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Committee on the Peaceful Uses of Outer Space

Report on the Fourth United Nations/International Academy of Astronautics Workshop on Small Satellites in the Service of Developing Countries: a Contribution to Sustainable Development

(Bremen, Germany, 30 September 2003)

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I. Introduction

A. Background and objectives

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) recommended, inter alia, that the joint development, construction and operation of a variety of small satellites offering opportunities to develop indigenous space industry should be undertaken as a suitable project for enabling space research, technology demonstrations and related applications in communications and Earth observation.[1] Additional recommendations emanated from the activities of the Technical Forum held at UNISPACE III.[2] In accordance with those recommendations, the Office for Outer Space Affairs of the Secretariat has substantially extended its existing cooperation with the Subcommittee on Small Satellites for Developing Nations of the International Academy of Astronautics (IAA).[3]

2. At the 1999 meeting of the IAA Subcommittee, it was agreed that the fifty-first International Astronautical Congress, which was to be held in Rio de Janeiro, Brazil, from 2 to 6 October 2000, would be an ideal opportunity to review the status and advancement of programmes in Latin America. It was further agreed that the Workshop should be open to participants from other regions, but that the situation in Latin America would be used as an example of how developing countries could benefit from small satellites and that it should form the core of the discussion. The report of the first United Nations/IAA Workshop (A/AC.105/745) was submitted to the Scientific and Technical Subcommittee at its thirty-eighth session, in 2001. Based on the positive response from participants and from States members of the Committee, it was decided that that regular activity should continue, with emphasis on different aspects of that issue and the specific needs of individual regions.

3. The second Workshop was held in Toulouse, France, on 2 October 2001, and the third in Houston, United States of America, on 12 October 2002. The corresponding reports (A/AC.105/772 and A/AC.105/799) were submitted to the Scientific and Technical Subcommittee at its thirty-ninth and fortieth sessions, in 2002 and 2003 respectively. At its forty-sixth session, in 2003, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences planned for 2003.[4]

4. The United Nations/International Academy of Astronautics Workshop on Small Satellites in the Service of Developing Countries: a Contribution to Sustainable Development was held in Bremen, Germany, on 30 September 2003. It was the fourth Workshop organized jointly by the Office for Outer Space Affairs and the IAA Subcommittee on Small Satellites for Developing Nations within the framework of the World Space Congress.

B. Attendance

5. The Workshop was an integral part of the Third World Space Congress and was attended by 60 registered Congress participants. Many of those attending the Workshop had also attended the United Nations/International Astronautical Federation Workshop on the Use of Space Technology for the Benefit of Developing

Countries (A/AC.105/812). The sponsors of the Workshop provided financial support to selected participants from developing countries.

6. One of the objectives of the Workshop was to review the benefits of small satellite programmes with particular emphasis on the contribution that small satellites could make to supporting sustainable development. The Workshop was also attended by several participants of previous workshops who provided valuable continuity and were able to assess the progress that had been made during the series of workshops.

II. Summary of presentations

7. In a brief introduction, the Workshop co-chairmen gave an overview of the results of earlier workshops held in Vienna (during UNISPACE III), in Rio de Janeiro, in Toulouse and in Houston. Six papers were then presented and discussed, most of which dealt with the use of outer space for developing countries.

8. The first paper was presented by students of science and law from France and Singapore who were studying in Canada and the United Kingdom of Great Britain and Northern Ireland. They presented a truly international and interdisciplinary analysis of small satellites for developing countries, including a political and policy analysis. The paper explored the potential for cooperation between developing and developed countries, from both the technical and legal viewpoints. The presentation started from the concept of sustainable development, as defined during the United Nations Conference on Environment and Development, held in Rio de Janeiro in June 1992, and examined laws containing statements with implications for developing countries dating from 1967, when the Treaty on Principles Governing Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (resolution 2222 (XXI), annex, the "Outer Space Treaty"), was adopted, to the present day. The need for technology transfer was highlighted. From the analysis, it appeared that success factors included a long-term relationship between two countries with a coordinated approach to education in space science and technology. The space treaties were shown to be useful in enabling developing countries to gain equal access to space. The two relevant issues that space technology could be used for in developing countries were the improvement of socio-economic conditions and access to knowledge and technology.

9. The second paper was prepared by an international team of students from the International Space University. A detailed analysis was presented of the conditions that indicated an outbreak of malaria and how space-derived information could assist in combating that disease. Malaria was said to lead to 1 million deaths and 300 million acute illnesses annually. The strategy proposed by the project team at the International Space University and presented to the World Health Organization consisted of studying the life cycle of the mosquito vector to identify indicators that could be fed into a predictive model for the purpose of creating a risk map. Such a risk map could enable the prediction of an epidemic 1-4 months in advance of its onset so that preventive treatment could be improved and the costs of treatment and management of the epidemic could thereby be reduced. Employing space technology to make long-term climatic predictions and take short-term in situ measurements could contribute significantly to improving the monitoring and

prediction network and thereby combating malaria; small, low-cost satellites with data-collection capability could play a valuable role in such a preventive system.

10. The advancement of technology, from large satellites to small affordable ones, paved the way for each country to have its own satellite in the context of small rapid missions, completed within budget and serving national priorities. The Disaster Monitoring Constellation (DMC) was a showcase of successful international collaboration, with the following participating countries: Algeria, China, Nigeria, Thailand, Turkey and United Kingdom. Several of the DMC satellites had already been launched and were providing data for international cooperation in natural and man-made disaster monitoring and for remote sensing applications in individual countries. The requirements for such a successful microsatellite programme were a long-term government commitment to space, the rapid establishment of a first national asset in space together with well-trained ground staff and further investments in second and third satellites and national facilities. The satellites could then be exploited to the benefit of the country.

