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REPORT ON THE UNITED NATIONS/INSTITUTO NACIONAL DE TÉCNICA AEROESPACIAL/EUROPEAN SPACE AGENCY INTERNATIONAL CONFERENCE ON SMALL SATELLITES: MISSIONS AND TECHNOLOGY, ORGANIZED IN COOPERATION WITH THE GOVERNMENT OF SPAIN

(Madrid, 9-13 September 1996)

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INTRODUCTION

A. Background and objectives

1. The General Assembly, in its resolution 37/90 of 10 December 1982, upon the recommendation of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82),[1] decided that the United Nations Programme on Space Applications should, *inter alia*, promote greater cooperation in space science and technology between developed and developing countries, as well as between developing countries.

2. The Committee on the Peaceful Uses of Outer Space at its thirty-eighth session, held in June 1995, endorsed the United Nations proposed programme of workshops, training courses and seminars for 1996 as outlined by the Expert on Space Applications.[2] Subsequently, the General Assembly, in its resolution 50/27 of 6 December 1995, endorsed the United Nations Programme on Space Applications for 1996.

3. In response to General Assembly resolution 50/27 and in accordance with the UNISPACE 82 recommendations, the United Nations/Instituto Nacional de Técnica Aeroespacial/European Space Agency International Conference on Small Satellites: Missions and Technology was organized, within the framework of the 1996 activities of the United Nations Programme on Space Applications, for the benefit of the international community, with particular emphasis on developing countries.

4. The Conference was organized and co-sponsored by the Office for Outer Space Affairs of the Secretariat, the Instituto Nacional de Técnica Aeroespacial (INTA) and the European Space Agency (ESA). The Conference was hosted by INTA on behalf of the Government of Spain.

5. The objectives of the Conference were to bring together engineers, scientists, representatives of space agencies and other persons from the space industry in order to analyse state-of-the-art technology relating to small satellites, in particular: (a) the development of dedicated payloads in small experimental satellites; (b) the logistics of design, process and system development methods; (c) ongoing programmes and small satellites already launched; (d) the economic and legal aspects of small satellites and their payloads; (e) international cooperation in the field of small satellites; (f) the development of dedicated launchers; (g) market perspectives; and (h) data reception and processing facilities.

6. The present report covers the background, objectives and organization of the Conference and includes a summary of the sessions and of the two panel discussions. The report has been prepared for the fortieth session of the Committee on the Peaceful Uses of Outer Space and the thirty-fourth session of its Scientific and Technical Subcommittee.

B. Organization and programme of the Conference

7. The Conference, which was held at Madrid from 9 to 13 September 1996, was attended by 263 space scientists. Participants came from the following countries: Argentina, Austria, Brazil, China, Colombia, Costa Rica, France, Germany, Ghana, Greece, Iran (Islamic Republic of), Ireland, Italy, Japan, Jordan, Kenya, Mexico, Mozambique, Netherlands, Peru, Portugal, Russian Federation, Spain, Sri Lanka, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United States of America, Uruguay and Uzbekistan. The following international organizations, space agencies, institutions and members of the space industry sent representatives: Office for Outer Space Affairs; Alcatel Space; Alenia Spazio; British National Space Centre; Centro para el Desarrollo Técnologico Industrial; Construcciones Aeronáuticas S.A. (CASA); Crisa; Escuela Técnica Superior Ingenieros de Aeronáuticos; ESA; HISPASAT; Inter-ministerial Commission for Science and Technology (CICYT) of Spain; Institute of Space Sensor Technology of the German Aerospace Research Establishment; Instituto de Géografía, Universidad Nacional Autónoma de México; INTA; Moscow Aviation Institute; National Aeronautics and Space Administration (NASA) of the United States; National Centre of Space Studies (CNES) of France; National Commission for Space Activities (CONAE) of Argentina; National Institute for Space Research (INPE)

of Brazil; National Space Development Agency (NASDA) of Japan; New Energy and Industrial Technology Development Organization (NEDO); Orbital Sciences Corporation; Real Instituto y Observatorio de la Armada; SENER Ingeniería y Sistemas S.A.; Universidad Carlos III; Universidad de Alcalá de Henares; Universidad de Valencia; Università di Roma; and University of Surrey.

