UNITED NATIONS
OFFICE FOR OUTER SPACE AFFAIRS

Programme on Space Applications

Human Space Technology Initiative

UNITED NATIONS

First man to orbit the Earth, Yuri Gagarin (USSR), 1961

First meeting of the United Nations Committee on the Peaceful Uses of Outer Space, 1961

Astronaut John Glenn, the first American to orbit the Earth (in his Friendship 7 capsule), 1962

First woman to orbit the Earth, Valentina Tereshkova (USSR), 1963

First spacewalk, Alexei Leonov (USSR), 1965

First space treaty, the *Outer Space Treaty* signed, 1967

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INTRODUCTION

Space exploration fires people's imaginations. Since the first human space flight in 1961, over 500 explorers from different nations have ventured into space, motivated by curiosity, the drive for knowledge and the belief that space exploration could benefit people on Earth. The involvement of a growing number of countries means that space exploration and the use of outer space are now truly global undertakings. Given the great importance of international cooperation in the peaceful exploration and use of outer space, the Committee on the Peaceful Uses of Outer Space (COPUOS) fills the need for an intergovernmental platform at the global level in this regard.

In the Declaration on the Fiftieth Anniversary of Human Space Flight and the Fiftieth Anniversary of the Committee on the Peaceful Uses of Outer Space, adopted by the United Nations General Assembly in 2011, States emphasized the significant progress in the development of space science and technology and their applications that had enabled humans to explore the universe, and the extraordinary achievements made over the previous 50 years in space exploration efforts, including deepening the understanding of the planetary system and the Sun and the Earth itself, in the use of space science and technology for the benefit of all humankind and in the development of the international legal regime governing space activities.

The United Nations Office for Outer Space Affairs, as the secretariat of COPUOS, services international discourses and dialogue against a backdrop of law and diplomacy, conducts capacity-building activities that harness space tools for development and promotes awareness through the celebration of space achievements and milestones. It works to meet the needs of developing countries, to advance the spacefaring technologies of nations and to encourage the emergence of new actors in space. Its Human Space Technology Initiative, an activity conducted under the United Nations Programme on Space Applications, is intended to help more countries benefit from space exploration and human space technology, and to open opportunities for further engagement in space exploration.

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2011 marked two important milestones in outer space affairs: the fiftieth anniversary of human space flight, and the fiftieth anniversary of COPUOS. Mazlan Othman, Director of the Office of Outer Space Affairs, adressed the opening of the International Space Exhibition at the UNOV Rotunda. 1 June 2011.

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The Office organized a panel discussion at the Vienna City Hall that brought together astronauts and cosmonauts from around the world to discuss the future of humankind in outer space. 2 June 2011.

HUMAN SPACE FLIGHT AND THE UNITED NATIONS

SPACE EXPLORATION— A GLOBAL HUMAN ENDEAVOUR

In the 2011 Declaration on the Fiftieth Anniversary of Human Space Flight and the Fiftieth Anniversary of the Committee on the Peaceful Uses of Outer Space (COPUOS), States recalled the launch into outer space of the first human-made Earth satellite, Sputnik I, on 4 October 1957, thus opening the way for space exploration; also recalled that, on 12 April 1961, Yuri Gagarin became the first human to orbit the Earth, opening a new chapter of human endeavour in outer space; and further recalled the amazing history of human presence in outer space and the remarkable achievements since the first human space flight, in particular Valentina Tereshkova becoming the first woman to orbit the Earth on 16 June 1963, Neil Armstrong becoming the first human to set foot upon the surface of the Moon on 20 July 1969, and the docking of the Apollo and Soyuz spacecraft on 17 July 1975, being the first international human mission in space; and recalled that for the past decade humanity had maintained a multinational permanent human presence in outer space on board the International Space Station (ISS).

In establishing COPUOS in 1959, the General Assembly requested this body to review the scope of international cooperation in peaceful uses of outer space and to devise programmes in that field, which could be undertaken under United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, as well as to study legal problems arising from the exploration of outer space. The United Nations Office for Outer Space Affairs and its predecessors within the Secretariat of the United Nations have been assisting the Committee and its Subcommittees to achieve their goals and implement their decisions since the late 1950s.

