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**Committee on the Peaceful
Uses of Outer Space**

**Report on the Fifth United Nations/International Academy
of Astronautics Workshop on Small Satellites in the Service
of Developing Countries: Current and Planned Small
Satellite Programmes**

(Vancouver, Canada, 5 October 2004)*

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* The present report required preparation by the individual speakers of abstracts of the presentations they had made during the Workshop. This process took several weeks, which delayed the submission of the report.



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-fifth 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/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 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 and the fourth in Bremen, Germany, on 30 September 2003. The corresponding reports (A/AC.105/772, A/AC.105/799 and A/AC.105/813) were submitted to the Scientific and Technical Subcommittee at its thirty-ninth, fortieth and forty-first sessions, in 2002, 2003 and 2004, respectively.

4. 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 within the framework of the United Nations Programme on Space Applications by the Office for Outer Space Affairs for 2004.⁴ Subsequently, the General Assembly endorsed the United Nations Programme on Space Applications for 2004 in its resolution 58/89 of 9 December 2003.

5. Pursuant to General Assembly resolution 58/89 and in accordance with the recommendation of UNISPACE III, the United Nations/International Academy of Astronautics Workshop on Small Satellites at the Service of Developing Countries: Current and Planned Small Satellite Programmes was held in Vancouver, Canada, on 5 October 2004. It was the fifth 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 IV (Space System Operation and Utilization).

B. Attendance

6. The Workshop was an integral part of the Congress and was attended by as many as 60 registered Congress participants. Many of those attending the Workshop had also attended the United Nations/International Astronautical Federation Workshop on Capacity-Building in Space Technology for the Benefit of Developing Countries, with Emphasis on Natural Disaster Management, held in Vancouver, Canada, on 2 and 3 October 2004 (see A/AC.105/834). 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 Workshop co-chairmen gave an overview of the results of previous workshops. Six papers were then presented and discussed, most of which dealt with the use of outer space for developing countries.

9. The paper on the PehuenSat-1 programme of Argentina highlighted the successes of an ongoing university programme with its various practical mission elements. PehuenSat-1 included experiments that had been conducted on the Space Shuttle and showed the importance of the Space Shuttle programme to developing countries for short-term space experiments. The latest satellite in the programme had been fit-checked to the Brazilian launcher that had been destroyed in the accident of 2004. The accident had had a considerable impact on the Argentine team, which had been at the launch site just one day before.

10. The university programme offered by Malaysia was showcased as a vehicle for hands-on student training. The technical details of the satellite were presented, as well as the challenges of executing a resource-limited university programme in parallel with the national programme in Malaysia.

11. The paper on the Kompsat-2 satellite of the Republic of Korea showed how Korean expertise in small satellites was being applied to one of the crucial subsystems for high-resolution imagery, such as the attitude determination and control system (ADCS) of a large-size satellite. An analysis was made of the optimal performance of the ADCS system in determining the configuration with the smallest impact on image quality while using reaction wheels for attitude control. The paper clearly showed the impact of local expertise on the Kompsat-2 mission.

12. The paper on the South African Sunsat 2004 microsatellite described how advances in commercial off-the-shelf technology were leading to the development of microsatellites with a performance that could be operationally applied for remote sensing. The 40-kilogram satellite, with a multi-spectral payload of the order of 6-metre ground spacing distance, was conceptualized and is in development at Stellenbosch University. The technological advances were so promising that the technology transfer to industry had taken place even before the university mission had been completed. The second part of the paper focused on the challenges of a resource-constrained university programme and examined the key factors for the success of a university satellite programme in the absence of a national programme and in the context of a growing space industry in its vicinity. The importance of a holistic programme that would meet university, industry and national interests was emphasized.

13. The paper by Surrey Satellite Technology Ltd. of the United Kingdom of Great Britain and Northern Ireland highlighted the progress made in the ground infrastructure supporting the constellation of microsatellites in the Disaster Monitoring Constellation. The ground stations of the various participating partners were being interconnected to facilitate information exchange and the scheduling of the constellation was in place, so that countries could order data sets from other participants in the constellation. The advantages of working together in a constellation for improved temporal resolution and sharing of resources were clearly demonstrated.

14. The paper on the Brazilian programme covered the applications, results, perspectives and consequences of a developing country's space programme over a period of 25 years. The programme covered local Brazil Data Collection Satellites CDS-1 and CDS-2, which monitored remote weather stations in the Amazon forest. The programme also covered international collaboration with China in the China Brazil Earth Resource Satellite (CBERS 1 and 2) series of satellites, which combined resources to obtain a large satellite capability. International collaboration on the International Space Station was expected to lead to long-term benefits. Access to a space programme element was important to Brazil, which was in a geographical location suitable for launches into both equatorial and polar orbits. The Brazilian launch programme had faced a number of challenges, but the resolve existed to set up a small launch vehicle capability.

III. Conclusions and recommendations

15. The Workshop clearly demonstrated that there were tremendous benefits to be gained from introducing space activities through a small satellite programme.

16. Participants at 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.

17. The following could be discerned from the papers presented:

(a) The utilization of outer space for the benefit of developing countries was expanding beyond demonstrations of technology and national missions aimed at

gaining initial access to space into the use of microsattellites for operational remote sensing applications;

(b) Resource-limited microsattellite programmes at universities in four of the countries that were the subject of papers were discussed and evaluated. Enhanced capability of microsattellites should lead to further interest in that technology, so that university research and development missions could be better funded in conjunction with national programmes that not only provided operational satellites, but also produced significant human resource development;

(c) Clear benefits could be derived from cooperation programmes, whether within a larger bilateral satellite programme (such as that of Brazil and the Republic of Korea) or in a constellation with improved temporal resolution. It was recommended that other developing countries also seek to gain benefits through international cooperation.

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 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. 75.