



## **Announcement of Opportunity**

United Nations Human Space Technology Initiative (UN-HSTI)

“Zero-Gravity Instrument Project (ZGIP)”

Third Cycle

1 January 2015

- 1. Thematic Area:** Human Space Technology Initiative (HSTI) Science Activity
- 2. Title:** Zero-Gravity Instrument Project (ZGIP) Third Cycle
- 3. Office in Charge:** United Nations Office for Outer Space Affairs (OOSA)
- 4. Duration and Beginning Date:** 2 years, beginning 1 September 2015
- 5. Deadline for Applications:** Completed application forms should be received by the Office for Outer Space Affairs **no later than 30 April 2015**. Successful applicants will be notified on the outcome of their applications by 1 August 2015.
- 6. Number of Available Instruments:** One (1) unit for each successful applicant. A total of 15 units are available for distribution around the world.
- 7. Expected Applicant Profile:** Heads of research groups, university professors with scientific orientation, or science teachers.
- 8. Language of the Project:** English
- 9. Brief Project Description:**

The Office for Outer Space Affairs (OOSA) is pleased to announce the opportunity for the Third Cycle of the Zero-Gravity Instrument Project (ZGIP) as part of the Human Space Technology Initiative (HSTI) under the framework of the United Nations Programme on Space Applications.

The Project provides unique opportunities for students and researchers to study the gravitational effects on samples, such as plant seeds and small organisms, in conditions of simulated microgravity, with hands-on learning in classroom or research activities conducted by each institution. In this Project, a fixed number of clinostats (microgravity simulation instruments) are distributed free of charge to qualified schools, universities and research institutes around the world.

The Project is aimed at contributing to promoting space education and research under microgravity conditions, particularly for enhancing capacity-building activities in developing countries. The Project is also aimed at motivating research institutions to invest in activities in space and microgravity research as well as fostering a global network of participating institutions in this field. It

is expected to create a data set of experimental results in gravity responses that could contribute to the design of future space experiments and to the advancement of microgravity research.

#### **10. Zero-Gravity Instrument (Clinostat) Description:**

The instrument to be distributed is a one-axis clinostat that simulates certain aspects of microgravity on the ground in a cost-effective manner. For details, please find information on the clinostat in [Annex-1](#) and on microgravity science experiments in [Annex-2](#).

#### **11. Project Schedule:**

##### **Timeline of the Application and Selection Process:**

- a) Deadline for application submission: **30 April 2015**
- b) Selection of applicants: **1 August 2015**
- c) Distribution of the instrument to the successful applicants: **1 September 2015**

##### **Timeline of the Experiment Process:**

- d) 1<sup>st</sup> Annual Report submission by the participating institutions: **31 December 2016**
- e) 2<sup>nd</sup> Annual Report submission by the participating institutions: **31 December 2017**

#### **12. Requirements for Applicants:**

##### **a) Eligibility:**

Applicants are required to act as leaders of the proposed activities of the Project in their institutions in developing countries or countries with economies in transition. Applicants are required to

- be either heads of research groups, university professors with scientific orientation, or science teachers at schools,
- provide in the attached Application Form his/her ideas on how he/she plans to utilize the distributed clinostat. The plans should clearly show the purpose of the project, which has to be in the following areas:
  - conduct microgravity research in order to increase knowledge in certain fields, and/or
  - provide science education to students at school.
- have a good command of spoken and written English.

##### **b) Requirements in Experimentation:**

Selected applicants who receive the instrument are required to conduct experiments with at least ten (10) plant seeds (indigenous to the region of the applicant).

**c) Annual Report Submission:**

Selected applicants who receive the instrument are expected to submit annual activity reports for a period of two (2) years after receiving the instruments. It is also expected that research centers and institutes will share the results of their activities with the world by publishing in journals and by participating in relevant conferences. Furthermore, all successful applicants are expected to return a questionnaire on request by OOSA.

**13. Delivery and Maintenance of the Clinostat:**

In donating the clinostat to the successful applicant, OOSA shall bear the cost of shipment of the clinostat to the location of the successful applicant. Any additional import duties, taxes, or fees, however levied, shall be borne by the successful applicant. The successful applicant bears full responsibility for proper operation and maintenance of the clinostat and shall, if necessary, undertake and arrange, at its own expense, any shipment or delivery for warranty work or otherwise directly with the manufacturer. OOSA shall be informed immediately of any loss of or damage to the clinostat.

