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Basic Space Technology Initiative (BSTI)

Activities in 2011-2012 and plans for 2013 and beyond

I. Introduction

1. The United Nations Programme on Space Applications was launched as a result of discussions at the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE), held in Vienna in 1968.¹ The Programme is implemented by the United Nations Office for Outer Space Affairs (OOSA) and provides support to capacity-building in space technology and its applications to all Member States of the United Nations, independent of their level of economic development.²
2. The initial focus of the Programme was on the applications of space technology, such as in satellite communications, Earth observations and positioning and navigation services. In the 1990s space science-related activities were added to the Programme through the Basic Space Science Initiative (BSSI).³
3. In response to the interest in a growing number of Member States to build capacity in space technology development, the Basic Space Technology Initiative (BSTI) was added as a new cornerstone to the Programme on Space Applications in

¹ United Nations, General Assembly, Official Records Twenty-Third Session, Agenda item 24, Report of the Committee on the Peaceful Uses of Outer Space, Annex II "Documentation on the United Nations Conference on the Exploration and Peaceful Uses of Outer Space", New York 1968.

² United Nations Office for Outer Space Affairs, "United Nations Programme on Space Applications", United Nations, ST/SPACE/52, February 2010.

³ Haubold, H., Gadimova, S., "Progress in basic space science education and research: The UNBSSI", Space Policy 26, Elsevier, February 2010, pp. 61-63.



2009.^{4,5} BSTI focuses on the development of affordable, small-satellite platforms with mass below 150 kg and on their associated technical, managerial, regulatory and legal issues.

4. This document reports on the BSTI activities conducted in 2011-2012 and on planned activities for 2013 and beyond. It should be read in connection with document A/AC.105/2011/CRP.14 which describes the mission and the underlying objectives of BSTI and reports on the activities in 2009-2011.

II. BSTI Workplan

5. BSTI activities are conducted in accordance with a multi-annual workplan developed in consultation with representatives from Member States and space technology development experts from all around the world. The work programme, as described in more detail in document A/AC.105/2011/CRP.14, is structured around five activity categories: I. Basic activities, II. International space technology conferences, III. Space technology education curriculum, IV. Establishment of long-term fellowship programmes, and V. Basic Space Technology Initiative projects.

6. The workplan is reviewed annually and updated to take account of changing needs in Member States and to reflect new trends in the field of space technology development. The latest version of the workplan is available from the BSTI Website at www.unoosa.org/oosa/en/SAP/bsti/index.html.

III. BSTI Funding

7. BSTI activities are implemented by the Space Applications Section of the Office for Outer Space Affairs. In terms of staffing the Initiative uses 85 per cent of the time of one P-staff and 20-25 per cent of the time of one G-staff. Basic funding for BSTI activities is provided through the Trust Fund of the Programme on Space Applications. In 2011 the Trust Fund contributed approximately US\$ 23,000. These funds were complemented by in-cash and in-kind contributions from various co-sponsors at a ratio of approximately four to one.

8. Co-sponsors of BSTI activities in 2011 included the Austrian Foreign Ministry, the City of Graz, the State of Styria, the European Space Agency, the International Space University and the Kyushu Institute of Technology. The vast majority of these funds were used to provide support to experts from Member States to participate in BSTI activities. In addition the University of Tokyo, the Kyushu Institute of Technology and the International Space University provided travel and subsistence support to OOSA staff implementing BSTI activities.

9. Member States interested in providing funding support for activities related to space technology development capacity-building under the BSTI are invited to contact the Office for Outer Space Affairs. In particular funding support is sought

⁴ Balogh, W., Haubold, H., "Proposal for a United Nations Basic Space Technology Initiative", *Advances in Space Research* 43, Elsevier, 15 June 2009, pp. 1847-1853.

⁵ Balogh, W., "Capacity Building in Space Technology Development: A New Initiative within the United Nations Programme on Space Applications", *Space Policy* 27, Elsevier, August 2011, pp. 180-183.

for the development of a space technology education curriculum, for the finalization and publication of a guidebook on small satellite programmes and for technical assistance missions to support capacity-building in regional/national space technology development activities.

10. In addition the Office for Outer Space Affairs is presently looking for a donor country interested in providing the services of an Associate Expert to the Basic Space Technology Initiative. The job description (INT-190-11-P090-01-V) is available from the Associate Expert Website at <http://esa.un.org/techcoop/associateexperts/>. Interested donor countries are invited to contact the Office.