There are several examples of the achievements of the Committee over the past 50 years for which the establishment of the legal regime governing the exploration and use of outer space is of fundamental importance. The first United Nations treaty on outer space, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) of 1967,

established, inter alia, that the "exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind".

The Third United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE III), held in 1999, recognized that large human space exploration missions exceeded the capacity of a single country and that cooperation should be privileged in that area. The ISS was cited as an example of that new paradigm which had been made possible by the end of the cold war. UNISPACE III recommended the development of future space programmes, in particular through international cooperation and the encouragement of access to the ISS by countries that had never participated in that endeavour. It also advocated the worldwide dissemination of information about research activities on board the ISS. One year later, in 2000, a crew boarded the ISS for the first time.

The Scientific and Technical Subcommittee of COPUOS, at its thirty-seventh session, in February 2000, began its consideration of a new agenda item for discussion entitled "International cooperation in human space flight", in accordance with General Assembly resolution 54/67. The Subcommittee had before it a working paper by the United States of America that presented an overview of the ISS. Delegations reviewed past, current and upcoming national and international programmes of cooperation in human space flight. Examples were given of international activities involving cooperation in national human space flight programmes such as Apollo, Soyuz, Salyut, Skylab, the Space Shuttle, Spacelab and the Mir Space Station. In addition, the nature and role of the ISS, as well as the activities and contributions of various States leading up to its development, assembly and utilization were discussed.

In June 2007, during the fiftieth session of COPUOS, the High-level Panel on Space Exploration offered insights into ongoing national and global space exploration initiatives and the possible future role the United Nations system could play in providing a forum for spacefaring, as well as space-using, countries to consider issues related to space exploration.

United Nations Secretary-General U Thant (centre) presented albums of United Nations stamps to Soviet cosmonauts Yuri Gagarin (right) and Valentina Tereshkova (left), the first man and the first woman to conquer outer space.
New York, 16 October 1963.

Neil A. Armstrong, Edwin E. Aldrin Jr. and Michael Collins, who made the successful journey to the moon in Apollo 11, visited the United Nations in New York and presented United Nations Secretary-General, U Thant, with a piece of lunar rock that was collected by the astronauts, and a United Nations flag which accompanied them to the moon and back.
20 July 1970.

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As part of its public outreach activities, the Office for Outer Space Affairs maintains a permanent United Nations space exhibit at its headquarters in Vienna, Austria. The display includes a Moon rock from the Apollo 15 mission.

©UNPA

In commemoration of the fiftieth anniversary of human space flight, the United Nations issued a series of 54 souvenir stamps in April 2011.

In 2011, the General Assembly declared 12 April as the International Day of Human Space Flight, to celebrate each year at the international level the beginning of the space era for mankind, reaffirming the important contribution of space science and technology in achieving sustainable development goals and increasing the well-being of States and peoples, as well as ensuring the realization of their aspiration to maintain outer space for peaceful purposes.

"I am confident that the International Day of Human Space Flight will remind us of our common humanity and our need to work together to conquer shared challenges. I hope it will also inspire young people in particular to pursue their dreams and move the world towards new frontiers of knowledge and understanding."

Secretary-General Ban Ki-moon, message on the International Day of Human Space Flight, 12 April 2012

