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## Committee on the Peaceful Uses of Outer Space

### **Report on the United Nations/United Arab Emirates Symposium on Basic Space Technology: Small-Satellite Missions for Developing Space Nations**

**(Dubai, United Arab Emirates, 20-23 October 2013)**

#### **I. Introduction**

1. The United Nations/United Arab Emirates Symposium on Basic Space Technology on the theme “Small-satellite missions for developing space nations” was the second in a series of international symposiums on basic space technology development to be held in the regions that correspond to the Economic Commissions for Africa, Asia and the Pacific, Latin America and the Caribbean, and Western Asia. The first symposium in the series was held as the United Nations/Japan Nanosatellite Symposium in Nagoya, Japan, in 2012. The symposiums are part of the Basic Space Technology Initiative, which is carried out in the framework of the United Nations Programme on Space Applications and aimed at supporting capacity-building in basic space technology and promoting the use of space technology and its applications for the peaceful uses of outer space and in support of sustainable development (see [www.unoosa.org/oosa/en/SAP/bsti/index.html](http://www.unoosa.org/oosa/en/SAP/bsti/index.html)).

2. The Symposium was organized by the Office for Outer Space Affairs of the Secretariat and by the Emirates Institution for Advanced Science and Technology (EIAST), on behalf of the Government of the United Arab Emirates, and was held at the Zayed University Convention Centre.

3. The present report describes the background, objectives and programme of the Symposium, summarizes the presentations made during its thematic sessions and panel discussions, and documents the recommendations and observations made by the participants. The report is prepared pursuant to General Assembly resolution 67/113. It should be read in conjunction with the reports on the three United Nations/Austria/European Space Agency symposiums on small-satellite programmes held between 2009 and 2011 (see A/AC.105/966, A/AC.105/983 and



A/AC.105/1005) and the report on the United Nations/Japan Nanosatellite Symposium (A/AC.105/1032).

## **A. Background and objectives**

4. Since the Third United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE III), held in Vienna from 19 to 30 July 1999, considerable progress has been made in the operational use of space technology and its applications. Today, space-based assets such as telecommunications, Earth observation and navigation satellites support a broad range of applications and are part of the public infrastructure in virtually every country, contributing to policymaking and decision-making in support of sustainable development to improve people's lives.

5. More recently, advances in technology, as well as the adoption of philosophies of technology development that accept a higher, but still reasonable, level of mission risk, have resulted in increasingly capable small-satellite missions that can be developed with an infrastructure and at a cost that make them feasible and affordable for organizations such as academic institutions and research centres, which have a limited budget for space activities. The many benefits that can be derived from such activities have led to an increased interest in establishing basic capacities in space technology development, including in developing countries and in countries that had previously only been users of space applications.

6. This in turn has led to a sharply rising number of players active in the field of small-satellite missions, as exemplified by the launch of 61 small satellites on two expendable launch vehicles (Minotaur 1 and Dnepr) and the deployment of four small satellites from the International Space Station (ISS) on 19 and 20 November 2013. This is equivalent to the previous average number of satellites launched during an entire year. Given ongoing small-satellite development activities, it can be expected that these launch rates may at the least also be maintained in the future. Furthermore, the increasing number of small-satellite developers in a growing number of countries makes it necessary to ensure adherence to binding and non-binding regulatory and legal obligations, to the extent possible, to maintain the long-term sustainability of outer space activities.

7. These developments led to the establishment in 2009 of the Basic Space Technology Initiative under the United Nations Programme on Space Applications, pursuant to its mandate to stimulate the growth of indigenous nuclei and an autonomous technological base, to the extent possible, in space technology in developing countries, with the cooperation of other United Nations entities and/or Member States, as set out in General Assembly resolution 37/90. The Initiative supports capacity-building in basic space technology, with an initial focus on the development of small satellites and their applications for the peaceful uses of outer space in support of sustainable development and, in particular, their contribution to achieving the internationally agreed development goals, including those set forth in the United Nations Millennium Declaration (Assembly resolution 55/2), as well as the goals set out in the Plan of Implementation of the World Summit on Sustainable

Development,<sup>1</sup> the Johannesburg Declaration on Sustainable Development<sup>2</sup> and the outcome document of the United Nations Conference on Sustainable Development, entitled “The future we want”.<sup>3</sup>

