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Committee on the Peaceful Uses of Outer Space

Report on the United Nations/Costa Rica Workshop on Human Space Technology

(San José, 7-11 March 2016)

I. Introduction

1. The United Nations/Costa Rica Workshop on Human Space Technology was held in San José, from 7 to 11 March 2016. The Workshop was part of the Human Space Technology Initiative (HSTI) under the United Nations Programme on Space Applications (see www.unoosa.org/oosa/en/ourwork/psa/hsti/index.html), which is implemented by the Office for Outer Space Affairs.

2. The Workshop was organized by the Office for Outer Space Affairs, the Government of Costa Rica and the International Academy of Astronautics (IAA).

3. The present report describes the background, objectives and programme of the Workshop, summarizes the presentations made during the technical meetings, summarizes the working group meetings held during the Workshop, and documents the recommendations made by participants. The report has been prepared pursuant to General Assembly resolution 70/82.

A. Background and objectives

4. The United Nations/Malaysia Expert Meeting on Human Space Technology, the first of its kind, was held in Putrajaya, Malaysia, from 14 to 18 November 2011 (see A/AC.105/1017). It focused on facilitating discussions on the benefits of human space technology, capacity-building and microgravity research in general and on defining HSTI activities to meet its objectives.

5. The United Nations/China Workshop on Human Space Technology was held in Beijing, from 16 to 20 September 2013. Its objectives were to enable participants to exchange information and views on human space exploration and human space technology and its applications, and to put forward constructive and innovative proposals on promoting international cooperation in microgravity science, capacity-building and education, and human space exploration.

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6. The present Workshop was an extension of the United Nations/China Workshop. Its objectives were to:

(a) Exchange information on the latest developments and future plans of human space flight, space exploration and space commercialization;

(b) Promote capacity in microgravity education and other areas of space research and technology;

(c) Identify potential opportunities for newly and emerging spacefaring countries to participate in the growing field of space commercialization and activities related to space exploration;

(d) Identify the role of the space industry in space commercialization and activities related to space exploration.

B. Attendance and financial support

7. Participants in the Workshop were selected on the basis of their academic qualifications and professional work experience in fields related to the overall theme of the Workshop, such as involvement in the planning and development of national, regional or international space programmes, in microgravity science, in capacity-building and education in space science and technology, and in human space exploration-related activities.

8. The Workshop was attended by 120 professionals from governmental institutions, universities and other academic entities, as well as from non-governmental organizations from the following 26 countries: Austria, Brazil, Canada, China, Costa Rica, Czechia, Ecuador, France, Germany, Ghana, India, Israel, Italy, Japan, Jordan, Mexico, Netherlands, Nicaragua, Nigeria, Pakistan, Panama, Peru, Philippines, Thailand, United Kingdom of Great Britain and Northern Ireland, and United States of America.

9. Funds allocated by the United Nations were used to defray the cost of air travel, daily subsistence allowance and accommodation for 17 participants. The Government of Costa Rica also provided funds for facilities, meals and refreshments, and in addition, organized a cultural event for the participants and an outreach activity for the general public.

C. Programme

10. The programme of the Workshop was developed by the Office for Outer Space Affairs in cooperation with the programme committee which included representatives from the Government of Costa Rica, IAA and the Office for Outer Space Affairs. The honorary committee and the local organizing committee also contributed to the successful organization of the Workshop.

11. The programme was comprised of an opening meeting, 10 plenary technical meetings, 6 poster sessions, 3 working group meetings, 1 joint working group meeting, 1 wrap-up meeting, a cultural activity tour and an outreach activity, followed by a closing meeting. The working group meetings were the principal occasions for discussion and for providing observations and recommendations. The results were reviewed in the joint working group meeting, and consolidated in the wrap-up meeting, by all the participants.

12. The chairs, co-chairs and rapporteurs assigned to each plenary technical and working group meeting provided their comments and notes as input for

the present report. The detailed programme, background information and full documentation of the presentations made at the Workshop have been made available on the website of the Office for Outer Space Affairs (www.unoosa.org/oosa/en/ourwork/psa/schedule/2016/workshop_costarica_human_space_technology.html).

