



UNITED NATIONS
Office for Outer Space Affairs



HSTI Science Activities

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Topics

- Brief Review of HSTI Origin and Objectives
- HSTI Science Activities
 - Zero-Gravity Instrument Distribution Project
 - Educational Project
- Summary / Challenges



Brief Review of HSTI Origin and Objectives

- The Human Space Technology Initiative (HSTI)
 - Launched by UNOOSA in 2010.
 - Built on the relevant recommendations of UNISPACE III in 1999.
 - Implemented under the framework of the United Nations Programme on Space Applications.

- HSTI Objectives
 - Promote international cooperation opportunities
 - Exchange information and create awareness on human space technology (e.g. UN/Malaysia Expert Meeting)
 - Build capacity on human space technology and its applications.



HSTI Science Activities

Zero-gravity Instrument Distribution Project

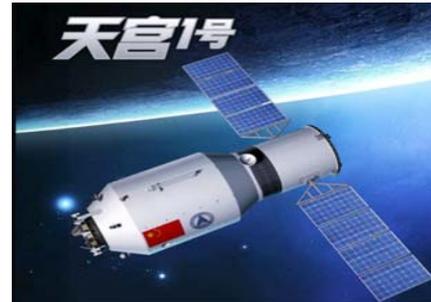
- Why to distribute
 - Zero-gravity, also called weightlessness or microgravity, is the absence of gravity. It is best illustrated by astronauts floating in their spacecraft.
 - Zero-gravity can provide a better understanding of fundamental questions of science and for the solutions of problems on Earth.
 - Life science research and experiments under zero-gravity will be needed for humans to venture beyond the Earth-bound existence.
 - Since there are many methods to achieve zero-gravity, including ground-based, aircraft, suborbital and orbital providing different duration of microgravity, distributing ground-based zero-gravity instruments for education and research is possible.
 - Zero-gravity research and education is a means of capacity building.



HSTI Science Activities

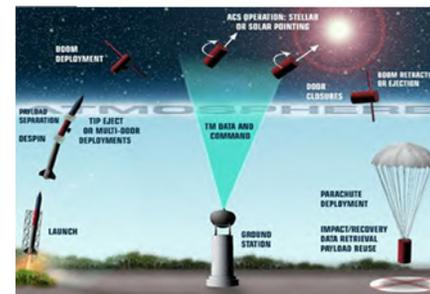
Zero-gravity Instrument Distribution Project

- How to obtain zero-gravity
 - There are at least six methods to obtain or simulate zero-gravity.
 - Spacecraft (space station/space lab/space shuttle/satellite)



Months/days, zero-g

- Sounding rocket flight



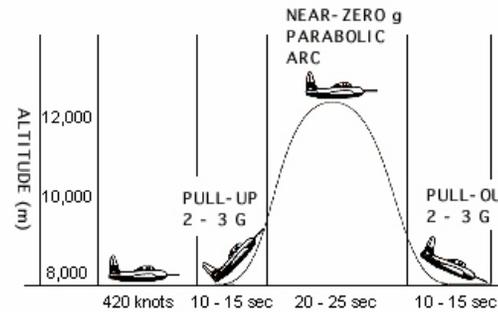
Parabolic trajectory
6- 15 minutes, 10^{-5}



HSTI Science Activities

Zero-gravity Instrument Distribution Project

- Airplane parabolic flight

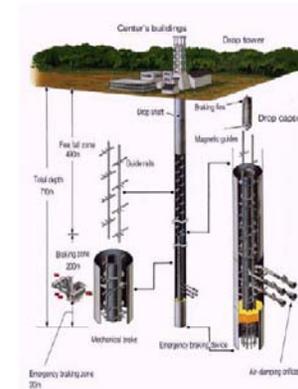
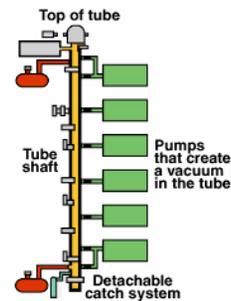


