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BENEFITS ARISING FROM SPACE ACTIVITIES AND THE NEEDS OF DEVELOPING COUNTRIES

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ABSTRACT

Space technology has triggered an important impact in the field of international relations as a result of developing countries having become involved in space activities. Special reference will be made in this paper to the examples of Argentina, Brazil and Mexico.

Article I, 1st paragraph of the 1967 Space Treaty lays down the general principle that the exploration and use of outer space shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development. The 2nd paragraph of this Article establishes freedom of access for all without discrimination of any kind.

Most of us are aware of the problems of developing countries in achieving "space benefits". In a certain measure Law would be providing the solution on the basis of international cooperation which, in the field of outer space, is viewed as an obligation and not just as an expression of ideals. In this sense the paper will focus on the various sections of the *Corpus Juris Spatialis*, including the United Nations General Assembly Resolutions, particularly the Declaration on International Cooperation in the Exploration and Use of Outer

Space for the Benefit and in the Interest of all States taking into particular account the Needs of Developing Countries (Res. 51/122):

The objective of this paper is to carry out an analysis leading to determine to what extent international co-operation is helping Argentina to develop its National Space Programme and to achieve the so-called "Space Information Cycle", in other words, the set of steps encompassing space data generation, transmission, processing and use, as its main target.

INTRODUCTION

Resolution 2625 (XXV) of the UN General Assembly, entitled Declaration on the Principles of Friendly Relations and Cooperation between States, enforced on 24th October 1970, includes both principles and rules of behaviour. Among its principles it includes the duty of States to cooperate with one another in accordance with the Charter.

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In the view of Arangio-Ruiz², cooperation has been understood, in a first approach, as one of the main principles of intergovernmental relations in the last twenty-five years of the United Nations, and it has been considered most vital. This principle should be considered as a kind of super principle implying the same operational status, in practice, of the other six principles of friendly relations. This author then states that this principle should have an auxiliary albeit vital function of making all the other principles come into practice.

Article 1, paragraph 1 of the 1967 Space Treaty establishes that “ The exploration and uses of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind”. The second paragraph of that same article establishes that “outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies”.

On 13 December 1966 the “Declaration on International Cooperation in the Exploration and Use of Outer Space for the benefit and in the Interests of All States, Taking into Particular Account the Needs of Developing Countries” (Res. 51/122) was adopted in the 83rd Plenary Session of the UN General Assembly. This Resolution, in its first paragraph, establishes that “international cooperation in the exploration and use of outer space for the peaceful purposes (hereafter “international cooperation) shall be

² Arangio-Ruiz, Gaetano: “Normative Role of the General Assembly of the UN”. *Recueil des Cours. Académie de Droit International, 1972. III Sijthoff, Leyden, pp. 572*

conducted in accordance with the provisions of international law, including the Charter of the United Nations and the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies. It shall be carried out for the benefit and in the interests of all States, irrespective of their degree of economic, social or scientific and technological development, and shall be the province of all mankind. Particular account should be taken of the needs of developing countries”.

This paper will analyse to what extent Argentina, as a developing state, is favoured by this instrument -international cooperation- provided by international law, and may develop a Cycle of Space Information with benefits for the whole of society.

THE ARGENTINE SPACE PROGRAMME AND INTERNATIONAL COOPERATION

On 28 May 1991 former Argentine President Menem signed the Decree 995/91 which, in Article 1, creates the “National Committee of Space Activities” (from here on, CONAE), with a capacity to act both in public and private levels, in areas concerning science, technology, industry, commerce, administration and finance, with complete financial and administrative independence, and depending directly and exclusively on the Nation’s President. Article 2 of the mentioned decree states that the CONAE is the only organ of the State with a capacity to comprehend, design, carry out, control, negotiate and administer projects and plans relating to space, and that its functions are the following:

- a) to propose the National Space Programme for the use and development of space science and technology for peaceful purposes, as well as the mechanism for its

financing, all of which must be approved by the national executive power.

- b) to centralise, organise, administer and carry out the National Space Programme.

In the Argentine Space Programme the social benefit arising from space activities is achieved, mainly, by two elements:

* the information generated by space applications and the means for its transmission.

* the means for the peaceful exploration and use of outer space³

The Space Programme also indicates that, once the information is made available to society, it gains an added value as it gets processed and prepared to be used, by the government or by the productive sectors, in the everyday decision-making process. Society encompasses a large number of companies that can be identified as "information companies" which carry out this type of work producing data and grouping them according to their values through a variety of methods.⁴ The final objective would be the elaboration of the "Space Data Cycle", which refers to the number of stages involved in the generation, transmission, processing and use of space data. Throughout the "cycle" the space activities promote the use, either by providing or using the information and its means of production, transmission, elaboration and storage.⁵

Decree 995/91, when listing the functions of the CONAE in Article 3 states, in paragraph J, that the CONAE

³ Presidency, CONAE: "Argentina en el Espacio".1995/2006", p. 1.

