory

The Mars Science Laboratory (MSL) will be launched into space in the Fall of 2011 to the Red Planet to begin a scientific mission exploring the Martian surface. The Rover, recently named Curiosity, will descend to the surface a short nine months after launch to begin collecting and analyzing surface samples. Curiosity, a robotic rover project led by NASA's Jet Propulsion Laboratory (JPL), carries a suite of 10 laboratory instruments searching for evidence of organic compounds and conditions that could have supported microbial life now or in the past. The mini-Cooper sized Rover, the largest built to date, is powered by a single Multi-Mission Radioisotope Thermoelectric Generator (MMRTG).

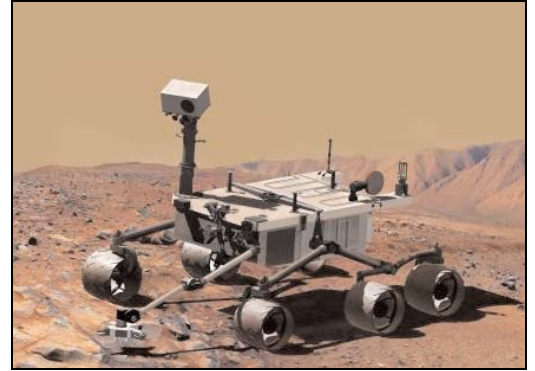


Fig. 1: Illustration, Mars Science Laboratory

This Radioisotope Power System (RPS), the first of a new design, will power the MSL platform and the scientific instruments. These power systems are used for planetary and deep-space missions where solar power is impractical. The MMRTG generates 110 watts of electrical power at beginning of mission, converting the heat produced by the radioactive decay of Plutonium Oxide fuel into electrical energy. The MSL MMRTG is in storage at the Idaho National Laboratory (INL) in Idaho where it was fueled and subjected to a series

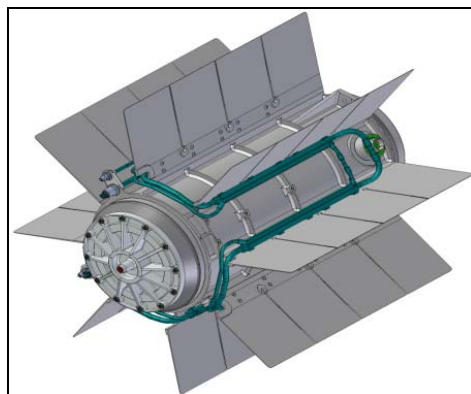


Fig.2: Illustration, MMRTG

of acceptance tests to ensure readiness for a launch environment and the robotic mission on Mars. An INL team will accompany the MMRTG to Kennedy Space Center in the Summer of 2011, where it will power the flight Rover, Curiosity, for the first time during a "hot fit check". The hot fit check is a final test of the flight components before Curiosity is placed upside down in a spacecraft, installed in a faring and stacked on an Atlas V Launch Vehicle at the Cape Canaveral Air Force Station launch site. The MMRTG will be integrated to the Rover at the launch site a few days before the launch.

Recent Studies: The Mars Hopper

The Center for Space Nuclear Research (CSNR) at the Idaho National Laboratory is pursuing development of several technologies for the exploration of space. In addition, the CSNR hosts around 15 to 20 students each summer as part of the CSNR Summer Fellows program. The students are immersed in an intensive ten-week program that allows them to assess the feasibility of new, innovative concepts originated at the CSNR.

The Mars Hopper , cont.

In the summer of 2009, the Fellows evaluated the design of a radioisotope-powered Mars Hopper. The idea entailed accumulating the heat given off by a low-level radioisotope source into a "thermal capacitor" material. During the heating of this "core", some of the heat is used to produce electrical power to operate a cryo-cooler. The cryo-cooler condenses the carbon-dioxide from the Mars atmosphere and stores the liquid CO₂ in a tank. When the tank is filled, the core is allowed to heat up to a maximum temperature. The tank is then opened and the CO₂ is used as a propellant to blow down the core and produce thrust-- both for ascent and for a powered soft landing. The results of the feasibility study showed that a small Mars Hopper could travel 5 to 10 km every 7 days for several years. As a result of the Fellows study, the CSNR has embarked on a project to build an electrically-heated prototype system that can be tested at the INL facilities.