8. The Basic Space Technology Initiative began with the holding of three United Nations/Austria/European Space Agency symposiums on small-satellite programmes in 2009, 2010 and 2011. The first symposium addressed general issues related to capacity-building in space technology development and small-satellite development activities. For the second symposium, the sub-theme “Payloads for small-satellite programmes” was chosen. The third symposium focused on the sub-theme “Implementing small-satellite programmes: technical, managerial, regulatory and legal issues”. The theme of the United Nations/Japan Nanosatellite Symposium held in 2012 was “Paradigm shift: changing architecture, technologies and players”. The objectives of the symposium that is the subject of the present report were:

(a) To review the status of capacity-building in basic space technology, in particular in the field of small-satellite (<100 kg) development activities and with a focus on regional and international cooperation opportunities for countries in Western Asia;

(b) To examine issues relevant to the implementation of small-satellite programmes, in particular organizational capacity-building, development and testing infrastructure and launch opportunities;

(c) To elaborate on the regulatory issues related to space technology development programmes, such as frequency allocation, space debris mitigation measures and import/export controls;

(d) To elaborate on legal issues and responsibilities related to space technology development programmes, such as those emanating from the relevant provisions in international space law;

(e) To continue the development of an education curriculum for aerospace engineering;

(f) To discuss the way forward for the Basic Space Technology Initiative.

## **B. Attendance**

9. Participants in the Symposium were selected on the basis of their academic qualifications and their professional working experience in space technology development or their involvement in the planning and implementation of small-satellite programmes of relevant governmental organizations, international or national agencies, non-governmental organizations (NGOs), research or academic institutions or private sector companies.

<sup>1</sup> *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex.

<sup>2</sup> *Ibid.*, chap. I, resolution 1, annex.

<sup>3</sup> General Assembly resolution 66/288.

10. The Symposium was attended by approximately 150 space professionals involved in nanosatellite and small-satellite missions from governmental institutions, universities and other academic entities and the private sector from the following 41 countries: Angola, Belgium, Brazil, China, Egypt, France, Germany, Ghana, India, Indonesia, Iran (Islamic Republic of), Iraq, Japan, Jordan, Libya, Mexico, Mongolia, Namibia, Netherlands, Nigeria, Oman, Pakistan, Russian Federation, Republic of Korea, Saudi Arabia, Singapore, Slovenia, South Africa, Spain, Sudan, Sweden, Switzerland, Syria, Thailand, Togo, Tunisia, Turkey, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United States of America and Venezuela (Bolivarian Republic of).

11. Representatives of the Office for Outer Space Affairs, the Economic and Social Commission for Western Asia (ESCWA), the International Telecommunication Union (ITU) and the International Academy of Astronautics (IAA) were among those participating in the Symposium. In addition, approximately 50 students from local universities participated in the Symposium.

12. Funds allocated by the United Nations and the sponsors were used to defray the costs of air travel, accommodation and local transportation for 33 participants. To demonstrate their qualifications, all participants applying for full or partial sponsorship were required to submit an abstract in accordance with the requirements of the Symposium's call for papers. The sponsors also provided funds for local organization, facilities and the transportation of participants.

### **C. Programme**

13. The programme of the Symposium was developed by the Office for Outer Space Affairs and the Emirates Institution for Advanced Science and Technology in cooperation with the programme committee of the Symposium. The programme committee included representatives of national space agencies, international organizations and academic institutions. An honorary committee and a local organizing committee also contributed to the successful organization of the Symposium.

14. The programme consisted of an opening session, keynote addresses, seven technical sessions, three panel discussions, a poster session and discussions on observations and recommendations, followed by closing remarks by the co-organizers.

15. During the poster session, a total of 27 posters, covering a wide range of technical topics related to the development of small satellites, were presented.

16. The chairs and co-chairs assigned to each of the technical sessions and panel discussions provided their comments and notes as input for the preparation of the present report. The detailed programme, background information and full documentation of the presentations made at the Symposium have been made available on the website of the Office for Outer Space Affairs ([www.unoosa.org/oosa/en/SAP/bsti/uae2013.html](http://www.unoosa.org/oosa/en/SAP/bsti/uae2013.html)).

## **II. Summary of Symposium programme**

### **A. Opening session and keynote addresses**

17. At the opening session, welcoming remarks were made by the Director General of EIAST, on behalf of the Government of the United Arab Emirates, and by the representative of the Office for Outer Space Affairs.