The recipient understands and agrees that the receipt of the clinostat is a non-commercial donation and that no fee of any kind may be levied against or charged to any person for the use or operation of the clinostat under any circumstances, regardless of whether such use or operation is in connection with the experiments envisioned under this project.

Please also refer to the enclosed document **“Terms of Participation”** in Annex-3.

**14. Application to the Project:**

The fully completed application form in Annex-4, properly endorsed by the applicant's institution, should be emailed to [hsti-zgip@unoosa.org](mailto:hsti-zgip@unoosa.org) both in PDF format (.pdf) containing the signature page and in MS WORD (.doc) **no later than 30 April 2015**.

The applicant should also mail the fully completed original application form to the following address:

Office for Outer Space Affairs  
United Nations Office at Vienna  
Vienna International Centre  
P.O. BOX 500  
A-1400 Vienna, AUSTRIA  
Phone: (+43 1) 26060- 4977  
fax: (+43-1)-26060-5830  
E-mail: [hsti-zgip@unoosa.org](mailto:hsti-zgip@unoosa.org)

OOSA will then proceed to evaluate each submission. At OOSA's sole discretion, additional information may be requested from applicants, if necessary, to assist in the evaluation of an application. Selected applicants will then be notified of the results of the selection process. All awards are final and made at the sole discretion of OOSA, not subject to challenge or review, and are contingent on the successful applicant's agreement to OOSA's terms and conditions of the donation agreement.

**15. Additional Information:**

The latest information on the Zero-Gravity Instrument Project will be made available on the website of the United Nations Office for Outer Space Affairs at <http://www.oosa.unvienna.org/oosa/en/SAP/hsti/index.html>.

For further information regarding the project and applications, please contact [hsti-zgip@unoosa.org](mailto:hsti-zgip@unoosa.org).

## Annex-1

### The List of Products for Distribution


In this Project, the following products along with documents and materials for experiments will be delivered by the United Nations Office at Vienna, Austria, to the location of the successful applicant.

#### 1. One-axis Clinostat

The instrument to be distributed to and utilized by selected institutions is a clinostat – a laboratory instrument that allows us to conduct scientific experiments under simulated microgravity conditions. Among many types and designs, a one-axis, desk-top type clinostat has been selected for this Project, taking advantage of its scientific approval as well as its ease of use for educational and research purposes. The recommendation of this kind of simulation principle is based on comparative experiments in gravitational biology performed in real and simulated microgravity conditions.

The clinostat under this Project has a horizontal rotational axis perpendicular to the gravity vector on the ground. By rotating samples - such as plant seeds and small organisms - around the axis, the clinostat can provide a simulated microgravity condition in equalizing the gravity vector, assuming that the exposed system no longer perceives the turning g-vector. The direction of the rotational axis can be varied from 0 degrees (parallel to the ground) to 90 degrees (perpendicular to the ground). The rotation speed can be freely selected from 0 to 90 rpm with a 0.5 rpm increment from 0 to 20 rpm and a 5 rpm increment from 20 to 90 rpm. The rotational accuracy is 1%. Table 1 shows the specifications and picture of the one-axis clinostat to be distributed.

Table 1: Specifications and picture of the one-axis clinostat to be distributed

Specification		Picture
1) Equipment size (cm):	Main body: 25 x 25 x 25 Control box: 23 x 20 x 11	
2) No. of rotational axes:	One	
3) Rotation speed:	0-90 rpm. 0-20 rpm: 0.5 rpm increment 20-90 rpm: 5 rpm increment Accuracy: 1%.	
4) Rotational axis angle:	0° (parallel to the ground) to 90° (perpendicular to the ground)	
5) Rotation direction:	CW or CCW	
6) Input voltage:	100V-240V	
7) Building materials:	Aluminum	
8) Experiment conditions:	Maximum weight of samples is 500 g. Maximum diameter of a sample container is 10 cm.	

#### 2. Teacher's Guide

A Teacher's Guide to Plant Experiments in Microgravity (ST/SPACE/63) provides teachers in secondary schools and users for this Project with basic knowledge about microgravity, information on the clinostat, samples of basic biology experiments as well as guidance on how to perform clinostat experiments and to write experiment reports.