8. Funds allocated by the co-sponsors of the Conference were used to cover the cost of international air travel, accommodation and daily subsistence allowance for 17 participants from Argentina, Brazil, China, Colombia, Costa Rica, Ghana, Iran (Islamic Republic of), Jordan, Kenya, Mexico, Peru, Russian Federation, Sri Lanka, Uganda, Uruguay and Uzbekistan. Conference facilities, equipment and local transportation for the field trip were provided by the Government of Spain through INTA.

9. The programme of the Conference was developed by INTA with input from the Office for Outer Space Affairs and ESA. The programme consisted of numerous meetings and two round-table discussions. The round-table discussions provided an opportunity for participants from developing countries to promote regional development and to promote new programmes of cooperation, as well as the development of this technology within their limited capacities. INTA will issue the proceedings of the Conference.

10. The Conference was supplemented with technical visits to INTA headquarters and CASA. At INTA, the participants heard a presentation by the Director-General of INTA on the Spanish satellite MINISAT 01 and toured the new ground control centre. At CASA, the Director of International Relations gave a presentation on the contribution of CASA to the Ariane launchers and to different European satellites.

I. OBSERVATIONS OF THE CONFERENCE

11. With over 200 participants, the Conference reflected the growing interest in the use of small satellites for dedicated missions applied to everything from scientific Earth observation to demonstrations on technology. Participants stressed on several occasions that such missions could be conducted quickly and inexpensively and could increase the opportunities for developing countries to gain access to space, which in turn would offer advantages related to the developmental and industrial aspects of space technology.

12. The Conference offered many opportunities to all attending specialists to exchange information, explore new concepts, encourage national, regional and international cooperation in mission planning and develop new collaborative relationships between individuals and institutions.

13. In the round-table discussions, participants from Jordan, Kenya, Peru, Sri Lanka, Uruguay and Uzbekistan highlighted the experiences and programmes of their countries in the development, within their capacities, of space technology. Participants from China, Mexico and the Russian Federation presented either papers or poster displays.

14. Several informal proposals were discussed by participants from Kenya and Uganda and by participants from Ghana, Iran (Islamic Republic of) and Jordan. Most of those countries did not have microsatellite projects but might have them in the near future. Several participants whose universities were participating in space projects shared their experiences and were ready to collaborate with persons from other countries in the development of space activities.

15. One of the major successes of the Conference was the substantial contribution from the space industry at the national and international levels. The Conference brought participants in direct contact with representatives of the space industry, with whom they could discuss their projects. A number of small satellites from countries with emerging space technologies had been built by foreign "providers" and adapted to their needs only during the last stages of preparation, sometimes even after they had been launched. As a result, presentations by the major providers of launchers and small satellite buses attracted the most attention at the Conference. Several companies approached participants from developing countries in order to obtain additional information on specific projects, such as the Satex I project of Mexico.

16. During the deliberations of the Conference and the field trip, it became evident that the commercialization of technology involving small satellites was an emerging trend. Throughout the deliberations, speakers representing the industry emphasized that even though, when speaking of satellites, "small is beautiful", most of the space business was financed with government funds and the difficulty lay in convincing Governments that promoting projects in that field was a good long-term investment.

17. Recent technological progress had proved that small satellites could offer services that previously had been unavailable or had been available only on much larger spacecraft. Sophisticated scientific and technological experiments (including experiments in the fields of space physics, astronomy, astrophysics and communications), technology demonstrations and projects designed to collect Earth resource data, including disaster information, could be carried out in space at modest costs.

18. Participants of the Conference were informed that the Scientific and Technical Subcommittee at its thirty-third session, held in February 1996, had recognized the importance of missions involving small satellites by including the issue in its programme as a special theme. In addition, the Committee on Space Research (COSPAR), the International Council of Scientific Unions and the International Astronautical Federation (IAF) had organized, in liaison with States, a symposium on the theme "Utilization of micro- and small satellites for the expansion of low-cost space activities, taking into particular account the needs of developing countries", to complement discussions on the subject within the Subcommittee (A/AC.105/611 and A/AC.105/638).

19. It was stated that, owing to the success of the present Conference, the United Nations Programme on Space Applications would pay more attention to such technology. The participants recommended that the Programme should place more emphasis on commercial aspects of the technology and begin a series of activities on the subject in every region. That would facilitate and encourage future cooperation between industries in developed and developing countries. In that way, the Programme would foster information exchange and collaboration in general mission-design work and in the actual development of small satellite technology.