11. The African resource management (ARM) constellation was intended to address African needs for space technology development and applications. The multi-sensor microsatellite imager payload was introduced. That payload was the baseline for the ARM constellation. In the first phase, it had a 2.5-metre panchromatic and multispectral capability and, in the second phase, it was to have an additional hyperspectral focal plane. The design of the ARM constellation mission took into account resource management priorities, as many disasters in Africa could be prevented through better management. The ARM programme would consist of a number of countries collaborating in technology development and transfer.

12. A presentation was made on the Brazilian experience with the Undergraduate Orbital Student Satellite (UNOSat) and included such aspects as project management, short-schedule pressure and technical problem-solving. Important lessons had been learned that would benefit engineering students. The explosion of UNOSat on the launch pad had made a lasting impression on the members of the student team who had worked on UNOSat.

13. A presentation on the educational opportunities that related to the building and launching of a 29-kilogram satellite, the Kolibri-2000, was made by a representative of the Russian Federation. Valuable experience had been gained and schoolchildren had also benefited. A new launch opportunity for a 29-kilogram satellite at 450 kilometres circular orbit was planned for the next Kolibri satellite project. The orbit would permit a longer mission period than that of the Kolibri-2000, thereby enhancing the educational opportunities provided by such a satellite programme.

III. Conclusions and recommendations

14. The Workshop clearly demonstrated, once again, that there were tremendous spin-offs to be gained from introducing space activities through a small satellite programme.

15. The participants of the Workshop recognized that small satellites were a useful tool for acquiring and developing technology and contributing to education and

training. The Workshop stressed the importance of placing the main focus on applications that provided sustainable economic benefits for developing countries.

16. In the presentations, it was emphasized that practical results had already demonstrated how effective small satellites were in addressing regional problems. New programmes had been presented and were expected to provide benefits such as those arising from remote sensing, especially in such fields as disaster mitigation, agriculture, desertification, forest monitoring and infrastructure development. Improving public health was a new and important application that had been discussed and that would need further attention in the future.

17. The participants also recognized that small satellite projects were promoting, through bilateral or multilateral agreements, international cooperation within a region or worldwide. Small satellite projects could result in fruitful cooperation between different countries in the planning, implementation and maintenance of a constellation of satellites, as well as in the effective utilization of the data acquired. The participants recognized that such an approach could be a useful means of sharing satellite development costs and information data.

18. Participants recognized that, within a country, a small satellite programme could stimulate interest in science and technology, enhance quality of life and the quality of education, promote research and development and result in better linkages between government agencies, educational institutions and industries. The participants therefore emphasized the need for greater awareness of the benefits of space programmes among the public and decision makers.

19. The participants also recognized the contribution of students to the Workshop and considered that the interest in the subject of small satellites shown by young students and young professionals was a positive sign of growing public awareness.

20. The participants of the Workshop recognized that the proposals made during UNISPACE III were fully applicable, but they made or reconfirmed the following additional conclusions and recommendations:

(a) Avenues of international cooperation should continue to be explored in order to foster the use of small satellite systems for the benefit of developing countries, including through the promotion of regional projects. For that purpose, the Workshop recommended that coordinated action be continued to identify significant problems that were common to different countries in a region and that could be addressed with the help of small satellite technology. The Workshop also recommended that partnerships be developed between regions with common needs, such as the equatorial regions of different continents;

(b) Efforts had been made to develop space systems devoted to improving the quality of life in developing countries. To provide maximum economic and social benefits to the populations of such countries, the Workshop recommended that programmes be established in such a manner as to ensure continuity and sustainability;

(c) The Workshop highlighted, in particular, the growing importance of Earth observation programmes for developing countries and the benefits of international cooperative efforts. The Workshop therefore recommended that long-term strategic programmes be developed to ensure the sustainable acquisition and processing of the data needed for monitoring the environment and natural

resources, for the mitigation of man-made or natural disasters, as well as for decision-making;

(d) The Workshop recognized the benefits of small satellite programmes in the acquisition, development and application of space science and technology, and the associated development of a knowledge base and industrial capacity. The Workshop therefore recommended that space activities be an integral part of any national programme devoted to the acquisition and development of technology and capacity-building;

(e) The Workshop confirmed that it recognized the importance of space development in education curricula, especially for motivating and training students. In line with the recommendations of UNISPACE III, the Workshop recommended that each country recognize the important role that space assets could play in education and the need to incorporate space science and technology in curricula;

(f) Finally, the Workshop emphasized the need to develop among the general public, universities and decision makers an awareness of the potential benefits of space technology applications. In particular, it recognized the important role that a dedicated organization or agency could play in the definition and implementation of a space programme. The Workshop recommended that every country or group of countries consider the attainment of a minimum level of space capabilities as they could be invaluable in enhancing socio-economic development, as well as the health and quality of life of populations.

Notes

[1] *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1, annex, para. 32 (b).

[2] Ibid., annex III.

[3] The purpose of the IAA Subcommittee on Small Satellites for Developing Nations is to assess the benefits of small satellites for developing countries and to develop awareness on the subject in both developed and developing countries. The IAA Subcommittee publishes its findings and disseminates relevant information through workshops and symposiums. In order to realize its goals, the IAA Subcommittee cooperates with: the United Nations and its Committee on the Peaceful Uses of Outer Space; the International Astronautical Federation and its Committee for Liaison with International Organizations and Developing Nations; and the International Space University.

[4] *Official Records of the General Assembly, Fifty-eighth Session, Supplement No. 20* (A/58/20), para. 74.