

**BRAZILIAN-CHINESE SPACE COOPERATION:
AN ANALYSIS OF ITS LEGAL PERFORMANCE ***

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*"The whole moral universe, the whole political universe,
the whole human universe, are based today on paper rags."
Rui Barbosa, Brazilian statesman (1849-1923)*

Abstract

This paper aims to examine some of the most important juridical issues raised during the short but yet rich Brazilian-Chinese space cooperation history. It tries to assess the effectiveness of the agreements signed by these countries on space matters.

At the same time, it seeks to present the political and legal concepts which were in the foundations of the main phases of this history.

Introduction

The current Brazilian government, according to the Republic's President, Fernando Henrique Cardoso, has a clear commitment to support a program for the indigenous development of space science and technology. Brazil already started its space activities in the sixties. However, the successful launching of its first satellite, the SCD-1 (1), did not occur before February 9, 1993, and the launching of its first space vehicle (VLS) is hoped to take place next year. Today Brazilian space activities, as a whole, rank between the 9th and 10th position among similar national space programs in the world. Its annual budget, which lies between US\$ 150 to 200 millions, has regained the level it had at the end of the eighties, as the Brazilian

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Space Agency recently informed.

The consciousness of the absolute necessity of international space cooperation for the future of the country's space program have increased in Brazil. At the same time, more and more Brazilian space specialists and officials understand that international space cooperation should be oriented not just by occasional offers, but answering national needs. Furthermore, they think that cooperation should not mean technical assistance, but joint development. (2)

For these reasons, it seems that Brazilian space authorities presently give the highest priority to the space cooperation with the People's Republic of China.

Having launched its first space vehicle in 1964 and its first satellite in 1970, China became the 5th space power. Nowadays, space technology became a priority in its current plans to improve national economic and social development. Particular attention is paid towards applied as well as applications satellites and is keen on pursuing cooperatives endeavors, although it intends to retain its autonomy. (3)

Therefore, it is not by chance that China and Brazil have already gone a long way in their joint construction of two remote sensing satellites. The project, named Chinese-Brazilian Earth Resources Satellite (CBERS), has been approved by both countries' governments in 1988. Many contrivances came forth along the eight years since.

At the beginning, it was presumed that the first satellite could be launched in December 1992. A schedule reevaluation performed at the beginning of 1993, after a long paralysis in the project, set the first launching to October 1996. There were new delays.

To a certain point, this was no surprise, considering the originality of a space cooperation between two developing countries. Brazilian diplomat Celso Luiz Nunes Amorim, whose participation on the initial negotiations with China was very assertive, as a especial secretary to International Issues at the Ministry of Science and Technology, has made a faultless prevision, in an article published in August 1988: "The actual realization of the (CBERS) project will certainly involve practical difficulties which we

cannot even anticipate, even though the high level support received by it allow us to trust that the necessary means to its completion will not lack, from either side.”(4)

Both aspects of these predictions came to fact. The encumbrances, in fact, have been not few nor small, but, after all, the project has already advanced several steps and has accomplished phases which importance one cannot minimize. Today it seems absolutely irreversible.

Till last September, Brazil has concluded its part in the construction of all equipments destined to the qualification model of the first satellite, and delivered it to China. The qualification phase will be finished at the beginning of 1997, at the Chinese facilities. Then, the phase of construction of the flight model will be started. The first satellite could be launched, then, by at the end of 1997 or at the beginning of 1998. The second satellite should go up two years later, that is to say, at the year of 2000. The chances that these predictions will come to fact are considered large, mainly because there have been no lack of the necessary means.

The good results achieved so far, mainly during the last years, led both sides to think about two subsequent satellites, CBERS 3 and 4. At the same time, the creation of a binacional enterprise to explore the products from the new remote sensing system is under study.

Today the space cooperation is the most prominent part of a wider bilateral collaboration policy which both countries officially consider as “strategic partnership”.

How did Brazil and China come so far? How did they overcome the problems and hindrances that delayed the CBERS implementation? How did a project, adopted under such enthusiasm and so many hopes, felt under a dangerous climate of waiting and indecisions — that almost made it sink — but was, in time, resumed, and gives now a clear indication that it is solidly irreversible?

This history may be told and studied under many aspects. Here, it will be examined under the juridical point of view. We will follow the sequence of agreements signed by both countries governments and institutions, in order that the CBERS project should be made real, and see how did they work.