II. SUMMARY OF THE DISCUSSIONS

A. Ongoing programmes

20. It was stated that small satellites had already been flown with considerable success by many organizations; their attraction lay in the promise of low-cost and short development times made possible by the use of proven standard equipment and techniques, coupled with a realistic expectation of performance. Such satellites made it possible for a country with even a small research budget and little or no experience with space technology to participate in their development, launching and operation. Also, small satellites presented an opportunity for training students, engineers and scientists in different disciplines, including engineering, software development for on-board and ground computers and management of sophisticated technical programmes. Definitions for small satellites varied, but most weighed below 400 kg, there being two main categories: small satellites (or "minisatellites"), weighing about 100-400 kg; and microsatellites, weighing less than 100 kg.

21. Spain had been one of the first countries to develop its own small satellite, INTASAT, which had been launched on 15 November 1974 by a United States Delta launcher. INTASAT had weighed about 25 kg and had measured 45 centimetres in diameter, corresponding to what was currently called a microsatellite. The satellite had been developed at INTA and had been used to measure space radiation. With its solar batteries, it had functioned in an orbit of 1,450 km high for two full years. After that, Spain had become involved in larger projects such as communication satellites in the HISPASAT series and had participated in different ESA projects. On 7 July 1995, a second Spanish microsatellite, UPM-Sat 1, had been launched by an Ariane 4 rocket into a 650-km circular heliosynchronous orbit. It had been developed at the Universidad Politécnica de Madrid and had a mass of 47 kg.

22. In 1992, a more complex Spanish space project, MINISAT, had been entrusted to INTA by CICYT. Many papers presented at the Conference described various aspects of that ongoing project. Modular satellites 180-500 kg in mass (depending on the number of modules used) would be launched by Pegasus airborne launchers from the Canary Islands starting in December 1996. The first satellite, MINISAT 01, would consist of the basic platform and would be used for scientific research. MINISAT 1 would be an upgraded version, equipped for remote-sensing observations. MINISAT 2 would use the basic platform to provide long-distance communications from the geostationary orbit. In addition, INTA had recently become involved in the NanoSat programme, aimed at the development of a 20-kg microsatellite for communication with the Spanish scientific base Juan Carlos I in Antarctica. The project had been initiated in 1995 and was targeted for satellite launch in 1998.

23. A small satellite project in Argentina, Scientific Application Satellite B (SAC-B), was being prepared in cooperation with the United States for a Pegasus launch at the end of 1996. The main purpose of the project was to design a satellite with a scientific payload to advance the study of solar physics and astrophysics. The mass of the satellite was about 180 kg; its expected active lifetime minimum was three years. It would have a circular orbit at 550 km and an inclination of 38 degrees. Experiments concerning examination of energetic particles and radiation from solar flares, localization of sources of intense transient emissions of gamma ray radiation, monitoring of galactic and extragalactic X-ray diffuse background and examination of energetic neutral atoms in radiation belts (in cooperation with Italy) would be conducted on board. SAC-C and SAC-D, representing a new generation of satellites for scientific research and remote sensing, were being prepared for launch in the period 1999-2006.

24. In Brazil, great significance was attached to the collection of data from remote platforms using space technology. The Brazilian Complete Space Mission (MECB) had successfully started in February 1993 with the launch of the data collection satellite SCD 1. The satellite had remained operational two years after its expected useful life. At least two similar satellites would be launched to ensure continuity of the mission. In addition, the improved SCD 3 satellite (200 kg) would also be used to prove the Brazilian concept of satellite voice and data communication services in the equatorial region.

25. The Advanced Interdisciplinary Communications Satellite (SACI-1), the first Brazilian microsatellite for scientific application, was to be launched in October 1997 as a piggyback with the China-Brazil Earth Resources Satellite (CBERS). The payload of SACI-1 was composed of four scientific experiments: the measurement of the Earth airglow emissions and the anomalous cosmic radiation fluxes, as well as the investigation of plasma bubbles and the geomagnetic field effect on charged particles. The ground segment was to consist of two receiving stations in Brazil and of user ground data collecting stations. A cost-effective local area network PC-based tracking and control system would be used and the scientific data and payload on-board configuration would be distributed through the Internet in order to decentralize and facilitate the interfacing between the payload and its customers.