18. The keynote addresses began with a presentation by a representative of EIAST on space science, technology and its applications for Western Asia, with a focus on the activities of EIAST. He noted that the number one strategic objective was to develop the nation's young talent and to empower them in the field of space systems development. The most important return on the investment by the United Arab Emirates in EIAST was the fostering of the next generation of human resources. The United Arab Emirates were also very eager and open to working with all regional and Arab neighbours to transfer their current know-how and capabilities, to build upon them and to jointly develop new missions which could benefit all humankind.

19. In his keynote presentation on the prospects and challenges for developing space nations in the field of small-satellite mission development, the representative of IAA reiterated the benefits of space technology development activities. They provided enormous opportunities to do more with less, to address local and global needs, to contribute to the development of the technical infrastructure of a country, to achieve higher levels of education for science, industry and management, to encourage the greater involvement of local and small industry in space activities and to reduce risks in the use of space. He concluded that small-satellite development activities were now within the reach and means of most countries.

20. Recently, ISS has been used as a launch platform for small satellites. One of the astronauts involved in launching the satellites from the Station during ISS Expeditions 22 and 23 made a keynote address on the topic of capacity-building in space technology development and ISS. This example demonstrated that there could be linkages between small-satellite development and human space exploration activities. It is expected that ISS will continue to act as a launch base for future small-satellite missions.

21. Finally, the representative of the Office for Outer Space Affairs made a presentation on the goals of the Basic Space Technology Initiative and on the objectives and practical arrangements for the Symposium.

### **B. Technical sessions**

22. Technical sessions were held on the following topics: (a) capacity-building in basic space technology development; (b) infrastructure for basic space technology development; (c) launch opportunities for small-satellite missions; (d) small-satellite platforms for Earth observations; (e) regulatory and legal issues; (f) space technology development activities in Western Asia; and (g) education curriculum on space engineering and the Basic Space Technology Initiative. The presentations made in the sessions were selected on the basis of a review of all abstracts submitted in response to the Symposium's call for papers. Highlights of

and major discussion points raised during the sessions are summarized in the paragraphs below.

### **1. Capacity-building in basic space technology development**

23. The discussion on the latest developments in the field of capacity-building in basic space technology development included presentations from space technology development experts representing various organizations on their experiences with regard to establishing small-satellite programmes. Opportunities for international and regional cooperation were also considered.

24. The first presentation, by a representative of the Systems Institute of Johns Hopkins University (United States), focused on strategic decision-making for small-satellite programmes, and included examples from various countries on approaches to sustain satellite programmes and a framework for evaluating organizational capacity-building. Subsequent presentations, providing additional case studies on space technology capacity-building, were given on the following topics: (a) capacity-building in space technology through low-cost programme initiatives, by the representative of the Space and Upper Atmosphere Research Commission of Pakistan; (b) case studies in capacity-building for space, telecommunications and information technologies: lessons learned and requirements for success, by the representative of Space Partnership International (United States); and (c) space engineering education through nanosatellite development and testing, by a representative of Kyushu Institute of Technology (Japan).

25. Subsequent speakers provided examples of frameworks for international cooperation in small-satellite development as part of presentations on the following topics: (a) international cooperation potential in picosatellite networks for promising Earth observation and telecommunications applications, by the representative of the University of Würzburg (Germany); (b) status of QB 50: an international network of CubeSats, by the representative of the Von Karman Institute for Fluid Dynamics (Belgium); and (c) Humsat-D: first satellite of the Humsat constellation, by the representative of the University of Vigo (Spain).

### **2. Infrastructure for basic space technology development**

26. This session considered the infrastructure required for small-satellite development activities, including integration and environmental testing facilities. The facilities needed to be tailored to the scope of the small-satellite programme, including by taking into account factors such as size, mass and the planned number of satellites to be developed. In practice, it was not necessary or even desirable to establish a complete in-house development infrastructure, as existing facilities could be shared or rented on a commercial basis.

27. The representative of California Polytechnic State University (United States) made a presentation on CubeSat, an entry-level form of space development, and basic infrastructure requirements for space technology development. He listed the following initial facilities that were required for CubeSat projects and that were usually accessible to most universities: (a) standard electronics development, including low-power electronics, solar power and batteries and basic radio frequency knowledge; (b) basic structural design; (c) embedded software development; and (d) a ground station, based on an amateur-radio set-up. Other,

usually accessible, facilities, including clean rooms and environmental testing facilities (vibration, thermal, vacuum), were not needed on a continual basis. He suggested making use of the CubeSat community to gain access to such facilities.