20- 30 seconds, 10^{-2}

$$L = (1/2) * g * t^2$$

2.2- 10 seconds, 10^{-4}

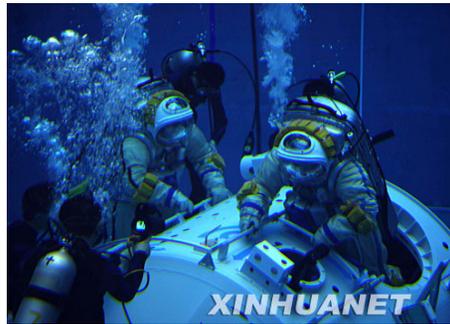
- Drop tower (drop tube, drop shaft)





HSTI Science Activities Zero-gravity Instrument Distribution Project

- Neutral buoyancy simulator



Simulation of effect
Offsetting gravity by
buoyancy
Months/days

- Slowly spinning an object



Use rotation to negate the effect of gravity
Suitable rotation speed is needed
Months/days

Environment controllable clinostat



HSTI Science Activities

Zero-gravity Instrument Distribution Project

■ What to distribute

UNOOSA is planning to distribute two types of zero-gravity instruments:

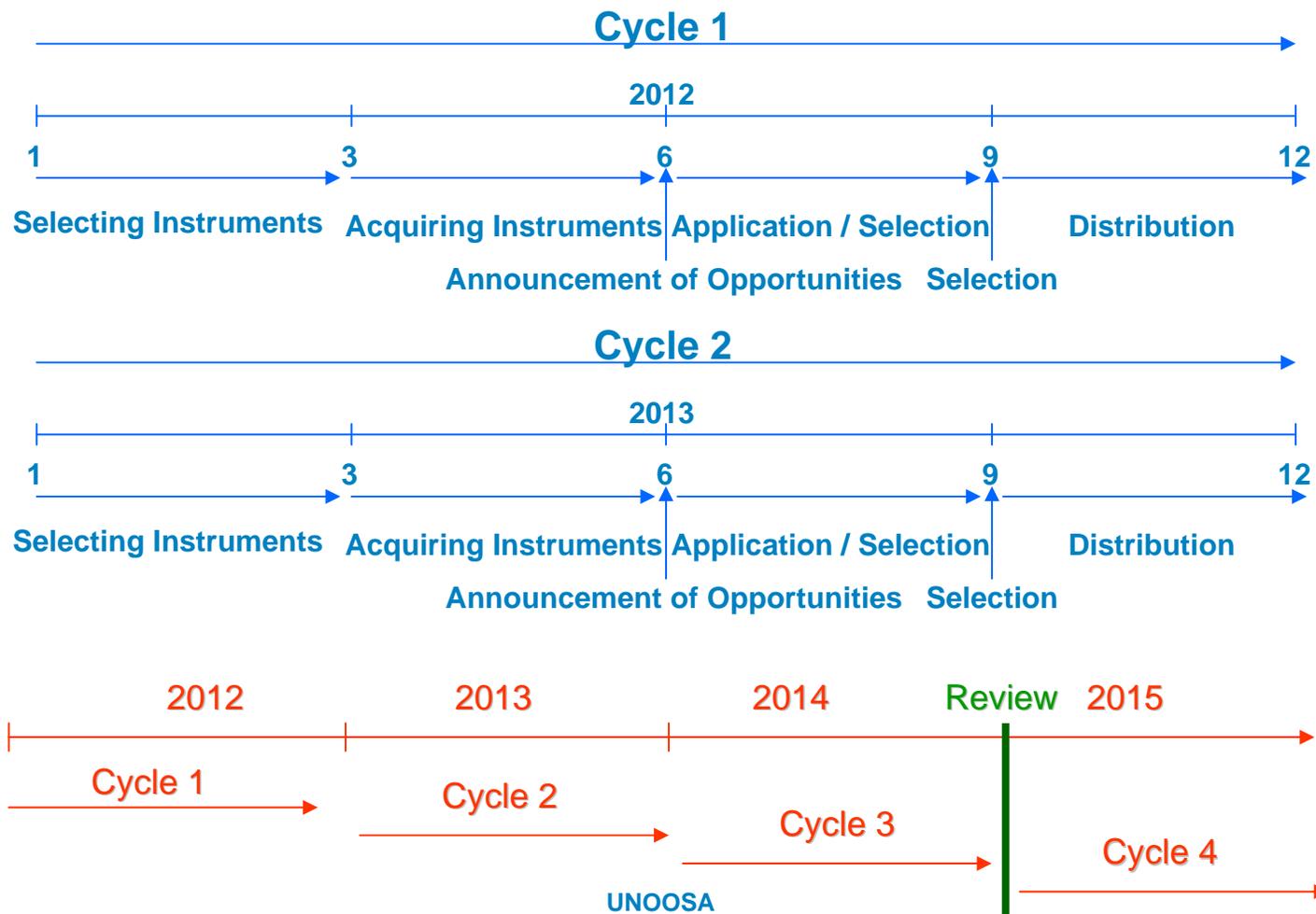
- Clinostats for observing plant-growth and crystal growth:
 - Two-Axes Clinostat
 - Conduct experiments in three-dimensional random motions
 - One-Axis Clinostat
 - Conduct experiments in simulated zero-gravity
 - Train students to prepare and run scientific experiments
- Desktop drop-tube type instrument for observing short duration physical phenomena such as combustion and fluid motion.