II. Summary of the Workshop programme

A. Opening meeting

13. During the opening meeting, the acting Minister of Foreign Affairs of Costa Rica, the Minister of Science, Technology and Telecommunications of Costa Rica, the IAA representative and the Director of the Office for Outer Space Affairs delivered welcoming remarks. One of the speakers noted that the establishment of the Sustainable Development Goals of the United Nations had further increased the importance of space technologies as a means to realize the potential for equal development. The point was raised that the fiftieth anniversary of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE+50), in 2018, offered an opportunity to look at the contributions the three United Nations Conferences on the Exploration and Peaceful Uses of Outer Space (UNISPACE I, II and III), held in Vienna in 1968, 1982 and 1999, respectively, had made to global development. UNISPACE+50 was also an occasion to chart the future of the Committee on the Peaceful Uses of Outer Space and the Office for Outer Space Affairs in relation to global space governance, including in the area of space exploration and innovation for the benefit of developing countries.

14. The chairperson of the local organizing committee, the administrator of the National Aeronautics and Space Administration (NASA) of the United States, and a senator and former astronaut of the United States made keynote speeches. Highlights included remarks that space is the future of humankind and must not be the scene of confrontations but must be shared and that all human beings should be entitled to human space exploration regardless of their gender, race or nationality.

15. The keynote speeches were followed by an address by the President of Costa Rica, in which he emphasized his country's willingness to continue to work on human space technology and to foster international cooperation. He acknowledged the importance of the Committee on the Peaceful Uses of Outer Space and of UNISPACE+50.

B. Technical meetings

16. The 10 plenary technical meetings were divided according to four themes: national, regional and international space programmes, space and microgravity science, human space exploration and commercial space activities. A total of 44 presentations were made during the plenary technical meetings.

17. The plenary meetings started with welcoming remarks by the representative of the United Nations Development Programme office in Costa Rica, followed by an introductory presentation about the role of the Office for Outer Space Affairs, its vision, its current and future activities, and, in particular, its strategic preparations for UNISPACE+50.

C. Poster sessions

18. At the poster sessions participants could present their work as it related to the themes of the Workshop. They covered a wide range of developments in the national space programmes, capacity-building and space education, human space exploration, and commercial space activities. In one of the presentations, a participant from IAA displayed a mock-up of the Sokol-KV2 space suit.

19. The Office for Outer Space Affairs displayed the hardware of a one-axis clinostat, which is a microgravity simulation instrument that has been distributed worldwide under the HSTI Zero-Gravity Instrument Project (ZGIP). At the end of the Workshop, the clinostat was donated to the Ministry of Science, Technology and Telecommunications of Costa Rica as a memento of the Workshop.

D. Cultural activity tour and outreach activity

20. The cultural activity, a visit to the Espíritu Santo coffee tour in Naranjo, was held in the afternoon of 8 March. The tour offered participants insights into the agriculture, economy and history of Costa Rica.

21. A public forum was held at the national stadium in San José on the evening of 9 March, at which seven astronauts from Brazil, Canada, China, Costa Rica, Italy, Japan and the United States shared their experiences in outer space and spoke to an audience of over 8,500 students from Costa Rica as well as to Workshop participants about the training they had received.

E. Working group meetings

22. Three working groups were held in parallel. Each dealt with its own theme: space and microgravity science, commercial space activities and human space exploration. The purpose of the working group meetings was to identify various countries' and entities' niche strengths, capabilities, and current activities that could be relevant to each theme, to identify issues and problems in implementing specific objectives and discuss ways to solve them, and to discuss ways to foster new activities. Observations and recommendations from the working group meetings were then presented to all participants during the joint working group meeting in order to document a set of draft recommendations for the wrap-up meeting.

III. Summary of technical meetings

A. National, regional and international space programmes

23. Three technical meetings were held on the theme of national, regional and international space programmes. They were designed to give participants the opportunity to exchange information on the latest developments and future plans in this area.

24. The European Space Agency (ESA) briefly summarized its space exploration strategy and related programmes, which included user-driven utilization of the International Space Station (ISS) and post-ISS platforms, ongoing cooperation with China in connection with that country's space station, and future plans for human space missions and robotic missions.

25. The Boeing Company gave an overview of its commercial space programmes and plans to explore beyond the low-Earth orbit. The speaker noted that ISS was a vital platform that had not only contributed to scientific research but also to fostering marketplaces for commercial space activities. The speaker also emphasized that commercial crew transportation was an important means to enable sustainable human space exploration activities.

26. The Central American Association for Aeronautics and Space reported about Costa Rica's path to space development and about a potential Central American cooperation programme. Costa Rica was working on the first draft of a national aerospace development policy programme and had the plan to establish a regional space agency in cooperation with other Central American countries.