The Brazilian-Chinese space agreements are the first high technology ones between developing countries. The experience and the products of this cooperation program surely will have a considerable influence over the future space activities of both countries and may turn out an example and a reference to other developing countries.

Two quotations would be proper here:

1) Another prophecy soon coming to fact, from Ambassador Celso Luiz Nunes de Amorim: “By the time (the two sino-brazilian satellites) are in orbit, they will provide the most significant example of a South-South cooperation in

the whole planet.” (5)

2) Some recommendations made by the program of priority actions regarding the cooperation South-South, from the 1990 report “The challenge to the South” (6), approved by the South Commission - created in 1987 by a group of well known scientists and statesmen from several countries:

a) “All developing countries should provide legal, technical and taxing initiatives that would foster joint-ventures and the completion of technology transfer agreements between southern enterprises.”

b) “The South should develop a scientific cooperation strategy centered in areas of greater mutual interests, where research and innovation could provide tangible benefits, through the addition and the conjugation of resources”.

A consistent evaluation of the effectiveness of the Brazilian-Chinese space agreements is, by these reasons, even more necessary and relevant. This is what I intend to outline here, centered mainly on the Brazilian side, but far from assuming to exhaust the matter. It goes beyond doubts that the Brazilian-Chinese space cooperation deserves many further and deeper researches, under many different aspects, including juridical and political, so that its enormous experience potential and learnings should be profited the most.

Pacta sunt servanda

Agreements must be honoured. That is the essence of the *rule pacta sunt servanda*, one of international law’s oldest principles, as defined in the Article 26 of the 1969 Vienna Convention on the Law of Treaties: “Every treaty in force is binding upon the parties to it and must be performed by them in good faith”.

The treaty, as said by the super realistic Hans J. Morgenthau, is “the main instrumentality by which the international law is created.”(7) Today, the written agreements are seen as the principal sources of international law, as well as the most democratic ones, since the States participate directly in its elaboration.

Nevertheless, even so, they are not always duly respected. This failure is critical to multilateral as well as to bilateral agreements. It can signify frustration, breaking off an entire chain of understandings from which concrete results could be expected, as well as the benefits, not only for the concerning countries, but also for international relationships as a whole. It is especially crucial with reference to agreements on high technology fields.

Of course, bilateral agreements, as well as laws of reciprocity, are relatively strong, being laws of limited partnership, whose members’ common end is a set of mutual interests. (8) It is usually easier to comply with bilateral agreements. Yet, it does not necessarily happen this way, even when the agreement deals with extremely important affairs.

In fact, agreements, including bilateral ones, may have different levels of respect. Sometimes they are implemented, not exactly as they have been established, and only some degrees of its compromises have been respected. Quite frequently, the Parties have complied with some of the obligations, but not with others, due to some new difficulty or reasoning, leaving it clear, however, by their actual deeds, that they are not giving up the entire agreement.

For this reason, we not only can, but we must analyze those implementations. The process could be named "performance of an international agreement".

Appraising the performance of international agreements is quite necessary, after all, because these agreements are, nowadays, the most important basis for achieving cooperation on practically all matters, including, of course, space ones. Not only by chance, the same Vienna Convention on the Law of Treaties recognizes, in its preamble, the importance of treaties as a "means to develop peaceful cooperation among nations, independent of their constitutional regimes".

Oscar Schachter remarks that "the governments which enter into cooperative arrangements through treaties or otherwise, do so, not because of their moral idealism, but because of the predicaments in which they find themselves." (9) If so, we gave still another argument to require the assessment of these arrangements.

Moreover, such an assessment is essential in relation to agreements signed to achieve the goals set for space projects, which comprise a range of high costs, difficulties and risks. That is the case of the Brazilian-Chinese space agreements.

