30 May 2013

English only

Committee on the Peaceful Uses of Outer Space
Fifty-sixth session
Vienna, 12-21 June 2013

Basic Space Technology Initiative (BSTI)

Activities in 2012-2013 and plans for 2014 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 2009.[4,5] BSTI focuses on the development of affordable, small-satellite platforms

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[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/Rev.1, September 2012.

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

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

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 2012-2013 and on planned activities for 2014 and beyond. It should be read in connection with documents A/AC.105/2011/CRP.14 and A/AC.105/2012/CRP.16 which describe the mission and the underlying objectives of BSTI and report on the activities in 2009-2011 and in 2011-2012, respectively.

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 conferences on capacity-building in basic space technology development, 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 Members 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 is provided through the Trust Fund of the Programme on Space Applications. In 2012 the Trust Fund contributed a total of US$ 50,000 to BSTI-related activities. These funds were complemented by in-cash and in-kind contributions from various co-sponsors at a ratio of at least four to one.

8. Co-sponsors of BSTI activities in 2012 included the Cabinet Office, the Ministry of Internal Affairs and Communications, the Ministry of Foreign Affairs, the Ministry of Education, Culture, Sports, Science and Technology, and the Ministry of Economy, Trade and Industry of the Government of Japan; the Aichi Prefectural Government; the city of Nagoya; the Nagoya Convention and Visitors Bureau; the Kyushu Institute of Technology; the University of Tokyo and the University Space Engineering Consortium (UNISEC). The Initiative also benefited from contributions made by the International Academy of Astronautics (IAA), Mitsubishi Heavy Industries Ltd., Suntory Holdings Limited and the Next Generation Space System Technology Research Association. The vast majority of

[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.

these contributions were used to provide support to experts from Member States to participate in BSTI activities.

9. Member States interested in receiving technical assistance on matters related to capacity-building in regional/national space technology development or in hosting or co-organizing BSTI events are invited to contact the Office for Outer Space Affairs. For further information on partnership opportunities please also consult www.unoosa.org/oosa/en/partnership/index.html.

10. The Office for Outer Space Affairs is also 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 2012-2013 and plans for 2014 and beyond

11. The following paragraphs describe the activities conducted in 2012-2013 and plans for 2014 and beyond under the five activity categories of the BSTI workplan:

I. Basic activities

12. From 2009 to 2011, the Office for Outer Space Affairs, in cooperation with the Government of Austria and the European Space Agency, organized a series of three United Nations/Austria/European Space Agency symposiums on small satellite programmes for sustainable development. A major objective of the symposium series was to prepare and review the work programme of the Basic Space Technology Initiative. A total of 279 space technology experts from 58 countries as well as from various international organizations participated in these events. The conclusions and recommendations of the symposiums are contained in the symposium reports A/AC.105/966, A/AC.105/983 and A/AC.105/1005.

13. Technical assistance is provided to Member States and organizations upon request, for example, through expert advice or the organization of specialized sessions or meetings of space technology development experts. In 2013 BSTI contributed to the CANEUS India Forum “Small satellites for Socio-Economic Needs”, held from 19-20 April at the Visvesvaraya Technological University (VTU), India’s largest technological University, located at Belgaum near Goa.

14. BSTI also continues providing useful information services to the small satellite community on topics such as on regulatory and legal issues, launch opportunities and standardization through the BSTI web pages at www.unoosa.org/oosa/en/SAP/bsti/fundamentals.html.

II. International conferences on capacity building in basic space technology development

15. Following the conclusion of the series of three United Nations/Austria/European Space Agency symposiums on small-satellite programmes for sustainable development held from 2009 to 2011, starting from 2012, BSTI is organizing international space technology symposiums on basic space technology development in each of the regions that correspond to the United

Nations Economic Commissions for Africa, Asia and the Pacific, Latin America and the Caribbean, and Western Asia.

16. The first Symposium in this new series was held as the United Nations/Japan Nano-Satellite Symposium, hosted by the University of Tokyo and co-hosted by the University Space Engineering Consortium (UNISEC) and held in Nagoya, Japan, in conjunction with the Japan Aerospace 2012, from 10-13 October 2012. The main theme of the symposium was "Paradigm shift — Changing Architecture, Technologies and Players". Approximately 290 delegates from 43 countries and three international organizations were in attendance.

17. The symposium programme was structured around five sessions on the following topics: (i) Satellite Architecture and Technologies; (ii) Innovation in Satellite Development Process; (iii) Utilization/Applications of Micro- and Nano-Satellites; (iv) Standardization and Regulatory Issues; and (v) Strategies for Capacity-building. Special lectures and panel discussions complemented the programme.