27. The Mexican Space Agency presented the space activities it had pursued since its establishment, the challenges it had faced, and the opportunities international cooperation in space matters would bring. The Agency would host the 67th International Astronautical Congress in Guadalajara, Mexico, from 26 to 30 September 2016.

28. The IAA representative remarked that space exploration, whether by human missions or robotics, was a major investment in the future of humankind and should be sustainable; therefore, it had to open new markets in the world. It was also noted that the ISS programme was expected to end in 2024 and that a follow-up programme needed to be agreed on.

29. The China Manned Space Agency introduced its manned spaceflight missions. The speaker announced the Agency's intention to open up the China space station, scheduled to be completed by 2020, for use by the rest of the world through international cooperation. The planned areas of activity were the development of devices, components, subsystems, and modules; space science experiments; astronaut selection, training, and flight; and the application of human space technology.

30. The Goodwill Ambassador of the United Nations Industrial Development Organization in Brazil presented that country's comprehensive space programmes, including their history and organizational structure. He emphasized that Brazil needed partners to further its space programmes.

31. The Civilian Space Agency of Ecuador introduced a civilian space programme, and mentioned that Ecuador had the desire to join the international space community and to contribute its experience, technology and resources to the concerted effort to construct a truly inclusive spacefaring society.

32. The Commission for Space Affairs of Panama provided an overview of the activities it had pursued since its establishment in 2015. The Commission was addressing legal and technical issues and developing a strategic road map for creating a national space agency.

33. The representative from Nicaragua reported the result of the Seventh Space Conference of the Americas, which had addressed the promotion of knowledge, the exchange of experiences and learning, and building capacity in space science and technology that would contribute to the comprehensive development of the Americas.

34. The Ghana Space Science and Technology Institute presented its national space programmes, including the plan to launch a synthetic aperture radar (SAR) satellite (GHANASAT) by 2020 and to establish a space policy that would address the use of space science and technology to derive optimal socioeconomic benefits for Africans in terms of both quality of life and wealth.

35. The Department of Science and Technology of the Philippines gave a presentation in which the speaker noted that the country's first microsatellite had been deployed from the Japanese Experiment Module (Kibo) on board ISS in January 2016. The Philippines had been participating in an international cooperation outreach programme of the Japan Aerospace Exploration Agency (JAXA) named Kibo-ABC. The Philippines will host the twenty-third session of the Asia-Pacific Regional Space Agency Forum in Manila from 15 to 18 November 2016.

36. The National University of Costa Rica reported about its activities to monitor an earthquake cycle using the Global Positioning System (GPS). The Czech Space Office presented its activities and reported that it had hosted the twentieth IAA Humans in Space Symposium in Prague in 2015.

B. Human space exploration

37. The three technical meetings on human space exploration enabled participants to exchange information on the latest development and future plans in this field and its related activities and to share their views on how to promote international cooperation.

38. IAA presented the activities it pursued under its study group on global human missions to explore the Mars system. The speaker emphasized that the goal of taking humans to Mars must be pursued as a truly international enterprise in which any country can contribute towards the final achievement.

39. A former astronaut from NASA talked about the experience he had gained cooperating with a cosmonaut of the Russian Federation. The two had participated in a joint mission of NASA and the Russian Federal Space Agency (Roscosmos), during which the space shuttle had made a rendezvous with and docked at the Mir space station. The speaker considered it vital to build mutual trust in spite of cultural differences.

40. An ESA astronaut from Italy talked about ISS in connection with science, technology and exploration and shared with participants his own experience as an astronaut on board ISS. He stated that human exploration activities will inspire people and unite them around a common goal.

41. The University of Munich highlighted the challenges the human body faced when adapting to extreme living conditions, such as in space, or to hostile environments on Earth. The speaker described how the immune competence of the human body changed with mobility as well as in response to new environmental and social stresses. The speaker stressed the significance of research in space for the progress of research on the ground.

42. The Ad Astra Rocket Company provided a brief overview of its variable specific impulse magnetoplasma rocket (VASIMR), which could contribute to future human space exploration by significantly reducing the radiation doses to which crews will be exposed and by reducing total mission costs.

43. Beihang University in Beijing reported about astrobiological studies on extremophiles and the application of the findings to combat desertification. The speaker focused on the origin, evolution and distribution of life in the context of cosmic evolution and suggested that some bacteria living under harsh conditions on Earth, such as cyanobacteria in desert environments, might be used as extraterrestrial pioneers to contribute to stopping desertification.