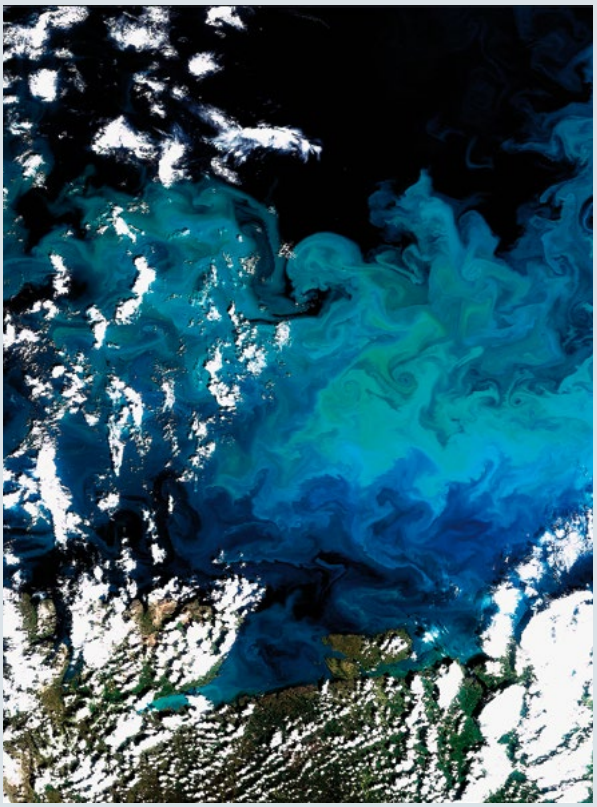
In 2011, COPUOS marked the fiftieth anniversary of humankind's first flight into outer space. This commemoration resulted in the adoption of the Declaration on the Fiftieth Anniversary of Human Space Flight and the Fiftieth Anniversary of the Committee on the Peaceful Uses of Outer Space, in which States Members of the United Nations stressed the need to look more closely into how advanced space research and exploration systems and technologies could further contribute to meeting challenges, including that of global climate change, and to food security and global health, and endeavour to examine how the outcomes and spin-offs of scientific research in human space flight could increase the benefits, in particular for developing countries.

HUMAN SPACE TECHNOLOGY INITIATIVE UNDER THE FRAMEWORK OF THE UNITED NATIONS

PROGRAMME ON SPACE APPLICATIONS

The United Nations Programme on Space Applications, since its creation in 1971, has made substantial progress in fostering knowledge of and experience related to space applications around the world. The activities of the Programme are carried out by the Office for Outer Space Affairs, with the annual endorsement of COPUOS. The mission of the Programme is to enhance the understanding and subsequent use of space technology for peaceful purposes in general, and for national development in particular, in response to expressed needs in different geographic regions of the world.

The overall strategy of the Programme is to focus on selected areas that are critical for developing countries, defining and working towards objectives achievable in two to five years and built on the results of previous activities. Those priority areas of the Programme are: *(a)* environmental monitoring; *(b)* natural resource management; *(c)* satellite communications for tele-education and telemedicine applications; *(d)* disaster risk reduction; *(e)* development of capabilities in the use of global navigation satellite systems; *(f)* the Basic Space Science Initiative, including the International Space Weather Initiative; *(g)* space law; *(h)* climate change; *(i)* the Basic Space Technology Initiative; and *(j)* the Human Space Technology Initiative. Additional Programme areas include spin-offs of space technology and promotion of the participation of youth in space activities and of private industry in the activities of the Programme.



A plankton bloom larger than Greece stretching across the Barents Sea off the tip of northern Europe. Long-term observations of the Earth from space can monitor minute changes in the environment and contribute to the detection of climate change.

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In furtherance of peaceful cooperation in space and through the combined efforts of the participating space partners, the ISS was developed, launched and constructed, and has had a crew on board continuously for over 11 years.

©NASA

Humans are gradually extending their capability to work and live in space. The astronauts are testing an untethered spacewalk aboard the Space Shuttle Discovery. This system allows an untethered astronaut to fly back safely to a spaceship.

HUMAN ACTIVITIES IN SPACE AND INTERNATIONAL COOPERATION

The docking of the Apollo and Soyuz spacecraft in 1975 was the first international human space mission. Since 2000, a multinational permanent human presence in outer space has been maintained on board the ISS. Since the beginning of the construction of the ISS, the Programme on Space Applications has invited experts to address topics such as the utilization of the ISS to provide benefits on Earth, and to discuss opportunities for developing countries to participate in research activities conducted on the ISS.

Recently, various studies and programmes throughout the world, in particular ones enthusiastically led by some emerging countries, have also been paving the way for future missions. In addition, the need for capacity-building in space science and technology and their applications has increased in many non-spacefaring countries. In response to the interest expressed by Member States, the Programme on Space Applications considered activities related to human space flight and exploration, which led to the launch of the Human Space Technology Initiative in 2010.

