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Committee on the Peaceful Uses of Outer Space

Report on the Seventh United Nations/International Academy of Astronautics Workshop on Small Satellites in the Service of Developing Countries

(Valencia, Spain, 3 October 2006)

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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).

2. At the meeting of the IAA Subcommittee held in 1999, 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 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 that topic should form the core of the discussion. The report of the first United Nations/International Academy of Astronautics Workshop on Small Satellites at the Service of Developing Countries: the Latin American Experience (A/AC.105/745) was submitted to the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space at its thirty-eighth session, in 2001. Based on the positive response from participants and from member States of the Committee, it was decided that that regular activity should continue, with emphasis on different aspects of the issue and the specific needs of individual regions.

3. The second workshop was held in Toulouse, France, on 2 October 2001, the third in Houston, United States of America, on 12 October 2002, the fourth in Bremen, Germany, on 30 September 2003, the fifth in Vancouver, Canada, on 5 October 2004 and the sixth in Fukuoka, Japan, on 19 October 2005. The corresponding reports (A/AC.105/772, A/AC.105/799, A/AC.105/813, A/AC.105/835 and A/AC.105/855) were submitted to the Scientific and Technical Subcommittee at its thirty-ninth, fortieth, forty-first, forty-second and forty-third sessions in 2002, 2003, 2004, 2005 and 2006 respectively.

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.

4. At its forty-eighth session, in 2005, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences planned within the framework of the United Nations Programme on Space Applications by the Office for Outer Space Affairs for 2006.³ Subsequently, the General Assembly, in its resolution 60/99, endorsed the activities to be carried out under the United Nations Programme on Space Applications for 2006.

5. Pursuant to General Assembly resolution 60/99 and in accordance with the recommendation of UNISPACE III, the United Nations/International Academy of Astronautics Workshop on Small Satellites in the Service of Developing Countries: Current and Planned Small Satellite Programmes was held in Valencia, Spain, on 3 October 2006. It was the seventh workshop organized jointly by the Office for Outer Space Affairs and IAA within the framework of the International Astronautical Congress. Following the reorganization of the structure of IAA, the responsibility for such cooperation was assigned to IAA Commission V, dealing with space policies, law and economics.

B. Attendance

6. The Workshop was an integral part of the Congress and was attended by some 55 registered Congress participants. Many of those attending had also attended the United Nations/International Astronautical Federation Workshop on the Use of Space Technology for Water Resources Management, held in Valencia, Spain, on 29 and 30 September 2006 (A/AC.105/878). The sponsors of the Workshop provided financial support to selected participants from developing countries.

7. 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 scientific, Earth observation and telecommunication missions. Emphasis was placed on international cooperation, education and training and the benefits of such programmes for developing countries. 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

8. In a brief introduction, the co-chairman of the Workshop expressed the importance of the series of workshops. Four papers were then presented and discussed, most of which dealt with the use of outer space for developing countries. Additional discussion and exchange of experiences took place at the end of the session.

9. In the first paper, the Myriade small satellite platform developed by the French space agency, Centre national d'études spatiales, was described as an example of a successful small satellite bus. A number of existing and planned missions were described. Satellite buses or platforms as a tool for space programmes for

³ *Official Records of the General Assembly, Sixtieth Session, Supplement No. 20* and corrigendum (A/60/20 and Corr.1), para. 94.

developing countries were examined, focusing on the maximization of the benefits of small satellites. Some of the important benefits of small satellites included the low cost of space access, short planning and execution cycles and the opportunity to train young engineers; a number of launchers could be used to launch the satellite as a piggyback payload; and programme implementation could be based around a common scientific mission with a dedicated or shared ground station and launch according to the available opportunities. In practice, experience with the single-string bus has shown a system availability for operation of more than 95 per cent. With 10 satellites planned for the 2008-2012 period, the Myriade bus was an example of a small satellite bus that was proving that small satellites could fulfil operational missions.

10. In the second paper, Surrey Satellite Technology of the United Kingdom of Great Britain and Northern Ireland examined the future of the already functioning Disaster Monitoring Constellation (DMC). The case was made that, for the operational continuation of DMC capability, further satellites should be added over time. The existing five members of the DMC Consortium met every six months to discuss how to operate the satellites and the images were distributed via a commercial spin-off company. The unique feature of DMC was its wide swath that enabled any location anywhere in the world to be imaged on a daily basis. The image specification was compared with the Land Remote Sensing Satellite image specification. A number of applications were supported by DMC, thus demonstrating the operational use of small satellites. Some of the examples that developing countries could benefit from included applications for precision farming and forest cover assessment in Brazil, where only a three-month cloud-free window existed.