The sources

The legal history of Brazilian-Chinese space cooperation is formed by the following eleven main documents:

1) **Agreement on Scientific and Technological Cooperation Between The Government of The Federative Republic of Brazil and The Government of The People's Republic of China**, done in **Beijing**, on **March 25, 1982**;

2) **Complementary Agreement on Scientific and Technological Cooperation**, done in **Beijing**, on **May 29, 1984**;

3) **Work Report on Sino-Brazilian Joint Project for Development of CBERS Satellite**, done in **Beijing**, on **March 4, 1988**;

4) **Protocol on Approval of Research and Production of the Earth Resources Satellite Between The Government of The Federative Republic of Brazil and The Government of The People's Republic of China**, done in **Beijing**, on **July 6, 1988**;

5) **Cooperation Agreement for the China-Brazil Earth Resources Satellite Between the Chinese Academy of Space Technology of China (CAST) and The Institute for Space Research of Brazil (INPE)**, done in **Beijing**, on **August 22, 1988**;

6) **Supplementary Protocol on Approval of Research and Production of the Earth Resources Satellite Between The Government of The Federative Republic of Brazil and The Government of The People's Republic of China**, done in **Brasilia**, on **March 5, 1993**;

7) **Protocol on the Main Points For the Further Joint Development of the China-Brazil Earth Resources Satellites Between Chine Space Administration of The People's Republic of China and The Ministry of Science and Technology of The Federative Republic of Brazil**, done in **Brasilia**, on **September 15, 1993**;

8) **Protocol on Further Developments of The China-Brazil Earth Resources Satellites and Related Matters Between Chine National Space Administration of The People's Republic of China and The Ministry of Science and Technology of The Federative Republic of Brazil**, done in **Beijing**, on **November 9, 1993**;

9) **Protocol Between The Ministry of Science and Technology of The Federative Republic of Brazil and The China National Space Administration of The People's Republic of China (CNSA) on Cooperation in the Peaceful Applications of Outer Space Sciences and Technology**, done in **Brasilia**, on **November 23, 1993**; and

10) **Framework Agreement Between The Government of The Federative Republic of Brazil and The Government of The People's Republic of China on Cooperation in the Peaceful Applications of Outer Space Science and Technology**, done in **Beijing**, on **November 8, 1994**. (10)

11) **Agreement Between The Government of The Federative Republic of Brazil and The Government of The People's Republic of China on Technical Security in Connection with The Joint Development of Earth Resources Satellites**, done in **Beijing**, on **December 13, 1995**.

12) **Minutes of Understanding on the Strengthening and Expansion of the Brazil-China Space Technology Cooperation**, done in **Beijing**, on **December 13, 1995**.

How did these agreements function? In which level have they been observed? What was its effectiveness? By answering these questions we can evaluate the legal performance of Brazilian-Chinese space cooperation until now. This analysis will be done as we show the phases of the legal history of Brazilian-Chinese space cooperation.

At this moment, it is interesting to note that most of these agreements have been signed, in Brazil's behalf, by four Ministers of foreign Affairs — Ramiro Saraiva Guerreiro (1979-84), Roberto de Abreu Sodré (1986-90), Fernando Henrique Cardoso (1992-93) and Luiz Felipe Lampreia (1995-) - and by one Minister of Science and Technology — José Israel Vargas (1993-). I call the attention to the fact that, from 1988 until today, in addition to the already mentioned, Brazil had three other Ministers of Foreign Affairs — José Francisco Resek (1990-92), Celso Lafer (1992) and Celso Luis Nunes

Amorim (1993-94) — aside four other Secretaries of Science and Technology - Decio Leal Zagottis (0989-90), José Goldemberg (1990-91), Hélio Jaguaribe (1991-92) and Edson Machado (1992-93).

By contrast, in China's behalf, the agreements have been signed by two Ministers of Foreign Affairs - Huang Hua and Qian Qichen (from 1988) - and one Administrator of the China National Space Administration - Liu Jiyuan.

This information shows the high level of administrative continuity in China, beneficial to the fulfillment of the signed agreements. About Brazil, we can say that the administrative interruptions after 1988 had ill effects upon the cooperation process, started that year, but the administrative continuity after 1993 has, undoubtedly contributed a lot for the progress of the CBERS project.