44. The National University of Costa Rica presented its activities in the field of aerospace engineering to build bridges between the industry and students. The University also had an outreach activity entitled "Space camp" bringing together

students from different high schools and offering them an opportunity to give speeches and exchange opinions on space-related subjects.

45. The University of Saskatchewan, Canada, gave an account of its work on the use of remote-presence robot technology, which was aimed at reducing the inequality in health-care delivery in remote, underserved locations. The speaker noted that the study of space health, which is concerned with the health of astronauts in outer space, and ground-based research on tele-health were related and should be closely linked.

46. An astronaut from the Canadian Space Agency gave a presentation on human challenges in long-duration space flight, sharing with participants details about the recruiting campaign and the training of astronauts. He emphasized the importance of team work, of having a creative spirit and of being willing to take responsibility.

47. JAXA highlighted its achievements in space exploration and presented its scenario for the future in connection with that field. Its Akatsuki Venus probe mission had been successfully inserted into an orbit around Venus on 7 December 2015 despite previous technical problems and had been contributing to our understanding of the planet. Japan would host the second International Space Exploration Forum, to be held in 2017.

48. The speaker for the Centre for Environmental Planning and Technology University, India, reminded participants that although we live in a highly technical era, some basic philosophical principles must also guide our development.

49. The speaker for Geo-Informatics and Space Technology Development Agency, Thailand, reported about the activities pursued under ZGIP, which included an international experiment and domestic education programmes. The Agency had been collaborating with JAXA on conducting microgravity experiments, for example on board microgravity aircraft or in the framework of the Kibo-ABC programme.

C. Space and microgravity science

50. The two technical meetings on space and microgravity science provided opportunities for scientists and engineers to present their activities and plans in space science, microgravity education and research activities using space and ground facilities.

51. A representative of the medical centre of Vrije Universiteit, the Netherlands, gave a presentation on gravity in the life and physical sciences, emphasizing the importance of research related to hypergravity and microgravity aimed at understanding the effects of gravity.

52. Research on exposure to artificial gravity had previously been dedicated to men; therefore, the effects on women had been unknown. The Medical University of Graz, Austria, revealed that artificial gravity improved orthostatic tolerance of women and men alike and that an individualized artificial gravity training programme was important.

53. The Federal University of Rio Grande do Norte, Brazil, reported about the results of its microgravity experiment on sugarcane plants on board the Brazilian sounding rocket VSB-30, showing that sugarcane leaves and roots lost tissue organization and that the plants used different enzymes to respond to microgravity stress.

54. Since 2013, the Office for Outer Space Affairs had been implementing ZGIP to distribute one-axis clinostats to selected universities, research institutions and high schools for microgravity research and education. As a recipient, the African Regional

Centre for Space Science and Technology Education — in English language, Nigeria, reported about the results of its experiment using the clinostat. ZGIP had contributed significantly to inspiring young students and developing capacity in Nigeria.

55. The China National Space Administration provided an overview of China's space technology and space science. In 2015, China had launched a returnable microgravity experiment satellite Shijian 10. China's next generation heavy launch system, Chang Zheng 5, will be capable of launching a payload of 25,000 kg to low-Earth orbit. A lunar exploration mission, Chang'e-4, will land on the far side of the Moon in 2018.

56. The Centre of Applied Space Technology and Microgravity at the University of Bremen, Germany, summarized the activities of the first and second cycles of the drop tower experiment series (DropTES), which the Centre has been implementing as an HSTI fellowship programme to give one student team the opportunity to conduct a microgravity experiment at the Bremen drop tower, and recalled that a third cycle had been launched.

57. As the institution selected for the first cycle of DropTES, the German-Jordanian University, Jordan, reported about its experiment. The results had proved the effectiveness of a tuned mass damper for controlling oscillation in a microgravity environment.

58. Even brief periods of microgravity are significant, not only for the development of space technology, but also for many fields of basic research such as the physics of liquids and metal alloys or combustion experiments. The Czech Space Office presented the idea to build smaller-sized drop towers, which could supplement taller drop towers such as the one in Bremen.

59. The Ad Astra Rocket Company reported about the results obtained through the NASA flight opportunities programme, which allowed Ad Astra to test and make progress with the design of a specific cooling system (VF 200). The system will be used for its VASIMR rocket.

D. Commercial space activities

60. The two technical meetings on commercial space activities provided participants with opportunities to exchange information on the latest developments and future plans relating to commercial space activities. A variety of topics was touched upon, such as the commercialization of space, public-private partnerships, space tourism and commercial cargo transportation.

