

PISCES LUNAR OUTPOST STUDENT DESIGN COMPETITION

OBJECTIVES

The PISCES Lunar Outpost Student Design Competition is a means of establishing a relationship between PISCES (Pacific International Space Center for Exploration Systems) and the academic community in a manner that will foster dialogue and interaction in an exciting new area of space exploration. PISCES intends to become a center for demonstration, testing, and operational development of the skills and technologies that will be used to establish permanent human footholds on other planets, first the Moon, later Mars and beyond. PISCES will become a focus for new ideas, for the education of students, including those that will make up its own staff, and for the training of people who will venture to the Moon and beyond.

Attached to the University of Hawaii, Hilo, PISCES will have facilities set in an environment as close to a planetary surface environment as may be accomplished on the Earth, on the flanks of Hawaii's immense Mauna Loa volcano. As the PISCES facility is defined, students are invited to participate by the development of concepts and designs for planetary habitats and the systems that support them.

PISCES is an international undertaking; its concept was developed by members of the Japan – U.S. Space Technology, Science and Applications Program (JUSTSAP), a bilateral coordination body established by NASA (U. S. National Aeronautics and Space Administration, www.nasa.org) and JAXA (Japan Aerospace Exploration Agency, http://www.jaxa.jp/index_e.html (English version) over 16 years ago. For the agencies, the goals of the design program are to bring fresh views on how to accomplish human exploration objectives, knowledge of technical capabilities that exist in the universities, and an opportunity to meet students who are about to enter the workforce.

The PISCES design program provides an opportunity to engage students in a rich and meaningful educational experience, derived from working on design problems of current interest, on important technical and programmatic issues that are central to the settlement of space. NASA and JAXA now have serious plans for the future of humans in space, including the continued construction of the International Space Station and human and robotic lunar exploration. Students now in university design programs will be the professionals who will implement the decisions.

DESIGN COMPETITION OPPORTUNITY

Contributions from student teams are invited in the areas of overall habitat design (architecture) as well as principal supporting subsystems (life support systems, lunar resource extraction and utilization, communications, robotics, energy conversion and power, surface transportation, etc.) that may be simulated in the PISCES environment. A general description of the PISCES plan is provided at the web site <http://PISCES.hilo.hawaii.edu>. Studies may also address issues of operations in space and on

planetary surfaces, such as the conduct of field geology, remote exploration from a planetary base, or problems of human performance and health.

PISCES stands ready to assist interested university design teams in contacting engineers, scientists, and administrators in NASA field centers and in industry who can act as professional mentors for their design project, providing up-to-date information on existing concepts and sources of information. PISCES can support interested teams by helping to refine the problem statement, in order to maximize the study's contribution to PISCES. PISCES (U. S. teams only; Japan will run its program independently) will provide a travel grant to at least one team of up to \$8,000 for two student members and the faculty advisor to attend the PISCES Annual meeting to be held in Hilo, Hawaii, November 7-8, 2007. At this conference, the university studies will be presented to the PISCES team and will be able to observe and participate in further planning of the PISCES program. The team(s) will also have the opportunity of attending the annual JUSTSAP meeting, which will just follow the PISCES meeting, and will be held on the island of Kauai.

The PISCES design project will provide students with a unique opportunity to work on challenging and relevant space development and settlement projects, initiate new engineering design directions, and interact with key people from NASA, JAXA, U. S. and Japanese industry, and academia. Depending on the choice of topics, opportunities may also be available for interested design teams to interact during the design process with teams from Japan.

WHO MAY PARTICIPATE?

Any U. S. university may field one or more teams that are interested in the topics of lunar surface facilities and operations. It is expected that most participants will consist of design teams of three or more graduate and/or undergraduate students, with a faculty advisor. A student team leader must be designated. Multidisciplinary teams are encouraged. It is not necessary for the team to be enrolled in a for-credit course to participate; however, they must have the support of a qualified faculty advisor. Teams are encouraged to document their work on a team web site that promotes the exchange of information and collaboration with other participating teams, particularly Japanese teams.

PROPOSALS AND SELECTION

A brief indication of interest is requested from university teams by January 31, 2007. This letter should include: team name; university; composition of team (number of graduate and undergraduate members, names, if available), contact information for faculty advisor, and topical area chosen for study. This indication of interest will be used by PISCES to provide technical help to the university team and to coordinate interaction with Japanese teams. No selection of teams will be made at this time; everyone can participate and will receive recognition from PISCES for their participation.

Communication between each team and PISCES at approximately bi-monthly intervals is recommended as the study proceeds.

The selection of the team(s) to be awarded travel grants to the PISCES annual meeting will be based on the review of reports, which must be submitted electronically (in PDF, no larger than 5 MB) by July 15, 2007. It is understood that studies may not be complete by that time; it is anticipated that selected team(s) may continue to work on their project(s) up to the time of their presentation at the PISCES meeting. Enough information must be provided in the July 15th report that a reasonable view of the expected contribution of the team can be obtained by PISCES reviewers. The report will be judged on the basis of:

1. Selection of the design problem. A short statement of the rationale for selecting the design problem will be provided. This should include both the technical rationale for the problem selection, how the team views the project to fit within PISCES, and a statement of how the problem fits into the educational goals of the student team.
2. Progress on the problem. A statement of what topics the team has researched with respect to the design problem, accompanied by no more than 10 pages of illustrative material (pictures, charts, prose).
3. A plan for completion of the project to meet the PISCES schedule (presentation November 7, 2007).
4. Evidence of university, faculty advisor and team commitment to the project. This could take many forms, for example, evidence that the design study has been incorporated into the academic program of the students, outside presentations made to students and other groups (outreach), fund-raising activities to increase the number of participants who could attend the PISCES meeting if the team is selected.

The reports will be judged by a group selected by PISCES, which will be made up of space exploration experts from academia, industry and space agencies. The judging criteria will include

Responsiveness to directions	10%
Informative and substantive technical abstract	10%
Understanding of problem	10%
Quality and thoroughness of work completed to date	25%
Quality of plan for completion:	25%
Plan for utilization of the travel grant, if selected:	10%
Evidence of commitment to project	10%

Selected participants will be notified by August 7, 2007, in order that the selected team(s) may make the most effective use of their travel grants. Travel grants will be administered by the University of Hawaii, Hilo.

All electronic correspondence regarding the PISCES student design program should be addressed to: Dr. Michael B. Duke mikeduke@earthlink.net.