28. Two additional examples of experience with launching small-satellite programmes were given as part of presentations on (a) “Micro/nano/pico-satellite activities in Japan: university challenge towards new space education and utilization”, by the representative of the University of Tokyo (Japan); and (b) the infrastructure required for basic space technology development, by the representative of NewSpace Systems (South Africa).

29. The option to carry out tests in-house or to outsource that activity was discussed by the representative of Intespace (France) in his presentation on supporting customers in the testing and the development of assembly, integration and test centres for the benefit of small-satellite programmes.

30. The representative of the Kyushu Institute of Technology reported on the status of the Nanosatellite Environment Test Standardization (NETS) project (see [http://cent.ele.kyutech.ac.jp/nets\\_web/nets\\_web.html](http://cent.ele.kyutech.ac.jp/nets_web/nets_web.html)), designed to establish an international standard for environmental tests of small-scale satellites with the goal of low cost and fast delivery. That effort might also require the community to agree on a definition of the term “small satellite”. It was planned that the standard would be submitted for publication as an International Organization for Standardization (ISO) publication in 2015.

### **3. Launch opportunities for small-satellite missions**

31. Launch opportunities for small satellites remain a major bottleneck for small-satellite developers. The choice of launcher is often limited in terms of availability, launch date, delivery orbit and cost. Often, launch cost still constitutes the major budget item for small-satellite missions.

32. Launch services and separation mechanisms for satellites in the 1-50 kg range were presented by the representative of NovaNano SAS (France), followed by two presentations on two launch vehicles presently under development that are of particular interest to the small-satellite community: (a) “Launcher One: revolutionary orbital transport for small satellites”, by the representative of Virgin Galactic (United States); and (b) “S3: enabling affordable and recurrent access to space”, by the representative of Swiss Space Systems (Switzerland). In the final presentation of the session, the representative of Montana Business Assistance Connection (United States) discussed the economic development of commercial spaceports, which had also been considered by the United Arab Emirates.

### **4. Small-satellite platforms for Earth observations**

33. Over the past few years, affordable small-satellite platforms have been developed that are capable of delivering medium- to high-resolution imagery for a wide range of geospatial applications. By flying several satellites in constellation or by forming collaborative satellite missions, their operational utility, such as reduced revisit times, can be further improved.

34. The following presentations reviewed the latest developments in the field of small-satellite platforms for Earth observations: (a) “DubaiSat-1/-2: experiences

with development and operational use”, by the representative of EIAST; (b) “Disaster monitoring constellation evolution and development”, by the representative of Surrey Satellite Technology Ltd. (United Kingdom); and (c) “The FIREBIRD constellation”, by the representative of Astro- und Feinwerktechnik Adlershof GmbH (Germany).

35. A technical tour of the satellite operations facilities of EIAST, organized for all participants, concluded the session and provided an opportunity to visit the mission control centre and one of the ground stations used for the DubaiSat series of Earth observation satellites.

## **5. Regulatory and legal issues**

36. Regulatory and legal considerations play an important role in the implementation of small-satellite programmes. Discussions on the registration of satellites with the United Nations, the liabilities of launching States, space debris mitigation guidelines and the long-term sustainability of outer space activities were included as part of presentations on the following topics: (a) regulatory and legal issues of small satellites, by the representative of the Office for Outer Space Affairs; and (b) long-term sustainability of outer space activities, by the chair of the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space.

37. The session concluded with a workshop and discussions on frequency registration for small-satellite missions by the representative of ITU. Symposium participants were updated on the activities related to resolution 757 (COM6/10) of the World Radio Communication Conference 2012 on regulatory aspects of picosatellites and nanosatellites. The ITU made available to participants a workshop CD-ROM with the latest updates, helpful information and supporting software to help with data capture and validation of the notification filing.

## **6. Space technology development activities in Western Asia**

38. The session on space technology development activities in the Western Asia region also served as an introduction to a survey of the small-satellite development landscape in the region in preparation for the panel discussion that followed the session.