26. In Chile, the first operational satellite would be FASat-Bravo, developed in cooperation with the University of Surrey in the United Kingdom. The 46-kg microsatellite would be put into circular orbit at 650 km with an inclination of 82.5 degrees at the end of 1996. It would carry an ozone layer monitoring experiment, data transfer experiment, experimental Earth imaging system and some other equipment, including an educational experiment. Using the communications link provided by the satellite, students would be able to engage in study activities (orbital mechanics, satellite communications analysis and telemetry analysis) one or two days each month.

27. In Mexico, the SATEX microsatellite project consisted of a family of microsatellites with the objective of mobilizing human resources in space technology and developing test bed systems. As part of a multi-institutional project supported by the Mexican Institute of Communications, the spacecraft would be launched by Arianespace as an auxiliary payload into a polar heliosynchronous orbit at an altitude of 800 km. The goals of the SATEX 1 mission were, *inter alia*: (a) the development of a technologically advanced spacecraft in order to support scientific experiments; (b) the assessment of a general-purpose space bus to be utilized with minimal changes in future missions; (c) the exploitation of previous space experiments; (d) the integration of experienced professionals; and (e) the training of young researchers in the space field. Mexico had announced the successful launch of its mini-satellite UNAM SAT B on 5 September 1996, a few days prior to the opening of the Conference.

28. The POSAT-1 remote sensing mission, a result of close cooperation between a Portuguese industrial consortium and the University of Surrey, was operating routinely. It carried a range of communications, small-scale space science, technology demonstration and Earth observation payloads which, together with an enhanced bus system, made it one of the most sophisticated of the latest generation of microsatellites. It had recently been used by the Portuguese Ministry of Defence to communicate with army units in different parts of the world (e.g. Angola and Bosnia and Herzegovina).

B. Small mission uses

29. Conventional Earth observation and remote-sensing satellite missions were extremely costly, typically costing over $200 million each. The development of high-density two-dimensional semi-conductor charged-couple device (CCD) optical detectors, coupled with low-power consumption microprocessors, presented a new opportunity for remote sensing by using inexpensive satellites. The limited mass, volume, stability and optics of microsatellites could not compete with traditional large-scale missions such as the Land Remote Sensing Satellite (LANDSAT), Satellite pour l'observation de la Terre (SPOT) and the European remote sensing satellite (ERS); however, for medium resolution and meteorological-scale imaging, the KITSAT and POSAT satellites had demonstrated a comparable facility but at a tiny fraction of the cost. That aspect was attractive to developing countries interested in having an independent remote-sensing capability, albeit with limited resolution, that could be under their direct control.

30. Many developing countries had had early access to satellite remote sensing but still had a long way to go in order to maximize the benefits made possible by the existing capabilities. There were unique needs at the national and regional levels that demanded new solutions. Brazil and the Republic of Korea were already developing new satellite programmes to address their specific needs. Developing countries in Latin America, south-east Asia and other regions required special sensor parameters such as spectral bands, spatial resolution and time resolution; they also needed advice regarding cost of image and investment level in ground equipment.

31. The French space agency CNES had created a working group on small satellites at the end of 1993 to propose recommendations for the development of a series of small satellites complementing the SPOT system, at a cost less than 300 million French francs per mission and with a development time of two years. The recommended programme was called Plateforme reconfigurable pour l'observation, les télécommunications et les usages scientifiques (PROTEUS). The first flight was envisioned for 1999 as a continuation of the successful French-United States altimetric satellite project Topex-Poséidon.

32. It was stated that telemedicine was an application that would increase the efficiency of medical services by allowing the transmission of information obtained by inexpensive and simple sensors directly to complex processing units in large medical centres, where it could be interpreted by specialized physicians. That would make it possible for powerful and effective emergency services to reach poor and undeveloped areas, saving many lives and avoiding unnecessary displacement of patients. The Healthsat project was a good example of telemedicine application, using a 60-kg microsatellite in a low Earth orbit (LEO) to relay medical data between Nigeria and countries in North America. Mobile communications could also play an important role in the event of natural disasters, enabling help to reach disaster victims sooner and providing logistical support to rescue teams.