HUMAN SPACE TECHNOLOGY INITIATIVE

High above New Zealand and Cook Strait astronauts work to attach a new truss segment to the ISS and begin to upgrade the power grid.
(2006) ©NASA

HUMAN SPACE TECHNOLOGY INITIATIVE

The Human Space Technology Initiative is aimed at involving more countries in activities related to human space flight and space exploration and at increasing the benefit from the outcome of such activities through international cooperation, to make space exploration a truly international effort.

The role of the Initiative in these efforts consists of providing a platform to exchange information, to foster collaboration between partners from spacefaring and non-spacefaring countries and to encourage emerging and developing countries to take part in space research and to benefit from space applications.

The activities of the Initiative are based upon three pillars:

- *International cooperation:* To promote international cooperation in human space flight and activities related to space exploration;
- *Outreach:* To promote increased awareness among Member States of the benefits of utilizing human space technology and its applications;
- *Capacity-building:* To build capacity in microgravity science education and research.

International cooperation: The Initiative bridges and connects different partners from the international space community and other United Nations entities, as well as Member States. In close cooperation with ISS partners, information on the management structure of the ISS and on research facilities is provided. Furthermore, the Initiative provides information about opportunities to cooperate with space agencies, as well as educational material on space science and technology.

Outreach: The Initiative organizes expert meetings and workshops annually to raise awareness of the current status of space exploration activities, as well as the benefits of utilizing human space technology and its applications. Experts from around the world meet together and exchange information and discuss possible future projects with regard to human space exploration and its related activities. The Initiative also provides publications and distributes informative materials on those subjects.

Capacity-building: The Initiative is conducting the Zero-Gravity Instrument Project, in which microgravity simulation instruments, called clinostats, are distributed worldwide for education and research. In addition to the Project, the Initiative is also seeking to establish programmes and fellowships that help researchers from non-spacefaring countries gain access to these facilities. Within such programmes, the Initiative provides information on the facilities and on opportunities to utilize them.

The ISS is an international research station in low-Earth orbit, the result of cooperation and partnership between the space agencies of Canada (CSA), Europe (ESA), Japan (JAXA), the Russian Federation (Roscosmos) and the United States (NASA).

STS-131 and Expedition 23 crew members gather for a group portrait in the Japanese Experiment Module "Kibo" laboratory of the ISS while space shuttle Discovery remains docked with the station.

INTERNATIONAL COOPERATION

Outreach seminar on the activities of the International Space Station

Vienna, Austria, 8 February 2011

The ISS, a remarkable achievement of space technology, provides unique and cooperative opportunities related to both scientific and engineering projects. The Office for Outer Space Affairs organized a one-day outreach seminar, in cooperation with the five ISS partner agencies — the Canadian Space Agency (CSA), the European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA), the National Aeronautics and Space Administration (NASA) of the United States and the Russian Federal Space Agency (Roscosmos) — bringing together many Government officials and experts from non-ISS-partner countries. The participants received first-hand information about the status of educational and research activities, and about how to participate in research projects on board the ISS.

United Nations Expert Meeting on the International Space Station Benefits for Humanity

Vienna, Austria, 11 and 12 June 2012

Based on the results and the recommendation of the United Nations/Malaysia Expert Meeting on Human Space Technology, held in Putrajaya, Malaysia, in November 2011, the United Nations Expert Meeting on the International Space Station Benefits for Humanity was held in Vienna, Austria, on 11 and 12 June 2012, during the forty-ninth session of COPUOS.

The meeting, whose title refers to a publication produced by ISS partners, brought together experts from ISS partners and United Nations agencies to discuss and identify potential collaborations, with the aim of extending the ISS benefits to all people in the identified areas of Earth observation and disaster response, health and education.

The participating agencies from ISS partners were NASA, CSA, ESA and JAXA. The participating bodies of the United Nations system were the World Meteorological Organization, the United Nations Environment Programme, the World Health Organization and the United Nations Educational, Scientific and Cultural Organization. Throughout the two-day meeting, activities on board the ISS and those pursued by the United Nations were presented to serve as grounds for identifying potential ways of extending the benefits.