39. The representative of the University Space Engineering Consortium (UNISEC) in Japan presented the international activities of UNISEC and a proposal to establish the UNISEC-Global organization, based on UNISEC local chapters. Presentations on the following three topics laid out the plan for establishing such local chapters: (a) prospects for Turkish UNISEC and international cooperation, by the representative of Istanbul Technical University (Turkey); (b) building a university consortium in space technology in Tunisia, by the representative the University of Monastir (Tunisia); and (c) improving learning by aerospace students at Cairo University by using CanSat-related teaching modules, by the representative of Cairo University (Egypt).

40. This was followed by presentations on the following topics: (a) Arab countries and space technology: requirements and applications, by the representative of the National Authority for Remote Sensing and Space Science (Egypt); (b) prospects for



capacity-building in the space technology programme of Egypt, by the representative of the Planetarium Science Centre-Bibliotheca Alexandrina (Egypt); (c) Arab small-satellite programmes for capacity-building and sustainable development, by the representative of the Environment Protection and Sustainable Development Society NGO (Syria); (d) Turkish satellite capabilities, by the representative of the Ministry of National Defence of Turkey; and (e) a synopsis of small-satellite activities in India, by the representative of Dhruva Space (India).

## **7. Education curriculum on space engineering and the Basic Space Technology Initiative**

41. The final technical session addressed activities related to space education and to activities under the Basic Space Technology Initiative.

42. The representative of the Kyushu Institute of Technology, who is one of the fellows of the United Nations/Japan Long-term Fellowship Programme on Nanosatellite Technologies working on this project, made a presentation on the Horyu-V space environment explorer, followed by a presentation by a representative of the Office for Outer Space Affairs about the status of the development of the education curriculum on space engineering ([www.unoosa.org/oosa/en/SAP/bsti/bsti-education/ecse.html](http://www.unoosa.org/oosa/en/SAP/bsti/bsti-education/ecse.html)).

43. Subsequently, the following presentations on space education activities were given: (a) education utilizing CubeSat experience: a systematic approach to delivering science, technology, engineering and mathematics content, by the representative of the University of Florida (United States); (b) building space capabilities in the Bolivarian Republic of Venezuela based on satellite technology, by the representative of the Bolivarian Agency for Space Activities (Bolivarian Republic of Venezuela); (c) nanosatellite development issues in developing countries: a case study on the Sudan, by the representative of the University of Khartoum (Sudan); and (d) space technology capacity development in Southern Africa: a case study on collaboration between Namibia and South Africa, by the representatives of the Namibian Institute of Space Technology and the French South African Institute of Technology (South Africa).

## **C. Panel discussions**

44. Panel discussions were held on the following topics: (a) requirements and conditions for enabling and sustaining space technology development activities in support of national and regional development priorities; (b) best practices for establishing infrastructure for basic space technology development; and (c) prospects for space technology development activities and regional and international cooperation in Western Asia.

### **1. Requirements and conditions for enabling and sustaining space technology development activities in support of national and regional development priorities**

45. In their discussions, the panellists from Germany, Japan, Pakistan, the United Arab Emirates and the United States, all of whom had experience with establishing successful space technology development activities in their respective countries, discussed the requirements and conditions conducive to enabling such activities.

46. These included access to funds and human resources, including the issue of training and retaining staff, the availability of the required development infrastructure, and governmental and institutional support. The panellists agreed that a well-planned, step-by-step approach with a long-term view and vision — looking at least 10 to 15 years ahead — was essential for making space technology development activities sustainable. They recommended that the first satellite mission should be designed as simply as possible, as the introduction of any additional complexity raised the risk of mission failure. Following a first successful mission and based on the experience gained and lessons learned, the complexity of follow-on missions could be increased in a stepwise fashion. The panellists also pointed out the need to combine effective technical implementation with consideration of non-technical issues such as organizational development, mentoring, programme management and cultural aspects of international collaboration.

47. In particular, the panellists stressed the importance of securing governmental support, in view of article VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, which mandated that the activities of non-governmental entities in outer space, including the Moon and other celestial bodies, should require authorization and continuing supervision by the appropriate State party to the Treaty. Gaining the support of the Government concerned required establishing the benefits to be gained from the planned space technology development activities for the country and its people early on. It was noted that the Government could also provide the link to relevant governmental departments that were potential users of space technology, if the aim of the activities was to provide operational applications.

## **2. Best practices for establishing infrastructures for basic space technology development**

48. The panellists from Japan, South Africa, Turkey, the United Arab Emirates and the United States considered the minimum infrastructure requirements for basic space technology development, in particular for small-satellite missions in the 50 kg class.