61. The company Air Liquide gave a presentation about cryogenics, which is a set of technologies and know-how needed to reach very low temperatures. Cryogenics is crucial for humans to venture into space, because it can be used for cabin air purification, long range vehicles' propellant tanks, energy storage, energy production and superconductivity.

62. ESA presented its initiative to partner with the private sector. Public-private partnerships and public-private initiatives were becoming the scope of ESA activities. Partnerships with the private sector would contribute not only to economic growth, but also to enabling and enhancing the feasibility of human space activities.

63. Surrey Satellite Technology Ltd. presented some of its activities. As a spin-off from the University of Surrey, United Kingdom, it had strong academic links and had contributed to the missions of space agencies and national missions. It had a plan to provide a low-cost support infrastructure that would help to develop a new market on the Moon for the benefit of both governmental agencies and the private sector.

64. NanoRacks, the first company to commercialize the deployment of cube satellites from the Japanese Experiment Module (Kibo) of ISS, gave a presentation in which it emphasized that there were markets for the utilization of ISS and that a commercial space station was possible.

65. The company SpacePharma gave a presentation on remote-controlled miniaturized nanosatellite laboratory platforms used for microgravity research and chemical and biological scientific applications on which it was working. The speaker noted that the results of research using the platforms might contribute to resolving global health issues caused by climate change.

66. The Boeing Company presented the story of how a small team of rogue designers influenced the outcome of the NASA commercial crew programme. According to the speaker, to achieve good results, it was important to make every worker feel a personal attachment to his or her work, even in a highly technical environment.

IV. Observations of the working groups

A. Working group on space and microgravity science

67. The working group on space and microgravity science was the result of merging two working groups from the United Nations/Malaysia Expert Meeting on Human Space Technology and the United Nations/China Workshop on Human Space Technology, namely the working group on microgravity science and the working group on capacity-building and education. The merged working group addressed current microgravity-related activities, available microgravity facilities and instruments, challenges and needs.

68. Based on the discussions held during its meeting, the working group recorded the following observations:

(a) Not enough financial resources are provided to end users for space and microgravity science projects in developing countries. To be successful and beneficial, space and microgravity-related activities require a lasting administrative and financial commitment on the part of Governments;

(b) ZGIP and DropTES activities have successfully benefited capacity-building in developing countries. The availability of a ZGIP clinostat in a country can enable local entities to develop additional clinostats in order to establish a broader base for education and capacity-building. It is encouraging that new ground-based research facilities have been developed;

(c) Space and microgravity science education is not yet sufficiently integrated in the education systems of developing countries;

(d) There is potential for using locally built small drop towers for education in space and gravity-related sciences; there is also potential for complementing ZGIP and DropTES with a hypergravity platform;

(e) International collaboration has secured and sustained activities related to space and microgravity science. There are opportunities for collaborating on activities related to regional space science;

(f) There are various databases related to space flight research in spacefaring nations. The participation of other countries in the exploration and operation of such databases provides developing countries an opportunity for being directly involved in low-cost space research.

B. Working group on commercial space activities

69. The working group on commercial space activities was newly established at the present Workshop. It comprised participants from the space industry, from space agencies engaged in partnerships with the space industry, as well as local students interested in commercial space activities. Each participating institution shared information about its interests. The participants further discussed the benefits and challenges of commercial space activities, the role of the space industry and the relationship between the space industry and Governments or space agencies.

70. The working group made the following observations:

(a) Commercial space activities will play an important role in expanding the use of outer space and will stimulate space activities for the benefit of humanity;

(b) A clear, well-defined and coherent vision is necessary on the roles of Governments and industry, such as in partnerships and contractor/contracting agency relationships;

(c) Different views are found to exist regarding ownership in space. In order to develop commercial space activities, common elements are required such as legal frameworks, funding, adequate human resources, education and training, and standards and certification;

(d) Technology transfer is a formidable challenge that currently slows down the growth of the space industry;

(e) It is necessary to develop channels and mechanisms for international cooperation across sectors and to create awareness that space commerce is regarded as globally accessible and a natural extension of earthbound business activities;

(f) Commercial space activities have rekindled the imagination and stimulated the interest of the public in space development by making space accessible to everyone; commercial space activities will bring a culture of innovation fuelled by competition that will change the paradigm of Government-driven space activities;

(g) A difference is found to exist in priorities and mindset between management and the technical workforce, resulting in the pursuit of short-term gain. Decentralization is a trend happening in commercial space activities to enable shorter and more efficient links between management and the technical workforce.