⁴ Presidency, CONAE: Argentina en el Espacio.1995/2006", pp. 1-2.

⁵ Presidency, CONAE: Argentina en el Espacio. 1995/2006", p.2.

shall promote and develop cooperation agreements with public and private entities in other countries, in accordance with Argentina's foreign policy and with due intervention by the Ministry for Foreign Affairs.

Following this legislation, the Argentine Republic has signed agreements which highlight international cooperation. We shall now focus, as examples, on the treaties with the following States⁶:

- 1) Germany: in 1992 the Framework Agreement for Cooperation in Space was signed between the CONAE and the Deutsche-Forschungs und Versuchsanstalt für Luft und Raumfahrt (DLR).

This agreement led to various projects in progress. In some of them the CONAE and the DLR act as coordinators of the Argentine and German parties.

Among the projects we shall mention the following:

- a) Reception of satellite images in Falda del Carmen, Province of Córdoba, Argentina. In June 1996 a Working Protocol was signed envisaging the installation, in the CONAE quarters in that city, of an aerial provided by DLR during a period in which this CONAE should install its own.

- b) "Argonauta" Project: joint development of telecommunications technology for the creation of a telemedicine system in the Province of Córdoba, Argentina.

⁶ Progress Reports of the National Space Programme (1995/2006) of the CONAE for years 1997 and 1999. Also see the text of the international legal instruments.

c) Project for agricultural monitoring in the Province of Entre Ríos, Argentina.

d) Participation of the DLR in Project SAC-C: development and application of optoelectronic systems, and mutual support and exchange of expertise relating to satellite missions and the development of subsystems.

2) Brazil:

On 9 April 1996 the Argentine and Brazilian governments signed the Framework Agreement for Cooperation in Space, which has a ten-year validity.

The Brazilian Space Agency and the CONAE are in charge of putting into practice the named Agreement.

During 1997, and within the SAC-C project, the Project for Work and Cooperation was approved, between CONAE and the National Institute for Space Research (INPE, Brazil), in connection with the evaluation and practice of components, subsystems and satellites.

In November 1997 a technical visit was carried out in the Brazilian Aerospace Technical Centre (CTA) to analyse the cooperation possibilities between Brazil and Argentina with reference to "Means of access to space and launching services".

Three agreements were signed with the Brazilian Space Agency: 1) development of SABIA, the Argentine-Brazilian satellite for information on food, water and environment; 2) concerning the launching of a sonda rocket, to be developed by the Aerospace Centre in Brazil with Argentine

cargo; 3) compatibility of earth systems operations in space missions.

3) Canada:

On 26 June 1995 the Declaration of Cooperation Intentions was signed between Argentina and Canada.

The CONAE acts as coordinator of the Argentine party in the Globestar 2 Programme (Latin American Programme for the Training and Development of Applications of Canadian satellite Radarsat). At the end of March 1997 a meeting was held between the representatives of the Canadian Centre for Remote Sensing (CCRS) and members of Argentine research groups who submitted papers to participate in the programme. Canada estimated an investment of 400.000 dollars for support of this programme throughout 1997 and 1998.

4) Spain:

A joint Declaration for Scientific and Technological Cooperation in the field of Space was signed with the National Institute of Aerospace Technology (INTA) in Spain.

5) United States of America:

On 28 February 1996, during the visit of Daniel Goldin, manager of NASA, the extension of the Framework Cooperation Agreement for the Civil Uses of Space was signed between the CONAE and NASA.

On 30 October 1996, at NASA's headquarters in Washington, the Memorandum of Understanding was signed between the CONAE and NASA, concerning satellite SAC-C.

On 4 November 1996 Argentine satellite SAC-b was launched from the base in Wallops Island, USA.

The scientific field includes two cooperation projects:

- a) "Chagas Maza" project, experimenting on the growth of crystals in microgravity in the space shuttle for the study of possible treatments for the "chagas" illness.
- b) Participation of the CONAE in project TOMS-EP (Total Ozone Mapping Spectrometer-Earth Probe).

Mention should also be made of Project X-33 (reusable satellite launcher).

In October 1998 NASA's space shuttle Discovery carried into space a group of seeds provided by primary school students, within "GERMINAR", the CONAE'S education programme.

6) France: on 26 February 1996, during Dr. Menem's visit to France, the framework agreement on cooperation was signed between the CONAE and the Centre National d'Etudes Spatiales (CNES).

This agreement deals with the following topics:

- space research and instrumentation: external and internal geophysics, astronomy, the exploitation of the solar system, the study of the evolution of the climate in the global environment, etc.