49. Facilities required included machine and electrical workshops, clean rooms and integration and testing facilities. Some of those facilities were usually readily available at engineering universities or could easily be adapted. Some of the other facilities could be rented or shared when available and accessible at other institutions. Various businesses also offered such facilities on a commercial basis. It was recommended that investments in infrastructure should correlate with the long-term goals of the activities.

50. Concerning the type and amount of testing of the satellite and its subsystems, it was noted that this was a decision that had to be weighed against the risk of mission failure. However, especially for small university-type satellites, such as CubeSats, that became a cost factor, as the actual building and launching of such a satellite could be cheaper than the cost of some of the tests that would be required if following a traditional, risk-averse testing philosophy. It was noted that at the very minimum outgassing and vibration tests, along with tests to assure that the other

satellites in a shared launch scenario would not be detrimentally affected, should be conducted.

### **3. Prospects for space technology development activities and regional and international cooperation in Western Asia**

51. A representative of ESCWA moderated the panel, with speakers from Egypt, Oman, Tunisia, the United Arab Emirates and the Regional Centre for Space Science and Technology Education for Western Asia, affiliated to the United Nations, located in Amman (see [www.unoosa.org/oosa/en/SAP/centres/western-asia.html](http://www.unoosa.org/oosa/en/SAP/centres/western-asia.html)). The panel considered past efforts regarding space technology development in Western Asia, in particular in the Arabic-speaking countries, the present status, plans and visions for the future, opportunities and challenges and the role of regional cooperation.

52. The panel participants agreed that, while Arab countries had been users of space technology and its applications for several decades, there was a need to catch up to move from being users or operators to becoming developers. There was also a need to enhance regional cooperation, as the capabilities of the countries in the region would complement each other, through competitive advantages and specialization. Such cooperation could also build on the definition of a regional road map for space activities, could make use of the recently established Regional Centre for Space Science and Technology Education for Western Asia, affiliated to the United Nations, and could be facilitated through ESCWA, the League of Arab States or other appropriate cooperation mechanisms. It was noted that a stable legal and regulatory environment, including the promulgation of space laws and policies — first at the national and possibly later at the regional level — would provide the necessary confidence and guidance for sustaining space activities, including those of the private sector.

## **III. Observations and recommendations**

53. Participants in the United Nations/United Arab Emirates Symposium on Basic Space Technology:

(a) Took note of the strong connection of space technology to the modern infrastructure that underpinned the information society and contributed to sustainable economic, social and environmental development;

(b) Took note of the fact that conditions for fully benefitting from space technology and its applications included: (i) a long-term vision and strategy to ensure the sustainability of efforts; (ii) a powerful regulatory environment that ensured stability and confidence to attract private industry; (iii) strong policy support from Governments; and (iv) regional and international cooperation with considerations related to competitive advantage, specialization and complementarity of capabilities.

54. Participants in the Symposium also:

(a) Took note of the discussions in the Committee on the Peaceful Uses of Outer Space under the agenda item on the long-term sustainability of outer space activities and of the establishment of a working group under that agenda item;

(b) Took note of the work of the four expert groups established under that working group to address particular aspects of the long-term sustainability of outer space activities;

(c) Took note of the fact that, on the basis of the work of the expert groups, the working group would develop a set of voluntary guidelines for States, intergovernmental organizations, NGOs and private sector entities to promote the safety and long-term sustainability of outer space activities;

(d) Recommended that those involved in small-satellite activities should establish contact with the representatives of their respective Member States in the working group and its expert groups to ensure that the interests and inputs of the small-satellite community would be taken into account in the preparation of the report and guidelines of the working group;

(e) Recommended that those involved in small-satellite activities should commit to fully implementing the voluntary guidelines for the long-term sustainability of outer space activities, once those guidelines were published;

(f) Recommended that those involved in small-satellite activities should implement the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space.<sup>4</sup>

55. Participants in the Symposium further:

(a) Took note of the necessity to provide timely notification to ITU about planned satellite projects to avoid harmful interference;

(b) Took note of the fact that the studies to be prepared in response to resolution 757 of the ITU World Radiocommunication Conference (COM6/10), on regulatory aspects for nanosatellites and picosatellites, were to be conducted under ITU Radiocommunication Sector (ITU-R) Working Party 7B;

(c) Recommended that members of the small-satellite community should actively engage with Working Party 7B on the review of the procedures for providing notifications regarding nanosatellites and picosatellites through their respective administrations or by joining ITU as an academic member, with a view to contributing to the study from the perspective of the small-satellite community/industry.