In the summer of 2010, the CSNR Summer Fellows performed another feasibility study that utilized extended capabilities offered by the Hopper. Realizing that the Mars Hopper could accumulate small samples from all over the surface of Mars, even the hard-to-get-to but geologically interesting places, the Fellows designed a Mars Sample Return (MSR) mission. Assuming that the Hoppers can collect samples from anywhere and carry them to a central location, a MSR could then land in a safe region and still acquire samples from all over the planet. The Fellows designed a mission that utilized two small nuclear thermal rocket (NTR) engines. One engine provided the orbital transfers between the Earth and Mars. The other engine performed the descent and ascent legs of the mission. Based on their results, a single launch of an Atlas-V heavy could result in the return of 100 kgs of samples from Mars. This compares well to the 1 kg currently being discussed using chemically-propelled rockets.

The CSNR Summer Fellows program will begin taking applications for the 2011 Summer program on January 2, 2011. Please see <http://www.csnr.usra.edu>

Dr. Steven D. Howe
Director, CSNR

Space Nuclear News...

News items compiled by Paul Edelmann

Russia to start work on nuclear space engines in 2011

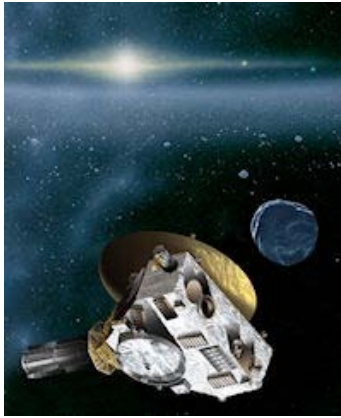
Russia is planning to start work on the development of nuclear-powered space engines next year, and their first launch could come in 2020, according to a space industry official. CEO of Energia Space Corporation Vitaly Lopota has said that the work on standardized space modules with nuclear-powered propulsion systems will begin in 2011.

"The first launches with a capacity of 150 to 500 KW nuclear engines could be made some time in 2020," Lopota was quoted as saying by RIA Novosti. According to earlier reports the project will require an estimated funding of over USD 580 million. Energia Space Corporation has also announced its readiness to design a space-based nuclear power station with a service life of 10-15 years for deployment on the moon or Mars. It is also working on a concept of a nuclear-powered space tug, which could more than halve satellite launching and orbiting costs.

Earlier, Chief of Federal Space Agency Roskosmos Anatoly Perminov had said the development of Megawatt-class nuclear space power systems (MCNSPS) for manned spacecraft was crucial if Russia wanted to maintain a competitive edge in the space race, including the lunar and Mars missions.

Since the Soviet days Russia has a rich experience in using small fission reactors to power its Kosmos series spy satellites.

For further information, see: <http://english.ruvr.ru/2010/11/24/35557367.html>.



New Horizons Halfway to Pluto

After nearly 5 years of travel the New Horizons spacecraft, powered by a radioisotope thermoelectric generator (RTG), is now halfway between Earth and Pluto, on approach for a dramatic flight past the icy planet and its moons in July 2015. New Horizons is only the fifth probe to traverse interplanetary space so far from the Sun.

For further information, visit NASA's New Horizons mission page at: http://www.nasa.gov/mission_pages/newhorizons/main/index.html

Fermi Telescope Finds Giant Structure in our Galaxy

NASA's Fermi Gamma-ray Space Telescope has unveiled a previously unseen structure centered in the Milky Way. The feature spans 50,000 light-years and may be the remnant of an eruption from a supersized black hole at the center of our galaxy.

"What we see are two gamma-ray-emitting bubbles that extend 25,000 light-years north and south of the galactic center," said Doug Finkbeiner, an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., who first recognized the feature. "We don't fully understand their nature or origin."