Applications:

- observation of the Earth and research on the environment, information, tracing and collecting systems, exchange of data, telecommunications, etc.
- Space technology
- Lightweight satellites
- Quality and reliability (components, equipment and systems), knowledge and technical expertise
- Embarked useful loads
- Satellite control and operation
- The launching of ultralight satellites as "Arianne"'s secondary load
- Integration and evaluation of space systems
- Scientific and technological formation

The CNES committed itself to the provision of ICARE for its integration with satellite SAC-C and for the scientific aspects of the mission.

7) United Kingdom:

During 1996 the Argentine-British Seminar on issues of Satellite Earth Observation was held in Buenos Aires and Córdoba. Eleven British scientists took part in this seminar.

8) Italy:

The Italian Space Agency took part in Project SAC-B by providing solar panels and ISENA. Likewise, it shall take part in Project SAC-C by contributing with the solar panels and a GPS receptor.

9) Ucraina:

In December 1996 the CONAE carried out a technical visit in Ucraina, during which various working topics leading to possible cooperation projects were introduced.

10) European Space Agency:

The First Latin American Meeting on Remote Perception through Radar: Image Processing Techniques, was held in Buenos Aires on December 2-4, 1996. It was organised jointly by the CONAE and the INPE, and was sponsored by the ESA.

Mr. Mauricio Fea from ESA took part, as external consultant, in the reviewing of the Argentine Space Programme.

THE SPACE INFORMATION CYCLE

The above-listed treaties are all in accordance with n° 5 of Resolution 51/122 of the UN General Assembly, which states that "International cooperation, while taking into particular account the needs of developing countries, should aim, inter alia, at the following goals, considering their need for technical assistance and rational and efficient allocation of financial and technical resources:

- a) Promoting the development of space science and technology and of its applications;
- b) Fostering the development of relevant and appropriate space capabilities in interested States;
- c) Facilitating the exchange of expertise and technology among States on a mutually acceptable basis".

The third course of action of the Argentine Space Programme which concerns this paper deals with information systems.

This would include all activity for the gathering, reception, transmission and storage of information coming from space systems, including mostly the development and operation of hardware and software systems, information networks and documentation centres. These activities relate, mainly, to teleobservation, particularly concerning the identification of the elements essential

for the production of complete cycles of space information⁷.

Within this course of action is the Regional Centre of Satellite Information (CREDAS) of the CONAE. Among the main aims for the establishment of this Centre is putting, at the disposal of Argentine and other Latin American researchers on meteorology, astrophysics and space sciences, the registered world knowledge as basic information on areas of their specialisation, in different parts of the world, such as the National Centre of Information of the Goddard Space Flight Centre, belonging to NASA⁸.

CREDAS is network-connected by an agreement with the Academic Teleinformatic Network (RETINA) and with NASA.

In 1996 the Scientific Board of the CONAE was created for the coordination of scientific research for each project or activity carried out within the CONAE and with the support from national or foreign organisations. The most important activities developed by this Board were: a) Putting into practise the first Latin American system for the measuring of amount profiles of ozone and atmospheric aerosols in relation to height; b) the continuation of the TOMS programme for the measurement of ozone from NASA satellites; c) the furthering of the ChagaSpace programme for research on medicines to cure the "chagas" illness in cooperation with NASA, etc.

As is known, the CONAE is in charge of the Space Information Cycle (CIE). The national executive power establishes that these operations should also be carried out with the participation of sectors of society that are directly interested, limiting CONAE's intervention to activities that are necessary for the development of the CIE

⁷CONAE, *Progress Report on the National Space Programme, January 1997*, pp. 6-9.

⁸ See www.conae.gov.ar--- Credas

and do not have reference in the country for their implementation⁹. Here it is important to mention the Programme for the Network of Associated Centres, which will enable the CONAE to link its developing technological infrastructure with groups experienced in the development and transfer of products derived from space information to the end consumers.

The aim of the Programme for the Network of Associated Centres is the cooperation with public and private institutions which are capable of:

- generating services and products from space information (as starting point)
- carrying out extension, promotion and technical assistance tasks;
- training personnel and carrying out methodological research or research on innovative applications.

For its implementation the following institutions were contacted¹⁰:

- the Programme for Technologies and Remote Sensing and Geophysical Systems of Geo-referenced information from the National University of Mar del Plata, Argentina.
- the Institute for Mineral Resources (INREMI) of the Faculty of Natural Sciences of the National University of La Plata / CONICET.
- the Centre for Research and Formation for Territorial Organisation (CIFOT) of the University of Cuyo, Mendoza, Argentina.

⁹ CONAE, *Progress Report for the National Space Programme, January 1997, pp. 11 and subsequent pages.*

¹⁰ CONAE, *Progress Report for the National Space Programme, January 1997, pp. 11 and subsequent pages.*

-the Centre for Photogrammetry, Cartography and Cadastre (CEFOCA) of the Faculty of Engineering of the National University of San Juan, Argentina.