## **Annex-2**

### **How to Conduct Experiments on Plant Growth or Other Systems (*depending on your ideas*) under Simulated Microgravity Conditions**

#### **1. What is microgravity?**

Everything that is living and non-living on Earth is exposed to gravity. All life forms evolved under the effects of this constant force. It is an essential factor and stimulus in most physical and physiological phenomena observed on our planet. For microgravity platforms such as drop towers, sounding rockets, spacecraft and the International Space Station, however, the effects of this gravitational force are absent, which allows scientists to examine physical phenomena and the reaction of living cells, small organisms and even the human body in the absence of gravity. This unique environment and the scientific research making use of it will provide new insights into certain phenomena and processes. Understanding how organisms and matter react to gravity and the absence of it may also lead to new applications that benefit humankind. New medical cures and new materials may result from such knowledge. It may also open up the possibility of expanding the human race into space.

#### **2. Clinostat – A tool for microgravity education and research**

On Earth, gravity with its distinct characteristic of pulling masses “down”, plays an important role in determining movement and growth directions. In microgravity, this preferential direction does not exist as gravity is absent. The simplest clinostat rotates the sample around a horizontal axis. In this manner, the sample is exposed to a constantly rotating gravity vector around itself. As a consequence, the sample no longer experiences a preferential direction, which may be identical to real microgravity conditions in space. Even though gravity is still present, the clinostat may simulate some aspects of a true microgravity condition. It is important that the sample be located on or near the rotational axis for a one-axis clinostat in order to prevent any centrifugal forces, which would impose a directional force on the sample. Furthermore, the speed of the rotation is important with respect to residual acceleration forces and time and therefore, the sensitivity of the sample.

#### **3. How to conduct a basic experiment with the clinostat**

One of the basic experiments with clinostats is to observe the germination and early growth of small plant seeds. The clinostat can provide insights into how plant seeds react to an environment with simulated microgravity during germination and early growth. For this purpose, some seedlings are placed on the rotational axis after proper preparation. The seedlings grown under rotation are compared to germinated seeds under normal gravity. Basically, any kind of seeds can be used for germination experiments with the clinostat. It is recommended to use seeds which show quick germination time over those with slow germination time. Applicants are encouraged to design experiments which use a clinostat and in addition, to change environmental parameters such as rotation speed, light conditions, temperature, and humidity. They are also encouraged to design their own scientific systems using a clinostat for experimental possibilities with not only plant seeds but also with small organisms, cells, or small samples from materials science.

## Annex-3

### **TERMS OF PARTICIPATION**

#### **United Nations Human Space Technology Initiative (UN-HSTI) “Zero-Gravity Instrument Project (ZGIP)”**

##### **1. Participation**

Applicants should be (i) nationals of developing countries or countries with economies in transition, (ii) heads of research groups, university professors with scientific orientation, or science teachers at schools, and (iii) have a good command of spoken and written English.

##### **2. Application form required**

Only applicants whose completed Application Form is received by the Office for Outer Space Affairs before the deadline established for the Project will be considered in the selection process for distribution of the microgravity simulation instrument.

##### **3. Administrative arrangements**

###### **a) Responsibilities of the United Nations:**

- i) The United Nations shall make available a one-axis clinostat (hereinafter referred to as “the Clinostat”), to the successful applicants for utilization at schools and public research institutions for the purposes of education and research. In donating the Clinostat to the successful applicant, the United Nations shall bear the cost of shipment of the Clinostat to the location of the successful applicant.
- ii) The United Nations shall provide technical assistance, with the support of the Human Space Technology Initiative Science Advisory Group (HSTI-SAG) for experimentation conducted by the selected institutions (recipients) throughout the period of the Project.

###### **b) Responsibilities of the selected applicant and his/her institution:**

- i) The recipient of the Clinostat will conduct microgravity research in order to increase knowledge in certain fields and/or to provide science education to students using the Clinostat. The recipients are required to conduct experiments with at least ten (10) different plant seeds (indigenous to the region of the applicant).
- ii) The recipient shall bear the full responsibility of receiving the Clinostat upon the prior notice of the shipping information from the United Nations and shall make necessary pre-arrangements, if any, to receive the shipment properly at their local shipping station. Any additional costs including import duties, taxes, or fees, however levied, shall be borne by the recipient.
- iii) The recipient bears full responsibility for proper operation and maintenance of the Clinostat, and shall, if necessary, undertake and arrange, at its own expense, any shipment or delivery for warranty work, or otherwise, directly with the manufacturer or duly authorized repair center. The recipient shall be liable for injury to third parties arising from the Clinostat.
- iv) The recipient agrees to annually deliver a detailed report to the United Nations on the activities conducted with the utilization of the Clinostat, and this should be done for at least two (2) consecutive years after receiving the Clinostat. The recipient further accepts to

truthfully respond to any questionnaires issued by the United Nations concerning the utilization of the Clinostat.