C. Industrial aspects

33. It was stated that the University of Surrey in the United Kingdom had pioneered microsatellite technologies since beginning its UOSAT programme in 1979. The need to accommodate a variety of payload customers within a standard Ariane Structure for Auxiliary Payloads (ASAP) launcher envelope, coupled with increased demands on packing density, economy of manufacture and ease of integration, had led to the development of a novel modular design of a multimission platform. It was based around a series of standard module trays that housed the electronic circuits and themselves formed the mechanical structure onto which solar arrays were mounted. The microsatellite used modern, sophisticated, but not necessarily space-proven, electronic circuits to provide a high degree of

capability. The circuits were underpinned by space-proven subsystems resulting in a layered architecture that achieved redundancy by using alternative technologies rather than by simple duplication.

34. Missions being considered by the Small Mission Opportunity (SMO) initiative of ESA might be classified by the parameters of a launch mass of 150-500 kg, an orbit of between 600 and 900 km, a development time of about two years and a cost of less than 40 million European currency units for platform and integration, delivery on orbit, commissioning and user ground station. It was a class of small missions generating a lot of interest where the European industry was not as competitive as it was in the microsatellite field. Various ESA member States had flown, were developing or were planning small missions. With few exceptions, those missions had involved or would involve the development of a single spacecraft. If more spacecraft should be realized, it would happen in intervals of 3-4 years. The European industry, through its trade association Aerospace, had suggested to ESA that the latter should pool together a sufficient number of missions from its own programmes and from those planned by its member States.

35. The basic idea of the SMO initiative was to have a common procurement of part or all of the mission elements of launch, platform integration and ground segment. That approach should achieve the low-cost benefits for such recurrent elements of the mission while preserving the user's control over the mission payload and operations. The possibility of efficiently integrating a number of different missions on a common subset of equipment had already been demonstrated by various small satellite programmes, such as the NASA Small Explorer programme. Actual contents of the SMO initiative would be defined after an analysis of the proposed mission requirements, which would be performed in the second phase of the ongoing studies. At present, the launch opportunity seemed to be the strongest common denominator.

36. States of the former Union of Soviet Socialist Republics were having a difficult time with respect to the space industry. Whereas the Russian Federation could offer ground segment services and launchers and Ukraine was developing some launcher capability, there was only limited experience in the field of small satellites. The tradition of heavy, complex spacecraft would be difficult to overcome in the near future. In Kazakstan and Uzbekistan, where there was a considerable concentration of the intellectual and industrial potential in space technology, there had recently been a lack of strategic planning on how to use those capabilities. In addition, with a considerable decrease in demand, many specialists had left the country, leading to a further deterioration in the situation.

37. One of the successful Russian small satellite missions was the communication system GONETS, intended for digital e-mail services. The first two demonstration satellites had been orbited in 1993 by the Tsiklon launcher. The mass of each satellite was 250 kg, and it would be possible to launch up to six satellites by a single launcher into a 1,500-km orbit with an inclination of 83 degrees. Currently, there were several projects in the Russian Federation for the creation of a constellation of small communication satellites. Signal, a low-orbit system, would consist of 12 satellites (300 kg each) in four orbital planes; a Courier-1 system would consist of 8-12 satellites (each with a mass of 250 kg) launched into a circular 700-km orbit inclined 76 degrees; and the Globsat system had been proposed for a 30-66 satellite constellation. There were also several projects for universal small space platforms (USSP-1, USSP-2 and USSP-3). Their mass would be from 60 to 400 kg and they could be used to carry radio equipment for the International Search and Rescue System (COSPAS-SARSAT).

38. A multipurpose small satellite platform was also being developed in China by experts from the Chinese Academy of Space Technology. It should satisfy servicing for small remote sensors, CCD cameras, scientific experimental instruments, experimental communications and new technology test payloads. The service system electronic module was a box measuring about 110 x 120 x 50 cm and it contained attitude control, an integrated house-keeping management unit, electrical power and a propulsion module. Its mass was about 250-350 kg, which included 100-150 kg of useful payload. The energy was provided by solar arrays combined with a nickel cadmium chemical battery. Initial stabilization after orbital injection was achieved by spinning up the whole satellite. After solar acquisition was achieved, the control mode should be switched to the Sun-pointing spin-stabilized mode and then, if required, to the full three-axis, Earth-pointing stabilized mode. The platform should be available in a few years time.