IV. Activities in 2011-2012 and plans for 2013 and beyond

11. The following paragraphs describe the activities conducted in 2011-2012 and plans for 2013 and beyond under the five activity categories of the BSTI work plan:

I. Basic activities

12. In 2011 the Office for Outer Space Affairs, in cooperation with the Government of Austria and the European Space Agency, organized the last in a series of three United Nations/Austria/European Space Agency symposiums on small satellite programmes for sustainable development.^{6,7,8} The symposium on the theme “Implementing Small Satellite Programmes: Technical, Managerial, Regulatory and Legal Issues” was held from 13 to 16 September 2011 in Graz, Austria and was attended by 102 selected space technology experts from 39 countries (Algeria, Austria, Azerbaijan, Belarus, Belgium, Brazil, Canada, China, Egypt, France, Germany, India, Iran (Islamic Republic of), Iraq, Israel, Italy, Japan, Kenya, Lithuania, Mexico, Nepal, Netherlands, Nigeria, Pakistan, Saudi Arabia, Slovakia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Thailand, Tunisia, Turkey, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United States of America, Uruguay, Venezuela (Bolivarian Republic of) and Viet Nam), as well as from representatives of ESA, the International Telecommunications Union (ITU) and EURISY. The United Nations and co-sponsors provided funding support for the participation of 27 space technology experts. The detailed symposium report, including the recommendations and observations made by participants, is available in document A/AC.105/1005.

13. Participants at the symposium took note of the growing number of satellite developers and their wide range of motivations to take on space technology development activities. Small-satellite programmes can be implemented using various types of management philosophies, ranging from less formal but more flexible student-run projects to projects strictly applying systems engineering standards developed for large space projects. Participants also identified a number

⁶ United Nations/Austria/ESA Symposium on Small Satellite Programmes for Sustainable Development 2009 website www.unoosa.org/oosa/SAP/act2009/graz/index.html.

⁷ United Nations/Austria/ESA Symposium on Small Satellite Programmes for Sustainable Development 2010 website www.unoosa.org/oosa/SAP/act2010/graz/index.html.

⁸ United Nations/Austria/ESA Symposium on Small Satellite Programmes for Sustainable Development 2011 website www.unoosa.org/oosa/SAP/act2011/graz/index.html.

of small-satellite projects that are open for international cooperation and collaboration.

14. Among the recommendations made by symposium participants was the importance of compliance with international treaties and other binding and non-binding legal and regulatory norms.⁹ It was suggested that the small-satellite community should be actively involved in providing input to the discussions relevant for small-satellite activities in Expert Group B established under the agenda item on the long-term sustainability of outer space activities in the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space.

15. Participants noted the increasing crowding of the amateur satellite service band owing to the growing number of small-satellite missions. To address this issue it was recommended that members of the small-satellite community should coordinate among themselves and work with their governments to submit proposals at future World Radiocommunication Conferences to make additional frequency bands available for small-satellite activities, including with regard to the possibility of widening the scope of purposes, which was currently limited by the definition of the amateur service. In this context it is noted that Member States at the recent World Radiocommunication Conference held in Geneva in 2012 in Resolution COM6/11 (WRC-12), invited ITU-R to examine the procedures for notifying space networks and consider possible modifications to enable the deployment and operation of nano- and picosatellites, taking into account the short development time, short mission time and unique orbital characteristics, and instructed the Director of the Radiocommunication Bureau to report to WRC-15 on the results of these studies. The Office for Outer Space Affairs is working in close cooperation with the International Telecommunications Union Radiocommunication Sector (ITU-R) to make available information on radio-frequency allocation and registration procedures under the BSTI.¹⁰

16. As part of the “basic activities”, BSTI continues to provide useful information to the small satellite community such as on regulatory and legal issues, launch opportunities and standardization through its webpages at www.unoosa.org/oosa/en/SAP/bsti/index.html.

II. International space technology conferences

17. Following the conclusions of the series of three United Nations/Austria/European Space Agency symposiums on small-satellite programmes for sustainable development held from 2009 to 2011, BSTI will organize international space technology conferences on capacity-building in space technology development in the regions that correspond to the United Nations Economic Commissions for Africa, Asia and the Pacific, Latin America and the Caribbean, and Western Asia starting from 2012.