**c) Applicants for the project should also agree to the following conditions:**

- i) The recipient understands and agrees that the receipt of the Clinostat is a non-commercial donation and that no fee of any kind may be levied against or charged to any person for the use or operation of the Clinostat under any circumstances, regardless of whether such use or operation is in connection with the experiments envisioned under this project.
- ii) The Clinostat shall not to be loaned out, sold, transferred, or disposed of, nor can responsibility for the Clinostat be re-delegated or reassigned from the recipient and the official executing this activity, for any reason, without prior written approval of the United Nations.
- iii) Should the Clinostat malfunction within the meaning of the manufacturer's warranty provisions, the recipient shall exercise such warranty provision or remedy directly with the manufacturer at no cost to the United Nations.
- iv) Loss of or damage to the Clinostat shall be immediately reported to the United Nations.
- v) The United Nations and the recipient will endeavor to resolve, through mutual cooperation, any dispute arising from joining this project.

**d) Termination of the Project:**

The United Nations reserves the right to terminate the Project in writing at any time.



## Annex-4

### APPLICATION FORM

**United Nations Human Space Technology Initiative (UN-HSTI)  
“Zero-Gravity Instrument Project”  
(Deadline for submission: 30 April 2015)**

Please fill in the fields by typing the information and marking an “X” when a choice is required.

#### **I. Basic Information of the Applicant and Institution**

##### **A. Information about the Applicant (Team Leader)**

- a) Family Name:
- b) First Name:
- c) Middle Names:
- d) Gender:
- e) Nationality:
- f) Date and Place of Birth:
- g) Position/Profession:
- h) Title: Mr. ( ) Ms. ( ) Dr. ( ) Prof. ( )
- i) Affiliation:
- j) Full International Telephone Number:
- k) Full International Fax Number:
- l) Email Address:

##### **B. Information about the Institution (e.g. school, university, laboratory)**

- m) Name:
- n) Status of your institution:  
Public ( ) Private ( )
- o) Attached to (e.g. ministry, company, university):
- p) Age of students:  
Normally from \_\_\_\_ to \_\_\_\_ years old.
- q) Gender of students admitted:  
Male only ( ) Female only ( ) Mixed ( )
- r) Language:
- s) Address:
- t) ZIP Code:
- u) Full International Telephone Number:
- v) Full International Fax Number:

## **II. Your Institution's Activities and Planning for the Clinostat**

Please attach a detailed description of your planned educational/research project to your application. The following information has to be covered. (Select A and/or B for your application.)

### **A. For an Educational Activity**

- a) Overview of your school
- b) Please describe activities related to science education in your school including the information about availability of teaching staff for such activities.
- c) Please describe the available infrastructure and activity means (available equipment or tools that can be used for the activities.)
- d) Please describe your planned educational activities using the Clinostat.
  - o about how the Clinostat will be employed;
  - o in which ways students will be involved in the project;
  - o expected average age of students taking part;
  - o the project schedule and planning.

### **B. For a Research Activity**

- a) Overview of your institution
- b) Research focus of your laboratory
- c) Please describe the available infrastructure and project means (available rooms/laboratories, equipment and tools that can be used for the projects.)
- d) Please describe your planned research activities using the Clinostat.
  - o objectives of the research activities
  - o itemized planning and conducting of the experiments
  - o expected results of the experiments

## **Answer Section**

Minimum length required for this section is a single A4 typed sheet with single line spacing. The information listed under the above A and/or B should be covered in your application (attach an extra page if necessary).

Please choose the goal for joining this project:

Educational Activity (    )                  Research Activity (    )

a)

b)

c)

d)

**You may use separate sheets of paper if necessary.**

### **III. Signatures**

#### **APPLICANT'S CERTIFICATION**

I hereby certify that the statements that I have made on this application form are true, correct and complete.	
<b>If selected, I hereby confirm that our institution will comply with the Terms of Participation of the Project.</b>	
Signature of the Applicant (Team Leader):	Date

Director of the Institution Name:  Title:  Signature:	Date
Official Seal of the Institution	

This form, FULLY COMPLETED, should be submitted to the United Nations Office for Outer Space Affairs, Vienna International Centre, P.O. Box 500, A 1400 Vienna, Austria, **no later than 30 April 2015**. Please also e-mail scanned copies of the application form or the e-file in MS WORD (.doc) to [hsti-zgip@unoosa.org](mailto:hsti-zgip@unoosa.org).

NOTE: The application is only considered valid if all the information requested is provided.