A history in four chapters

From the proclamation of The People's Republic of China until August 15, 1974, Brazil has kept severed its diplomatic relations with that country. In August 1961, there was an important attempt to an approach. Brazil's vice-president, João Goulart, has visited China, and, in addition to a bank agreement, authorized the establishment of a commercial office at an important Brazilian city. But in March 1964, the winning military movement, that promoted the automatic alignment with the United States, arrested nine Chinese civil servants that have come to set the commercial office. Ten years later, the world had already gone through the first petroleum shock, and the north-American president himself, Richard Nixon, had visited China. The then Brazilian government, under the late general Ernesto Geisel, had an attitude quite different from its predecessors. It defended a project of national autonomy on strategic sectors. It was he who elaborated and approved the first large spatial program in the country, the Complete Brazilian Space Mission, known as MECB. And it was also he who decided - not without strong internal reactions, mainly within the Army - to resume relationships with China. (11)

However, the first Brazilian-Chinese agreement on scientific and technological cooperation wasn't signed until seven years later, on March 25, 1982. Yet, this agreement is very cautious and doesn't mention space cooperation.

According to its Article I, the scientific and technological cooperation between both countries will be carried out "in fields to be decided through diplomatic channels." Its Article II, listing the ways the scientific and technological cooperation will be developed, foresees in its seventh and last item "other forms of scientific and technological cooperation to be agreed by the Parties", leaving that way an open door to any fields of cooperation, including space.

Finally, its Article III allows the Parties to conclude the Complementary Protocols, "in

which basis the cooperation shall develop". It also establishes that these Protocols will be negotiated and approved through diplomatic channels or by the Brazilian-Chinese Commission on Scientific and Technological Cooperation, which was created at that time. The Brazilian Ministry of Foreign Affairs and the Chinese Ministry of External Economical Relations and Trade were designated as "executive bodies" of the Agreement.

Two years later, in May 29, 1984, Brazilian and Chinese Governments have signed the first Supplementary Protocol to the 1982 Agreement. They agreed to intensify its cooperation and to this end had elected seven areas, including space. (12)

At the same time, the Brazilian Government had designated, as executive organism for the future space cooperation projects with China, the Brazilian Commission of Space Activities (Cobae), acting through the Technical Aerospace Center (CTA) and the National Institute for Space Research (INPE). Meanwhile, the Chinese Government had designated its Ministry of Space Industry to the same task. (Later, in 1993, that ministry has been transformed in China National Space Administration, the Chinese space agency.)

It was agreed that this cooperation would be carried out in the following areas: Communications satellites, remote sensing satellites and image processing, launching vehicles and its systems, sounding rocks and other techniques. This Complementary Protocol didn't, however, define any projects.

This Supplementary Protocol, even though it represented a step forward, didn't immediately produce any tangible assets, however.

So far, this was the pre-history of the Brazilian-Chinese space cooperation. The actual history didn't start until 1985, and may be divided into four periods: 1985-88, 1988-89, 1989-92, 1992-96. (13)

The first period (1985-88)

In March 15, 1985, after 21 years under a military regime, a civil government was inaugurated in Brazil and the first Ministry for Science and Technology was created in the country's history. One of the first acts of the new minister, ruling over de National Institute of Space Research (INPE), was to consider the Chinese proposals, so that the possibilities and general intentions registered in the Complementary Protocol of 1984 could come to fact under a cooperation program.

The first Brazilian minister for Science and Technology, Renato Archer, valued highly the international cooperation. On his inauguration speech he stated: "... (we cannot) hope that the higher developed nations turn themselves into donors of such valuable goods, as are knowledge and know-how. What we want from them are mainly an understanding position towards

our problems and our solutions to it, giving way to a mature cooperation, based on mutual advantages, were the richer nations wouldn't give anything for free, but wouldn't either try to establish rules on how we should conduct our development. This is the posture we hope for, both at the bilateral level and the multilateral courts were the questions concerning Science and Technology are discussed. This same principle of respect to the national options of each country shall preside the collaboration agreements we intend to keep with countries at the same progress level as ours." (14) This point of view, clearly presided over the relationships between Brazil and China, which soon became activated.

In July 1986, the minister Renato Archer visits China and starts a cycle of technical negotiations aiming to the elaboration of a real space program cooperation.

Such an effort results in the Work Report on Sino-Brazilian Joint Project for Development of CBERS Satellite, signed in Beijing, in March 4, 1988, by three representatives for Chinese Academy of Space Technology (CAST) and three for the Brazilian Space Research Institute (INPE).