D. Launchers and the ground segment

39. It was stated that the cost of available launchers was limiting the current and future development of small satellites. Currently, the most common practice was to have small satellites ride piggyback on large payloads (e.g. Ariane 4, Russian Cosmos or Zenit launchers). Of the major European and United States small launchers, only Pegasus and Taurus were flight-proven. Spain was preparing a test flight of its new Capricornio launcher; the development of the San Marco Scout of Italy had not yet started (although its forerunner, the United States Scout, had been operational for many years) and the Ariane-5 derivative programme should be completed in 1999. Because of the lack of competition in the market, the cost of launching was usually a substantial portion of the overall cost of the mission.

40. Launch access for small satellites could be obtained either on a purely commercial basis or by participating in international cooperative agreements. A country might also consider developing its own launch capability. A driving force in pursuing that approach was the lack of available low-cost launchers and the inability of a country to meet launch requirements on a timely basis if it viewed access to space as critical to its national development. The acquisition of launch services from international commercial sources was sometimes preferable to cooperative arrangements, owing to difficulties in finding an appropriate exchange opportunity. In particular, countries seeking their first launch might find a commercial acquisition the most effective route open to them.

41. It was noted that requirements for the ground segment of a small satellite system varied enormously depending on the application area. At one extreme, low data rate sensors with only local or regional coverage on missions with low tracking and command requirements would impose relatively low demands on the ground segment, possibly comprising only 10 per cent or less of the total programme cost. More complex data retrieval and processing requirements could result in ground segment costs accounting for up to 50 per cent. Assuming that ground segment costs tended to average 25 per cent of the programme total, it was clearly important to identify potential savings in the ground segment in concert with those of the space segment.

E. International cooperation and legal aspects

42. Based on the deliberations of the Conference, the success of the new emerging technology would depend on the way missions were planned, specified, realized, funded and operated. Opportunities were available at the national, regional and international levels for cooperation to acquire advanced technologies and upgrade technical expertise in new fields. Small satellite systems could provide an opportunity to invest limited resources and to gradually increase a national infrastructure.

43. One of the major outcomes of the Conference was the official announcement of a cooperation agreement between Argentina, Chile, Mexico and Spain to develop a minisatellite for Earth observation. Its specific applications were still to be defined. The satellite would be ready for launch in the year 2000. The programme of the agreement was in the process of being defined.

44. Cooperative missions might be considered when a clear programmatic benefit was shared by two or more countries with a mutual desire to maximize their unique national resources and available funding. International cooperative agreements varied from mission to mission and from country to country; most required each country to assume full financial and technical responsibility for its portion of the cooperative effort. In addition, clean and distinct managerial and technical interfaces should be detailed in such agreements.

45. Small satellite projects were often carried out in close international cooperation that was dictated by the need to share some technology and sometimes even the launchers. Usually, partners provided financial input with respect to the construction, integration, testing and operation of individual instruments in return for participation in the

mission and in the analysis and publication of the results. An alternative method of participation was to provide another instrument, or instruments, for the payload, with the capability of performing unique research, together with sufficient financial backing or technical facilities for necessary integration, testing and operational activities.

46. Cooperative space activities were usually supported by some kind of technology transfer. A successful technology transfer in the development of the small satellite project implied a process by which a team acquired sufficient momentum to be able to produce the next generation of small satellites. There were several mechanisms whereby technology transfer could be achieved, but to be successful, the transfer should be a transfer of understanding and not just the transfer of a technology package ("know-why" as well as know-how). There were examples of programmes where engineers from developing countries were trained on small satellite design, production and operations. The University of Surrey had provided such assistance in the development of small satellites under 100 kg to Chile, Pakistan, Portugal and the Republic of Korea and even to small countries in Europe that had decided to initiate a space programme.

47. Several papers were devoted to the legal problems connected with the exploration of outer space and the practical use of space technology. Two papers presented by the Office for Outer Space Affairs described problems of the official registration of objects launched into space (in particular, small satellites prepared in cooperation with several countries) and the danger of pollution in outer space by debris created during the launching and subsequent deployment and exploitation of the constellations of many small satellites in low orbits. Also described were activities of the Office aimed at the promotion of international cooperation in the peaceful uses of outer space.

Notes

[1]See *Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 9-21 August 1982* (A/CONF.101/10 and Corr.1 and 2), para. 430.

[2]*Official Records of the General Assembly, Fiftieth Session, Supplement No. 20* (A/50/20), para. 34.