C. Working group on human space exploration

71. The working group on human space exploration met for the second time at the present Workshop. Its first meeting had been held at the United Nations/China Workshop on Human Space Technology. Scientists, engineers, astronauts and local students participated in the working group and discussed the possibilities of collaboration and the future of space exploration.

72. The working group made the following observations:

(a) Public-private partnerships in developing countries can leverage sufficient resources to fund human space exploration projects;

(b) Human space exploration has a strong motivating effect on young people, encouraging them to enter science and technology careers, which could in turn encourage them to pursue highly specialized skills. The human element of space exploration uniquely captivates the imagination and fosters national self-confidence;

(c) In many developing countries the current regulatory and legal systems have not evolved to meet the needs of human space exploration activities;

(d) Developing countries that have invested national resources, either public or private, in domestic human space exploration programmes can obtain maximum benefit from the inspirational effect of astronauts;

(e) Developing countries can participate in human space exploration by identifying, strengthening and coordinating the niches best suited to their capabilities. However, in general an international framework is missing that would allow developing countries to participate in human space exploration, and such a framework is needed;

(f) Nuclear power is an enabling technology that can mitigate threats associated with sustainable, safe, and robust human exploration missions in deep space.

V. Recommendations

73. The last day of the Workshop was dedicated to finalizing the recommendations. A joint working group meeting was held, at which the chair shared the observations and recommendations of each working group with all participants. This was followed by a wrap-up meeting, at which a draft of the consolidated recommendations was presented for the participants to review.

74. The Workshop adopted the following 12 recommendations:

(a) At future workshops, the United Nations should organize working groups to discuss, in detail, confinement physiology and the effectiveness of artificial gravity in long-duration human space flight;

(b) The United Nations should continue current ZGIP and DropTES activities and explore the possibility of extending those activities by providing access to a hypergravity platform for developing countries;

(c) The United Nations should provide a platform or knowledge base that educators and user groups can use to discuss and share operational, educational and engineering information on clinostats, drop towers and parabolic flights;

(d) The United Nations should encourage the creation of a framework to set up an exchange of experts between spacefaring nations and developing countries in order to foster the participation of developing countries in human space exploration;

(e) The United Nations should continue to organize outreach activities such as workshops and expert meetings that bring stakeholders such as decision makers together with the general public; the United Nations should also continue to provide a platform for exchanging information on space exploration and discussing how to encourage the participation of developing countries in human space activities though international cooperation;

(f) The United Nations, Governments, and space agencies should promote and implement activities aimed at educating the public about the advantages and the safety of nuclear power in space;

(g) Governments of all countries, in particular spacefaring countries, should explore the possibility of opening up existing space-related research programmes and databases for students and/or professionals from developing countries; meanwhile, Governments of developing countries should continue to seek partnerships with other countries;

(h) Governments should integrate programmes related to space and microgravity science into the curriculums of undergraduate and/or graduate education programmes;

(i) Governments should examine national legal frameworks in order to enhance the transfer of technology;

(j) Governments should simplify procedures for enhancing developing countries' participation in human space exploration activities;

(k) Governments should work through international bodies to regulate ownership in space by assessing risks to sustainable development of space resources;

(l) Governments, the academic community and the space industry should consider the long-term benefits of human space exploration and develop long-term, committed and inclusive partnerships that enable the efficient and transparent availability of funds for space activities.

VI. Conclusions

75. The United Nations/Costa Rica Workshop on Human Space Technology was held as a follow-up to the United Nations/China Workshop on Human Space Technology held in 2013, with the intention of exchanging information and views on human space exploration, human space technology and other areas of space research and technology. The Workshop was also aimed at identifying the role of the space industry in activities related to space commercialization and exploration and at promoting international cooperation in microgravity science, capacity-building and education, and human space exploration.

76. The Workshop was attended by participants from nine countries (Brazil, Ecuador, Italy, Mexico, Nicaragua, Panama, Peru, Philippines and United Kingdom) that had not participated in the previous events in the series, namely the United Nations/China Workshop on Human Space Technology held in 2013 or the United Nations/Malaysia Expert Meeting on Human Space Technology held in 2011. In total, 47 countries have participated in these HSTI activities to date. This shows that human space exploration and its related activities have become truly global undertakings.

77. In recognition of the fact that human space exploration can be regarded as a common goal of humanity that can unite the world, the aim of HSTI is to bring the benefits of human space activities to all and to bring nations together around that endeavour by creating new opportunities for international cooperation.