The following are the principal issues agreed in the Work Report:

1) The Chinese-Brazilian earth resources satellite (CBERS) is to be jointly developed "on the basis of equality and mutual benefits";

2) The CAST will share responsibility for 70% and the INPE for 30% of the total project cost, which includes expenses for development of satellite (two flight models) and purchasing two launching vehicles and the launch services;

3) The CBERS will be utilized by both parties. When it flies over the two parties' territories, each party may use its own earth station to receive the remote sensing and DCS system data. The use of the satellite by a third country and delivery of remote sensing products to a third can only be allowed under the approval of both parties;

4) A "Project Committee" has to be established as highest level authority of the project, consisting of representatives from both countries, with the responsibility to organize and implement the project while exercising its leadership and supervision.

5) The mark of fulfilling the project is that CBERS has had a qualification test in orbit and has been delivered for utilization;

6) None of the parties is allowed to cease implementing the program of the project, otherwise will bear all the responsibility resulted from its independent ceasing of the project and will compensate to the other party for all the losses;

7) Any amendment or addition to the project must be unanimously approved by the Project Committee;

8) The Work Report will be annexed to the Agreements and has the same legal effect as the Agreement after they are signed by both Governments.

This Work Report includes two annexes:

1) CBERS Technological Requirements, which presents its mission objectives, its overall system, satellite description;

2) Engineering Management, with the Development Program and Plan, as well as the phases of construction.

Based on this Work Report, the first consolidated space cooperation project between Brazil and China came forth. In July 6, 1988, the Brazilian and the Chinese Foreign Ministries signed, in Beijing, at the presence of the Brazilian President Jose Sarney, the "Protocol on Approval of Research and Production of the Earth Resources Satellite Between the Government of the People's Republic of China". This Protocol was negotiated by the Brazilian Ministry of Science and Technology through the INPE and with the support of the Ministry of Foreign Affairs. The Brazilian Commission for Space Activities (COBAE), which was headed by the Chairman of the Joint Chiefs of Staff (EMFA), approved the plan to develop space cooperation with China, in spite of the opposite vote from the Ministry of Aeronautic representative.

The Protocol encompasses only two points, being a small document:

1) It approves de CAST-INPE Work Report of March 4, 1988; and

2) It designates the INPE and the CAST as the executing agencies for the joint program. They were entrusted with celebrating the necessary acts for its implementation.

In the brief Protocol introduction, Brazil and China reaffirm "their determination to strengthen bilateral ties in the field of high technology". That is the reason why this space relationship was seen at the time as an example of cooperation between two developing countries in a high technology field.

A step further was to be taken just a month later, in August 22, when the Cooperation Agreement, a document exclusively executive was signed between CAST and INPE, for the CBERS. This agreement, not only reaffirms and enhances the CAST-INPE Work Report of March 4, but establishes a practical legal basis for the implementation of the Project as well.

Its Article 3 lists the following eight appendices, "which have the same legal effectiveness as this Agreement": CBERS Technical Requirements; CBERS Development Plan; Organization; Tracking, Telemetry and Command (TT&C) and Operational Management; Division of Work; Financial Share; Regulation on Personnel Exchange; and Product Assurance.

The Appendix 1 defines two CBERS mission objectives:

* The use of advanced space remote sensing techniques to inventory, develop, manage and monitor the Chinese and Brazilian earth resources in agriculture, forestry, geology, hydrology, geography, cartography, meteorology and environment, etc.

* The promotion of the development and application of space remote sensing and space tech-

nology in China and Brazil.

The CBERS Development Plan (Appendix 2) had planned the launching of the first satellite to be done in December 1992. This proved to be a mistake, due to the fact that the Taiyuan Satellite Launch Center, from where the CBERS should be launched, doesn't usually function at that period of the year.

In Article 4, it was, for the first time, established the amount for the total project investment, US\$ 150 millions — US\$ 100 millions for the development and the assembling of two satellites, and US\$ 50 millions for the purchase of two Chinese launchers and launching services. It was also registered that China would be responsible for 70% of the total costs, 30% being Brazil's due. It was stated, however, that "if the contribution provided by each party in the implementation of the Project, due to mutual subcontracting, doesn't correspond to its accorded share, the difference shall be covered with money, materials, goods or services".

It is known, today, that the Project's costs went beyond those calculated before. Brazil has already invested about US\$ 64 millions, from 1988 till 1995, and shall invest US\$ 33,5 millions more, from 1996 till 1999. To this, it must be added other costs amounting to approximately US\$ 35 millions, from important items as the construction of the Brazilian wide field camera (WFI), integration and test of CBERS 2 in Brazilian facilities, ground stations, new contracts on the structure of satellite and applications and commercialization of the CBERS products. However, both parties haven't, so far, redefined this matter through another agreement.