HSTI Science Activities

Zero-gravity Instrument Distribution Project

- How and when to distribute





HSTI Science Activities

Educational Project

■ Why

- The development or utilisation of space technology requires knowledge and scientific competences
- Conducting education project is another means of capacity building

■ Potential Target Groups

- Researchers/Teachers: information, training
- Students: training, education
- General public: awareness

■ Objectives

- Inform researchers and students about possibilities and benefits of microgravity research and provide access to necessary information
- Motivate students for scientific studies and provide some basic knowledge in microgravity science and human space technology
- Create awareness on utilisation and benefits of human space technology



HSTI Science Activities

Educational Project

■ How

- Develop and publish materials
 - HSTI brochure
 - Educational materials
 - What is zero-gravity;
 - How do humans live in space ?
 - How to prepare a zero-gravity experiment ?
 -
 - Training materials
 - How to design a zero-gravity experiment for a specific facility type (drop tower, RPM....) ?
 - How to train students for zero-gravity research ?
 -
 - Information materials
 - What is human space technology and its benefits ?
 - What are the possibilities for zero-gravity research ?
 - What is zero-gravity research ?
 -



HSTI Science Activities

Educational Project

– Lectures / Training

According to request, UNOOSA invites experts and astronauts to give lectures:

- Technical Lectures for universities and institutions
 - Benefits and brief history of human space activities
 - Space policy
 - Space environment
 - Space system design
 - Space technology
 - Space business and management
 - Space applications
 - Space science
 - Space social science and humanity
 -
- Launch “An Astronaut in The Classroom” project for schools
 - Invite astronauts to classrooms to share their space experience



Summary / Challenges

- HSTI Objectives:
 - Promote the use of human space technology and its application.

- Planned activities:
 - Distribution of zero-gravity instruments
 - Distribution of training and education materials, organizing lectures at universities and schools

- Challenges to be overcome
 - In-cash / In-kind contributions for Zero-gravity Instrument Distribution Project
 - Collaboration with experts on microgravity science and human space technology for Educational Projects
 - Collaboration with space agencies and institutions for resources in space experiment, astronauts selection assistance, training and flights.



Let's go to space, together !

Suggestions? Ideas? Comments?
Propositions?



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