-the Research Programme for Teledetection (PRODITEL) of the University of Luján, Argentina.

-the National Patagonic Centre (CENPAT) of the CONICET, in Puerto Madryn, Argentina.

-the Institute for Research in Mining (IIM) of the National University of San Juan.

-the Research Centre for Geological Resources (CIRGEO)-(CONICET/UBA).

Following this course of action, Decree 125/95 created the National Register for Space Objects launched into Outer Space, in accordance with the international duties in the 1967 Space Treaty and the 1974 Registration Convention.

This Register, in accordance with Article 1 of the named decree, is supervised by the CONAE.

The Register is considered public on the basis of Article 8, which establishes that the Register is public and all interest parties may obtain a certified copy of the annotations in the Register by request to the authority in charge.

The investment in the development of space technology will no doubt lead to big benefits. For instance, the Province of Tucumán ordered the elaboration of a map to calculate the production of sugar cane for 1997. Each image cost 2500 pesos. CONAE's customers may be private entities or state related organs. Former Minister for Foreign Affairs, Guido Di Tella said this project was an income-producing one¹¹.

¹¹ O'Donnell, María "A satellite station has replaced Cóndor", *La Nación*, 16/9/97, p. 12

The space environment is an area where, as we have seen, state activity and private activity meet. It is also true that it is a context where mankind must be considered. In this sense, Article 1, para 1 of the Space Treaty states:

“The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.”

Regarding this Article Prof. Williams¹² states it is difficult to determine with precision what exactly must be understood by the terms “for the benefit of all countries”. This is a subjective concept evaluated with significant differences in the various countries, therefore, when it comes to defining it there is a real challenge. On the other hand, one thing is to say that the benefit of space exploration involves the whole of mankind understanding, for example, that the activities must be, in general terms, beneficial (like telecommunication satellites, the use of solar energy or the advanced weather forecasts by other means) and another thing is to sustain that the resulting benefit, including the specific one, derived from space activity, must be shared and divided among all the members of the international community. This author concludes that it seems reasonable to support the former position.

The Programme complements the commercial satellite activities that companies carry out more efficiently than the State, thus leading to significant

¹² Williams, Silvia Maureen, “Las empresas privadas en el espacio ultraterrestre” in *Revista del Centro de Investigación y difusión Aeronáutico-Espacial (CIDA)*, year VIII, n° 8, 1983, p. 39. Also see, by the same author, “Derecho Internacional Contemporáneo”, publ. by Abeledo-Perrot, 1990, Buenos Aires, Chapter 8.

benefits. However, in Néstor A. Domínguez’s opinion¹³, this does not mean that the work already done will not bring economic benefits to the country (apart from the social, educational, defense, security and public health benefits which will anyway be obtained).

CONCLUSIONS

As analysed in the previous paragraphs, international cooperation is a key to developing the Argentine Space Programme. We have looked into the main agreements signed by Argentina under Article 3, paragraph J of Decree 995/91, which allows CONAE to make cooperation agreements.

International cooperation, as the principle applicable to intergovernmental relationships, came into practice in this field. The developed countries provided technical support, promoted the development of space science and technology, as well as its applications, strengthening, in this way, the growth of a space aptitude, and easing the exchange of knowledge in accordance as stated by UN General Assembly Resolution 51/122 (1996).

It is, indeed, difficult to quantify the economic benefits, from space activities, to a State, whether the activities are commercial or not. Let us recall what former Minister for Economy, Di Tella, stated a few paragraphs back, during his visit to the Teófilo Tabanera Centre¹⁴. The former Minister, when becoming aware of the special features of satellite images which signify a cost of 2500 dollars, referred to this project as an income-producing one.

¹³ Domínguez, Néstor A, “El plan espacial nacional y su aprovechamiento político”, in *Boletín del Centro Naval*, , N° 786, Vol. 115, April/June 1997, p. 275.

¹⁴ “Una estación satelital reemplazó al Cóndor”, in *La Nación*, 16/9/97, Buenos Aires, p.12.

It is unnecessary to analyse the benefits for Argentina as a result of having a “space information cycle” and a Regional Centre for Satellite Information, where all the basic knowledge on meteorology, astrophysics and other space sciences which can be found in different centres of the world such as the National Centre of Information of the Goddard Space Flight Center of NASA, will be at the disposal of Argentine and other Latin American researchers.

All these activities will be beneficial following the ruling of Article 1 of the Space Treaty.

It will be hard to measure the benefits from the Argentine Space Plan as these will be reflected in an improvement of educational health areas (such as in the “ChagaSpace” programme).

In the end, society will “appropriate” these benefits resulting from a space programme consolidated on the basis of international cooperation as the tool provided by international law to govern the relationship among States.