⁹ Balogh, W., “The role of binding and non-binding norms in the implementation of small satellite programmes”, in “Soft Law in Outer Space - The Function of Non-binding Norms in International Space Law”, I. Marboe (ed.), ISBN 978-3-205-78797-6, Böhlau Verlag, 2012, pp. 325-242.

¹⁰ OOSA Basic Space Technology Initiative — Basic Activities: www.unoosa.org/oosa/en/SAP/bsti/fundamentals.html.

18. The 2012 international space technology conference will be held in cooperation with the University of Tokyo as United Nations/Japan Nano-Satellite Symposium in Nagoya, Japan, from 10 to 13 October 2012. Registration for the Symposium is possible through the symposium website at www.nanosat.jp. The United Nations, under the BSTI, will provide funding support for qualified space technology experts to attend the symposium. Applications for funding support can be submitted through the OOSA website at www.unoosa.org/oosa/en/SAP/bsti/japan2012.html. The deadline for applications is 1 June 2012. A well-attended press conference to announce the Symposium and to promote BSTI and the small-satellite activities of the University of Tokyo was held on 9 December 2011 in Tokyo.

19. The 2013 international space technology conference will be held in the United Arab Emirates in cooperation with the Emirates Institution for Advanced Science and Technology (EIAST). An expression of interest to host the 2013 conference has been received from Mexico.

20. From 26 to 28 September 2011 the Office for Outer Space Affairs, under the BSTI, organized a regional expert meeting on capacity-building in space technology development in connection with the Fourth African Leadership Conference on Space Science and Technology for Sustainable Development, held in Mombasa, Kenya. The Office contributed with special sessions on the theme “Space Technology Development in Africa”, “Space Systems and Engineering in Africa” and “Space Technology and Law”. The detailed programme and the presentations made at these session can be found at the OOSA website at www.unoosa.org/oosa/en/SAP/bsti/alc2011.html. The Office provided funding support to enable the participation of space law and space technology experts and provided financial support to the National Council for Science and Technology for the organization of the Fourth African Leadership Conference on Space Science and Technology for Sustainable Development.

III. Space technology education curriculum

21. In connection with the establishment of the Regional Centres for Space Science and Technology Education (affiliated to the United Nations), the Programme on Space Applications has prepared a series of education curricula. These curricula, in line with the courses offered at the Regional Centres, initially focused on space applications.^{11,12} The Office for Outer Space Affairs is presently coordinating the preparation of education curricula on Global Navigation Satellite Systems (GNSS) and space law which shall complement the existing curricula. The BSTI Workplan calls for the preparation of a space technology education curriculum, which should include topics such as space engineering, mission design and project management.

22. It is planned that work on the space technology education curriculum will begin at the 2012 international space technology conference. A special session has been set aside for this purpose at the United Nations/Japan Nano-Satellite

¹¹ OOSA Regional Centres for Space Science and Technology Education webpage: www.unoosa.org/oosa/en/SAP/centres/index.html.

¹² OOSA Education Curriculum webpage: www.unoosa.org/oosa/en/SAP/centres/education-curriculum.html.

Symposium in Nagoya, Japan. It is anticipated that the preparation of the space technology education curriculum will be completed in 2014, BSTI seeks to engage the world's best academic experts as well as representatives from the Regional Centres for Space Science and Technology Education (affiliated to the United Nations) in developing the education curriculum. In this context it is noted that the Centre for Space Science and Technology Education in the Asia and Pacific (CSSTEAP) is planning to organize an international short course on overview on small-satellite missions.

23. To promote the work on the space technology education curriculum, BSTI was presented to the 3rd International Cluster Forum held in connection with the 62nd International Astronautical Congress in Cape Town, South Africa, on 5 October 2011 and to the 2nd meeting of the Space Universities Administrative Committee (SUAC) of the International Astronautical Federation (IAF) which was held on 13 March 2012 at UNESCO Headquarters in Paris.

24. BSTI organized the session on "International Capacity Building Program" at the 3rd Nano-Satellite Symposium hosted by the University of Tokyo, the University Space Engineering Consortium and the Kyushu Institute of Technology and held in Kitakyushu, Japan, from 12 to 13 December 2012. Presentations made at the session are available from the symposium website at www.nanosat.jp/3rd/index.html.