11. The third paper, presented by South Africa, dealt with a remote sensing road map for developing countries. Given the advances in the cost/performance ratio of small satellites, they could be considered for operational remote sensing programmes. Developing nations that were using small satellites as a mechanism for space access needed sustainable programmes that would provide data continuity and engage their young satellite engineers in ongoing programmes. A small satellite programme focused on remote sensing applications could ultimately lead to the utilization of information for intelligent decision-making. The paper reviewed reasons for having space programmes in developing countries and proposed a three-satellite project that could be carried out over five years, which would be capable of producing useful information and would provide the opportunity for the sustained engagement of a local satellite engineering team. As a case study, the progress in the South African satellite technology programme was described, with an examination of the expected outputs of the African Resource Management (ARM) constellation initiative. The ARM constellation was a collaborative effort among Algeria, Kenya, Nigeria and South Africa to establish a constellation of satellites optimized for addressing the information needs of Africa. The paper supported the assertion that small satellite technology was appropriate for developing nations. The paper expanded the premise to show that developing nations could use small satellites for sustainable space programmes.

12. The fourth paper, presented by Indonesia, compared satellite activities in Indonesia and Malaysia, in particular from the point of view of possible collaboration. A number of university programmes were examined to determine

their essential elements and how those programmes could form the basis for further cooperation. Small satellites were seen as a motivator for the development of human capacity for high technology endeavours.

III. Conclusions and recommendations

13. The Workshop clearly confirmed that there were tremendous benefits to be gained from introducing space activities by means of a small satellite programme.

14. The Workshop considered that the proposals made by UNISPACE III and at previous workshops were fully applicable. The series of workshops was considered by the participants as an important contribution to the implementation of the recommendations of UNISPACE III and to the building of awareness among countries.

15. The presentations made at the Workshop showed that practical results had demonstrated how effective small satellites could be in addressing national and regional problems. Information was presented on programmes that were already providing benefits, especially those arising from remote sensing in such fields as disaster mitigation, agriculture and infrastructure development.

16. Information was also presented on scientific programmes, showing how technological progress enabled ambitious scientific missions to be designed and launched using small satellites.

17. The Workshop also took note of the benefits of small satellites for education and training, in particular at universities.

18. Participants considered it important to reconfirm and complement the proposals made previously, in particular:

(a) They stressed the importance of focusing on applications, especially those related to remote sensing missions, that would provide sustainable economic benefits for developing countries. To provide maximum economic and social benefits to the populations of such countries, it was recommended that programmes be established in such a manner as to ensure continuity and sustainability;

(b) The presentations indicated that small satellite projects were promoting international cooperation within regions or worldwide by means of bilateral or multilateral agreements. Small satellite projects could result in fruitful cooperation between different countries in the planning, implementation and operation of scientific and application satellite missions, as well as in the effective utilization of the data acquired while sharing developmental and operational costs. To that end, it was recommended that coordinated actions continue 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. It was also recommended that partnerships be developed between regions with common needs, such as the equatorial regions of different continents;

(c) The continuing and ever-growing interest in Earth observation programmes for developing countries and the benefits of international cooperation efforts, including those directed towards natural disaster management, were highlighted. It was therefore recommended that long-term strategic programmes be

developed to ensure the sustainable acquisition and processing of data needed for decision-making and to monitor the environment and natural resources and mitigate man-made and natural disasters;

(d) Participants 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. It was therefore stressed that space activities should be an integral part of any national programme devoted to the acquisition and development of technology and capacity-building;

(e) The participants also noted with appreciation the contribution of students to the workshops and recognized that the interest of students and young professionals in the subject of small satellites was a clear sign of growing public awareness. The role of universities in developing space capacity was highlighted as a potential means of developing space assets in a country. It was therefore recommended that each country should recognize the important role that space assets could play in education, the need to incorporate space science and technology in curricula and the key role that universities could play in implementing a national space plan. The benefits of developing small satellite programmes at universities were emphasized, but it was considered important to limit project duration to one to two years so that students could benefit from their involvement in the complete life cycle of a project;

(f) Participants emphasized the need for greater awareness among the public and decision makers of the potential benefits of space technology applications. Every country or group of countries should consider the attainment of a minimum level of space capability, as that could be invaluable in enhancing socio-economic development, as well as the health and quality of life of the population. In that respect, a dedicated organization or agency could play an important role in the definition and implementation of a space programme.