18. The participants discussed the latest developments in the field of nano-satellite development and made recommendations related to the coordination of frequency spectrum for small satellite missions. They stressed the importance of conducting such missions in compliance with existing regulatory and legal obligations and voluntary guidelines. Recommendations included to set up special working groups on frequency coordination issues and on the long-term sustainability of outer space activities. A special session was held to kick-off the development of an education curriculum on space technology engineering. Participants endorsed the approach and the multi-year schedule of work for the development of this education curriculum. The symposium report has been issued under the document number A/AC.105/1032 and a detailed day-by-day summary of the symposium can be accessed at www.nanosat.jp/4th/report.html.

19. In 2013, the international space technology conference will focus on the Western Asia region and will be hosted by the Emirates Institution for Advanced Science and Technology (EIAST) on behalf of the Government of the United Arab Emirates at the Zayed University Conference Center in Dubai, United Arab Emirates, from 20-23 October. Registration and applications for funding support to attend the Symposium can be made through the BSTI website at www.unoosa.org/oosa/en/SAP/bsti/uae2013.html. Within the limits of the funds made available by the co-sponsors the United Nations, under the BSTI, will provide support for qualified space technology experts to attend the symposium. The deadline for applications is 30 June 2013.

20. The following topics will be considered in dedicated sessions: (i) Capacity-building in Basic Space Technology Development; (ii) Infrastructures for Basic Space Technology Development; (iii) Small Satellite Platforms for Earth Observations; (iv) Regulatory and Legal Issues; (v) Working Groups of the International Panel of Experts for the Development of the Education Curriculum on Space Engineering.

21. In 2014, the international space technology conference will focus on the region of Latin America and the Caribbean and will be hosted by the Government of Mexico. The 2015 conference will be held in Africa and expressions of interest to host the meeting have been received from Egypt and South Africa.

III. Space technology education curriculum

22. 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 to ensure an acceptable minimum common standard of teaching. The curricula, in line with the courses offered at the Regional Centres, initially focused on space applications.[6,7] An education curriculum on Global Navigation Satellite Systems (GNSS) was issued in 2013 (ST/SPACE/59) and a curriculum on space law is under preparation to 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.

23. Work on the space technology education curriculum began at the 2012 United Nations/Japan Nano-Satellite Symposium with the organization of a special United Nations Space Education Curriculum Session. 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. Information on the education curriculum development status is available from www.unoosa.org/oosa/en/SAP/bsti/bsti-education/ecse.html.

IV. Establishment of long-term fellowship programmes

24. As part of the BSTI the Office for Outer Space Affairs and the Government of Japan in cooperation with the Kyushu Institute of Technology (KIT) have established the United Nations/Japan Long-Term Fellowship Programme on Nano-Satellite Technologies for nationals of developing countries or countries with economies in transition. Presently four doctorate degree students from Egypt, Mongolia, Nigeria and Thailand are studying at KIT under this fellowship scheme.

25. From 2013 the Fellowship Programme has been expanded to accept up to four three-year doctoral and up to two two-year master's degree students per year with full support through a scholarship provided by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. It is now called the Post-graduate study on Nano-Satellite Technologies (PNST) and is funded until 2015.

26. By the deadline of 28 February 2013, 72 valid applications from 28 countries had been received. The four doctorate degree scholarship were awarded to applicants from Bangladesh, Egypt, Romania and the Ukraine. The two master's degree scholarships were awarded to applicants from Singapore and Sudan. They will begin their studies at KIT in October 2013.

27. The fourth selection round will open for applications at the end of 2013. Application information will be available from the Fellowship web page at www.unoosa.org/oosa/en/SAP/bsti/fellowship.html.

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

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

28. 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

29. HumSAT is a nano-satellite constellation project led by the University of Vigo, Spain and is being considered under the BSTI.[8] 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 ground stations and is also pursuing various educational objectives.[9] The first satellite in the constellation, HumSat-D, passed its programme of thermal vacuum tests at ESA's Space Technology and Research Centre (ESTEC) in The Netherlands in April 2013 and is scheduled for launch in November 2013 (for details see www.esa.int/Education/ESA_gives_HumSat-D_a_hot_and_cold_farewell_before_its_launch).

30. In follow up to the Team Project Small Satellites conducted during the International Space University (ISU) Space Studies Programme (SSP) held in Graz, Austria, from 11 July to 9 September 2011, several of the participants in the studies programme are continuing work on developing a Small Satellite Guidebook.[10] The book aims to provide information and process description for pursuing small satellite programmes based upon available technology and drawing from the lessons learned in past programmes. It will discuss relevant legal and managerial issues, policies and regulations, education and training, system engineering fundamentals, launching and operations. The target audience will be decision makers and managers in academia, government and industry.

V. Conclusions

31. 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 Symposiums on Small Satellite Programmes for Sustainable Development held in Graz, Austria. Since 2012 the focus is on the international space technology conferences and on the preparation of the space technology education curriculum.

32. 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.

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

[9] Global Educational Network for Satellite Operations (GENSO) website: www.genso.org.

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