The purchase of the two launching vehicles and launching services was left to a later, distinct agreement, within the same financial partition as the original Project.

This launching contract ended up by being signed almost five years later, in November 9, 1993.

The Articles 10 and 13, on delicate questions as "Defaults" and "Disputes" were written in poor legal terms, certainly because it was intended to be the most cordial it could be, aiming to prevent by all means any type of confrontation, as well as the ending of the agreement itself. I think it worth to quote them here, so that the spirit in which they were written can be perceived.

Article 10 says:

"If either party fails to fulfill any commitment required in this Agreement, and if such Party fails to remedy such failure within a reasonable period after being notified by the other party in written form, the other party shall have the right to terminate the present Agreement.

It is a very serious step to terminate the Agreement. Both parties shall do whatever they can to avoid that. If either party wishes to consider the termination of the Agreement, an urgent Project Committee shall be held to discuss if the termination can be prevented. Otherwise,

a detailed procedure for the termination shall be worked out."

Article 13 says:

All disputes arising in connection with the present Agreement and during the implementation of the Project shall be solved through friendly consultation. In case an agreement is not reached, all disputes shall be analyzed and solved by the Project Committee. If the disputes are still persisting, both parties shall report to their government".

Until now all the defaults and disagreements, even the most serious, have been dealt with and solved through friendly consultations and negotiations.

The main important case of difference on interpretations on the CAST-INPE Agreement was on the definition of responsibilities for the tracking, telemetry and command of the satellites in the second phase of the mission (from the separation of the satellites, including the complete in-orbit tests, to the delivery of the satellites to the users).

This question wasn't solved until several years later.

Why this kind of project?

Let's open an especial chapter to examine why is that Brazil and China decided to adopt this kind of project.

Brazil had some good reasons for that decision:

1) The need to develop indigenous capabilities on the construction of remote sensing satellites, greatly enlarging its accumulated experience on working with satellite applications, started in the beginning of the seventies. By 1972, Brazil was the third country, behind USA and Canada, to have an operational system for receiving data from remote sensing satellites (Landsat);

2) The first Brazilian space program, named Brazilian Complete Mission (MECB), approved in 1979, had, as its main object, the construction of four satellites - two Data Collecting and two Remote Sensing Satellites. Brazil has, furthermore, as part of the MECB, prepared qualified human resources, as well as some modern facilities, which could also help to accomplish an international cooperative space project;

3) The CBERS could contribute to maintain the MECB, in the case the hypothesis of its unfeasibility, as some have supposed at the time, should come to fact (14);

4) The two CBERS satellites would cost considerably less than the four MECB satellites. This was very important, considering the Brazilian budgetary difficulties (15)

5) The political willingness to participate in a great international space project, capable to impart new stimulus to Brazilian space activities and to rise them to a qualitative higher level.

6) The strategic conviction that the cooperation with China in remote sensing , based on

strong mutual interests, could open new opportunities to reach space technologies, otherwise impossible to establish or to buy in developing countries. The Brazilian space program has been thwarted by the seven most development countries (G-7), the USA being the first of them, by the Missile Technology Control Regime (MTCR), as to the assembly of the VLS (Satellite Launching Vehicle), to begin with. (16) By the time the Protocol was signed, in July 6, 1988, the then Brazilian President, Jose Sarney, stated to the Press that the cooperation with China, thanks to an effort authentically shared, could brake those restrictions the developed Nations had built against the advanced technologies transfer. He added that the so much praised south-south cooperation - until then limited, except for a few modest technical assistance and student and in-the-job trainees exchanges - was going thorough high technologies boundaries to get inside the more advanced spheres of research and space technologies. (17)

China also had strong reasons for going for such a cooperation with Brazil:

1) External cooperation was, at that time, and still is welcome, as a means to speed up the development of Chinese capability in satellite application, as China considers its "services and operations in the field of meteorology, navigation and remote sensing, essentially dependent on foreign satellites."(18)

2) Brazil could be a competent and efficient partner in the assembly of application satellites, since it already have some technical and industrial experience in this field, and could even contribute with financial resources;

3) Brazil could bridge China's possibilities on getting further technological resources from other countries, with whom it didn't have the conditions for transacting this kind of goods before.