56. In the field of capacity-building in space technology development, participants recommended the setting up of a network of universities and other academic institutions involved in space technology development for the promotion of space education and the strengthening of space project capacities, including:

(a) Cooperation on joint research projects, education and research issues to offer graduate students better job perspectives and experience in project planning and implementation;

(b) Exchange of information on curricula and teaching materials;

(c) Exchange of lecturers and other teaching personnel to build up new capabilities or improve existing ones;

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<sup>4</sup> *Official Records of the General Assembly, Sixty-second Session, Supplement No.20 (A/62/20)*, paras. 117 and 118, and annex.

(d) Exchange of students.

The initial core of such a network might consist of a kernel of experienced universities and other academic institutions and should be extended step-by-step by including additional partners.

57. In that context, participants in the Symposium also noted the proposal to establish UNISEC-Global, an international non-profit organization to facilitate and promote practical space development activities at the university level, such as designing, developing, manufacturing, launching and operating micro/nano/pico-satellites and rockets, including their payloads (see [www.unisec-global.org](http://www.unisec-global.org)).

58. With regard to regional cooperation in Western Asia, participants in the Symposium:

(a) Took note of past efforts in Western Asia to establish such intergovernmental cooperation frameworks regarding space activities;

(b) Took note of the role of existing intergovernmental frameworks in support of regional cooperation that could take different forms;

(c) Recommended that the starting point in regional cooperation should be the establishment of national policies, national laws and regulatory frameworks to govern national activities, which may then as a next step be followed by the establishment of regional cooperation frameworks;

(d) Recommended that all member States in the region should consider becoming members of and actively supporting the Regional Centre for Space Science and Technology Education for Western Asia, affiliated to the United Nations, including through the nomination and sponsorship of students and expert lecturers in all domains of space technology and its applications;

(e) Took note of the fact that there were major opportunities and untapped potential for cooperation among member States of ESCWA, particularly in terms of policy coordination and harmonization, as well as the promotion of an Arab culture of innovation in the space domain, with socioeconomic development goals in mind;

(f) Recommended that member States of ESCWA should consider providing it with the mandate to take a more active role in the field of space activities in support of regional space cooperation in Western Asia, in the bringing together of the space actors in the region and in the exploration of joint project and policy coordination;

(g) Took note of the fact that ESCWA could organize an expert group on regional space cooperation for the Arab region, as it had done for activities in the field of information and communications technologies, under the umbrella of the World Summit on the Information Society.

59. Finally, the participants:

(a) Confirmed the continuation of activities under the work programme of the Basic Space Technology Initiative, as contained in paragraphs 59 and 60 of document A/AC.105/1005;

(b) Endorsed the approach and schedule of work for the development of the education curriculum on space technology engineering;

(c) Noted the progress made with the development of the Humsat constellation (see [www.humsat.org](http://www.humsat.org)) and that Humsat-D, the first satellite in the constellation, would be launched in November 2013 and encouraged those interested in contributing to a collaborative mission to participate in Humsat by developing components for its ground or space segment or by utilizing the system;

(d) Noted the presentation by the representative of the Mexican Space Agency on the organization of the United Nations/Mexico Symposium on Basic Space Technology, to be held in 2014, and welcomed the fact that the Centre for Scientific Research and Higher Education at Ensenada would host the Symposium on behalf of the Government of Mexico.

#### **IV. Conclusions**

60. The United Nations/United Arab Emirates Symposium on Basic Space Technology, the second in a series of symposiums under the Basic Space Technology Initiative to be held in the regions that correspond to the Economic Commissions for Africa, Asia and the Pacific, Latin America and the Caribbean, and Western Asia, will be followed by a symposium organized in cooperation with the Government of Mexico on the theme “Making space technology accessible and affordable”, hosted by the Center for Scientific Research and Higher Education at Ensenada and to be held in Baja California, Mexico, during the week of 20-24 October 2014. For the period 2015-2016, representatives of institutions of the following countries have expressed an interest in hosting a regional workshop on basic space technology development: Canada, Egypt, India, South Africa, Thailand, Tunisia and Venezuela (Bolivarian Republic of).