This picture shows the sun and many components of the ISS. In the lower right foreground is the Alpha Magnetic Spectrometer (AMS) experiment installed during the STS-134 mission. AMS is a state-of-the-art particle physics detector designed by an international team to use the unique environment of space to advance knowledge of the universe and lead to the understanding of the universe's origin by searching for antimatter and dark matter and measuring cosmic rays. (2011)

As a result, three concrete projects in the areas of education and health were identified. In order to convert these collaborative ideas into possible future projects, further assessment by the interested parties will be needed. This will be begun by the Initiative.

OUTREACH

United Nations/Malaysia Expert Meeting on Human Space Technology

Putrajaya, Malaysia, 14-18 November 2011

The first United Nations meeting of its kind, the United Nations/Malaysia Expert Meeting on Human Space Technology was held in Malaysia in 2011, with the participation of more than 20 countries.

The meeting brought together senior Government officials and experts from space agencies, academia and relevant industries. Its programme included discussions on ways to bring the benefits of human space technology to society, foster cooperation and promote capacity-building in countries for future generations.

The five-day meeting concluded with 10 specific recommendations on the way forward, for example on promoting cooperation between countries and increasing awareness of research and applications in human space technology, as one approach to supporting development of activities under the Initiative.

The meeting was hosted by the Institute of Space Science of the National University of Malaysia, and co-organized by the Office for Outer Space Affairs and ISS partner agencies, in cooperation with the Astronautic Technology Sdn Bhd, the National Space Agency of Malaysia (ANGKASA) and the University Malaysia Pahang.

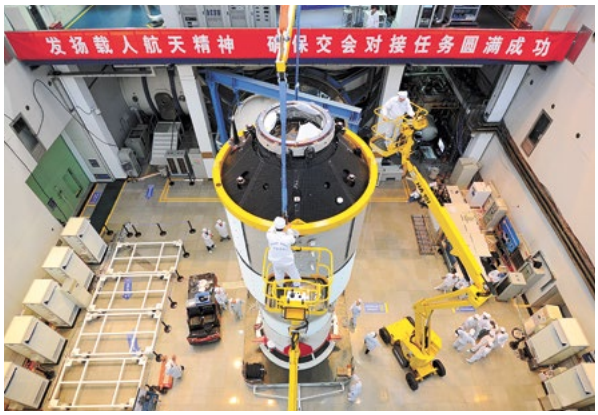
United Nations/China Workshop on Human Space Technology

Beijing, China, 16-20 September 2013

As a further extension of the United Nations/Malaysia Expert Meeting on Human Space Technology, the United Nations/China Workshop on Human Space Technology was held in Beijing, China, from 16 to 20 September 2013.

The workshop focused on exchanging information on the latest developments and future plans related to human space flight and space exploration, creating awareness of the benefits of human space technology and its applications, promoting capacity related to microgravity research and education and identifying potential opportunities for new spacefaring and emerging countries to participate in efforts related to space exploration.

The workshop was hosted by the China Manned Space Agency (CMSA), on behalf of the Government of China, and co-organized by the International Academy of Astronautics.



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The TianGong-1 is China's first experimental space laboratory and the first target spacecraft for rendezvous and docking missions. A vacuum thermal test was performed in a space environment simulator in Beijing. (April 2011)

©CMSA

The Chang Zheng (CZ)-2F launch vehicle, integrated with the TianGong-1, is transported to the launch pad in Jiuquan Satellite Launch Center for lift off. (September 2011)

CAPACITY-BUILDING

The Human Space Technology Initiative is carrying out scientific activities aimed at contributing to promoting space education and research under microgravity conditions around the world, particularly for enhancing capacity-building efforts in developing countries.

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.

Zero-Gravity Instrument Project (ZGIP)

The Zero-Gravity Instrument Project provides unique opportunities for students and researchers to study 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 also aimed at motivating research institutions to invest in activities in space and microgravity research and 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.