IV. Establishment of long-term fellowship programmes

25. In cooperation with the Kyushu Institute of Technology (KIT) and the Government of Japan, the Office for Outer Space Affairs under the framework of the BSTI continues to offer the United Nations/Japan Long-term Fellowship Programme on Nano-Satellite Technologies.^{13,14} The "Doctorate in Nano-Satellite Technologies (DNST)" Fellowship Programme is a three-year PhD programme. Successful participants will be awarded a doctorate degree in Nano-Satellite Technologies (Doctor of Engineering). It is the first PhD-level Fellowship Programme under the United Nations Programme on Space Applications. Every year two successful candidates will be offered the opportunity to participate in the Programme.

26. For the first selection round in 2011, applications from 38 candidates from 17 countries have been received. Following a competitive selection exercise, the Fellowships were awarded to applicants from Egypt and Mongolia who began their studies at KIT in November 2011.

27. For the second selection round in 2012 applications from 39 candidates from 25 countries have been received. The selection process has been completed and the Fellowships have been offered to applicants from Nigeria and Thailand. The new fellows are scheduled to begin their studies at KIT in October 2012.

¹³ Cho, M. and Balogh, W., "UN/Japan Long Term Fellowship Programme on Nanosatellite Technologies", Proceedings of the 3rd Nano-Satellite Symposium, Kitakyushu, Japan, 12-14 December 2011.

¹⁴ OOSA Basic Space Technology Initiative — Fellowship Programme webpage: www.unoosa.org/oosa/en/SAP/bsti/fellowship.html.

28. The third selection round will open for applications at the end of 2012. Application information will be available from the Fellowship webpage at www.unoosa.org/oosa/en/SAP/bsti/fellowship.html.

29. The Office for Outer Space Affairs is continuing discussions with educational institutions to identify education opportunities for future space technology experts.

V. Basic Space Technology Initiative projects

30. HUMSAT is a nano-satellite constellation project led by the University of Vigo, Spain is being considered under the BSTI.^{15,16} The HUMSAT constellation of satellites will provide services for the collection of data from globally distributed sensor networks. Several organizations have indicated their interest to contribute satellites to the constellation. HUMSAT is making use of the GENSO distributed network of groundstations and is also pursuing various educational objectives.¹⁷ The first satellite in the constellation is planned to be launched in November 2012.

31. The International Space University (ISU) Space Studies Programme (SSP) was held in Graz, Austria, from 11 July to 9 September 2011. Participants at the SSP enrol in one of three Team Projects (TP). Under the BSTI the Office for Outer Space Affairs proposed a Team Project Small Satellites, with the main objective to develop the elements for a best practices guidebook for small satellite development for use by countries and organizations interested in establishing basic capacities for space technology development.¹⁸

32. A total of 39 ISU SSP participants from 18 countries participated in the Team Project and created the “Guidebook on Small Satellite Programmes” which is available from <http://gosp.isunet.edu/>. Several of the Team Project members have pledged to continue work on a revised edition of the guidebook. Expressions of interest to publish the book have been received from several publishing houses.

V. Conclusions

33. BSTI is continuing to assist Member States interested in the establishment of basic capacities for space technology development. The first phase of the Workplan has been completed in 2011 with the conclusion of the three-year series of Symposia on Small Satellite Programmes for Sustainable Development held in Graz, Austria. From 2012 onwards the focus will be on the international space technology conferences and on the preparation of the space technology education curriculum.

34. Member States are invited to make full use of the activities offered under the BSTI. The Office for Outer Space Affairs welcomes comments on the Initiative as well as expressions of interest for cooperation on activities related to capacity-building in space technology development.

¹⁵ Humanitary Satellite Network project (HUMSAT) website: www.humsat.org/.

¹⁶ Castro, A., Walker, R., Emma, F., Aguado, F., Tubio, R., Balogh, W., “The HumSAT system and the ESA GEOID Initiative”, European Space Agency, Bulletin 149, February 2012, pp. 44-50.

¹⁷ Global Educational Network for Satellite Operations (GENSO) website: www.genso.org.

¹⁸ OOSA Team Project Small Satellites webpage: www.unoosa.org/oosa/en/SAP/bsti/isu-ssp2011.html.

35. For the latest information on the Basic Space Technology please consult the BSTI webpages at www.unoosa.org/oosa/en/SAP/bsti/index.html.