Source: http://www.nasa.gov/mission_pages/GLAST/news/new-structure.html

NASA Spacecraft Camera Yields Most Accurate Mars Map Ever

(July 23, 2010) A camera aboard NASA's Mars Odyssey spacecraft has helped develop the most accurate global Martian map ever. Researchers and the public can access the map via several websites and explore and survey the entire surface of the Red Planet (see: <http://mars.jpl.nasa.gov/odyssey/news/whatsnew/index.cfm?FuseAction=ShowNews&NewsID=1022>).

The Mars Odyssey spacecraft is equipped with several key instruments, including the thermal imaging system used to create the global Martian map, gamma ray spectrometer, neutron spectrometer, and high-energy neutron detector. The Odyssey also carries the Mars Radiation Environment Experiment that was used to characterize the radiation environment in transit to Mars and in the Martian orbit.

Complete details on the Mars Odyssey mission and spacecraft can be found at <http://mars.jpl.nasa.gov/odyssey/>.

Articles to Contribute

Would you like to contribute a news item or article to a future edition of the ANSTD Newsletter? Just send your draft article in a text or Microsoft Word file to dion@anatech.com. Accompanying photos and figures are welcome, and should be sent as separate JPEG files.

2010 – 2011 ANSTD Officers and Executive Committee

OFFICERS (2010 – 2011)

Mr. Martin Sattison

Idaho National Laboratory

Past Chair

E-Mail: Martin.Sattison@inl.gov

Dr. Shannon Bragg-Sitton

Idaho National Laboratory

Chair

E-Mail: Shannon.Bragg-Sitton@inl.gov

Shannon has approximately 10 years of experience in researching nuclear technologies for space power and propulsion applications, both as a graduate student and after completing her PhD in Nuclear Engineering at the University of Michigan. Shannon has recently joined the Space Nuclear Systems and Technology Division at the Idaho National Laboratory. Prior to joining INL, Shannon was most recently an Assistant Professor of Nuclear Engineering at Texas A&M University; previous to that she was a member of the space reactor design team at Los Alamos National Laboratory and supported non-nuclear test work at the NASA Marshall Space Flight Center.



Dr. Steven D. Howe

Center for Space Nuclear Research

Vice-Chair/Chair-Elect

E-mail: showe@usra.edu



Steve Howe is currently the Director of the Center for Space Nuclear Research (CSNR) at the Idaho National Laboratory in Idaho Falls, ID. The CSNR is engaged in facilitating research and education of nuclear technologies for space exploration. Currently, the CSNR is investigating the design and construction of a radioisotope powered Mars Hopper prototype and the fabrication of tungsten CERMET fuels for space reactors. Prior to this position, Steve was at the Los Alamos National Laboratory for 22 years where he worked on nuclear weapons physics, nuclear data acquisition, antimatter physics, and nuclear technology development for space. Steve has over fifty published technical papers and is also CEO of a small business.

Mr. Paul G. Edelmann

Los Alamos National Laboratory

Secretary

E-Mail: edelmann@lanl.gov

Paul G. Edelmann, P.E., is an R&D Engineer at Los Alamos National Laboratory. He arrived there in 2004 as a nuclear design engineer with over 10 years of experience in the commercial nuclear power industry, primarily in reactor fuel and core design, and in core physics and thermal analysis with both PWR and BWR technology. His initial LANL experience involved work in space power and propulsion reactor design for the Jupiter Icy Moons Orbiter (JIMO) mission. Mr. Edelmann holds a B.S. in Nuclear Engineering from the Rensselaer Polytechnic Institute, and is currently completing a Ph.D. in Nuclear Engineering at the University of New Mexico.



Mr. Dion Sunderland

Anatech, Inc.

Treasurer

E-Mail: Dion@anatech.com

Executive Committee Members

John Bess (INL), Jeff Halfinger (Babcock & Wilcox), Heather MacLean-Chichester (INL), J. Boise Pearson (NASA MSFC), Ross Radel (Phoenix Nuclear Labs), Robert Singleterry (NASA LaRC), Steve Wright (Sandia National Labs), Jim Werner (INL)

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