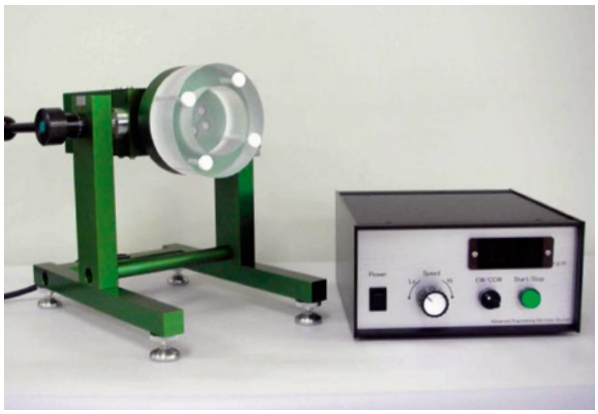
Drop Tower Experiment Series (DropTES)

The Drop Tower Experiment Series is a fellowship programme in which students can learn and study microgravity science by performing experiments in a drop tower. The Bremen Drop Tower in Germany is a ground-based laboratory with a drop tube of a height of 146 meters, which can enable short microgravity experiments to be performed in various scientific fields, such as fluid physics, combustion, thermodynamics, materials science and biotechnology.

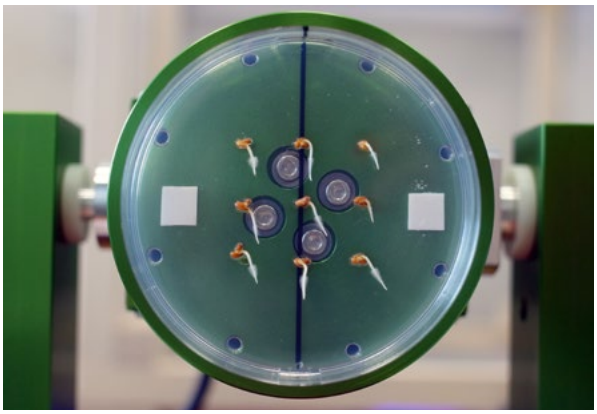
In collaboration with the Center of Applied Space Technology and Microgravity (ZARM) and the German Aerospace Center (DLR), the fellowship programme offers a selected research team the opportunity to conduct its own microgravity experiments at the Bremen Drop Tower. The series of experiments will consist of four drops or catapult launches during which approximately 5 or 10 seconds of microgravity, respectively, are produced.

Information about the Zero-Gravity Instrument Project (ZGIP) and the Drop Tower Experiment Series (DropTES) is available from:

www.oosa.unvienna.org/oosa/en/SAP/hsti/index.html.



The clinostat has one rotational axis perpendicular to the gravity vector. Rotating samples at a constant speed can cancel the effects of gravity, thus creating a simulated microgravity condition on the ground.



The Petri dish with cress is placed on a clinostat and rotated at a constant speed. Plant seedlings can no longer sense the direction of gravity during the rotation.

First humans on the Moon, Neil Armstrong and Edwin Aldrin (USA), 1969

Close-up view of an astronaut's footprint in the lunar soil photographed during the Apollo 11 extravehicular activity on the moon, 1969

First space station launched,"Salyut-1" (USSR), 1971

First element of the International Space Station "Zarya" launched, 1998

First Chinese manned mission: Yang Liwei on board Shenzhou-V, 2003

First decade of a continuous human presence in outer space aboard the International Space Station, 2010

www.unoosa.org

The United Nations Office for Outer Space Affairs (OOSA) is responsible for promoting international cooperation in the peaceful uses of outer space and assisting developing countries in using space science and technology.

Over the past 50 years of space exploration, human space technology has become an essential part of the advancement of civilization. The Human Space Technology Initiative strives to bring the benefits of human space activities to all and to bring nations together for this endeavour, thus creating new opportunities for international cooperation.

The Human Space Technology Initiative is promoting space exploration as a common and unifying goal for humankind. It will also help us understand our existence on Earth.

FOR FURTHER INFORMATION,
PLEASE CONTACT:
United Nations Office for Outer Space Affairs
Vienna International Centre, P.O. Box 500,
1400 Vienna, Austria
Website: www.unoosa.org

For enquiries about the Human Space Technology Initiative, please send an e-mail to hsti@unoosa.org
Website: www.unoosa.org/oosa/en/SAP/hsti/index.html

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