The second period (1988-1989)

The effective implementation of CBERS didn't begin until this period. It started with the CAST-INPE Cooperative Agreement of August 22, 1988, which establishes all the objectives, plans, structures, work ways, schedules and regulations of the project. This was the time when the different teams have been created and started working.

The CAST-INPE Cooperative Agreement has incorporated the organization structure proposed by the Work Report on March 4.

The Project Committee is the highest authority level for the joint development of the CBERS. It turned out to be known as "Joint Project Committee" and by the acronym "JPC". It is formed by eight members - four from each party. Each party appoints one chairman. Under the JPC there are two Project Managers. Under the Project Manager are placed the Engineering Technical Group (ETG) and the Engineering Management Group (EMG).

The JPC defines the general policies and issues orders and instructions, as well as approves the execution of cooperative plan and all the reports from the ETG and EMG.

There are two Project Managers - a manager from China and an associate manager from Brazil. They hold great responsibilities. While working together, they set the project implementation, verify all the system level reports from the two engineering groups, approve all the subsystem level documents, as well as coordinate and solve the problems raised within the joint development.

The Engineering Technical Group may have up to 16 members from each party and is composed by one chief head from China and one associate head from Brazil. The ETG is composed by two subgroups. The System subgroup deals with mission analysis, orbit design, configuration design, integration, assembly and verification, interface with launcher, interface with launch site and others. The Satellite subgroup looks after the structure, thermal control, power supply, tracking, telemetry and command (TT&C), on-board data holder (OBDH), circuits & cables, altitude and orbit control subsystem (AOCS), payloads and ground electric support equipments (GESE).

The Engineering Management Group is composed of up to five representatives from each party, with one chief head from China and one associate head from Brazil. This group works out the development plan; arranges detailed programs for each phase and each year; inspects the implementation of the plan; organize review meetings, maps out the product technical documents; coordinates and handles all management affairs.

The JPC conducts its work in the form of meetings, held alternatively in both countries and chaired by the chairman of the host country. The resolutions discussed and decided at each meeting are written in the form of minute, which orientates the subsequent development of the project. Until now seven meetings have been held, as shown in the following box:

Joint Project Committee (JPC) Meetings
1) August 24-25, 1988, in Beijing, China;
2) August 2-8, 1989, in São José dos Campos, Brazil;
3) June, 11-16, 1990, in Beijing;
4) February 25-March 2, 1993, in São José dos Campos;
5) July 26-August 6, 1993, in Beijing;
6) October 18-21, 1994, in São José dos Campos;
7) September 26-28, 1995, in Beijing.

Therefore, two JPC meetings have taken place during this period (1988-89): the first one in August 24-25, 1988, in Beijing, immediately

after the signature of the CAST-INPE Cooperation Agreement of August 22, and the other, one year later, in August 2-8, in São José dos Campos.

It happened that, in January 1989, the then Brazilian President, José Sarney, introduced considerable changes in his government structures. The Ministry of Science and Technology merged into the Ministry of Industry and Commerce to form the Ministry of Economic Development, Science and Technology. It didn't last beyond a few months, for the National Congress ended up by refusing it, forcing the government to go back on its decision of fusing both ministries and to create a Secretary of Science and Technology to replace the Ministry of Science and Technology, aside from creating back the Ministry of Industry and Commerce. This ministerial reform, however, had a negative effect, as a whole, over the scientific and technology sector, which went aimless during quite a long period, a victim of disorientation, uncertainties and indefinities. Priorities and agreements previously assumed had, to a great extent, lost its sense, including the space cooperation with China. As a result, the Brazilian party didn't give the project the importance it has given it at the year of 1988 anymore. This way, during 1989, as asserted by the technicians involved in the project at that time, it went on by inertial momentum, spending up the fuel accumulated at the previous year. This can be viewed by the degree of implementation of the CBERS Development Plan at the period. (See the table below)

Until the end of 1989, phases A and B were concluded, but phase C tasks, foreseen for this period, couldn't be done. From one side, the qualification and contracts with the Brazilian firms selected to assemble the necessary pieces,

parts and subsystems didn't start. From another, the assembly and launching of the first satellite at the beginning of the nineties became impossible, as it was predicted. The main cause: Brazilian government didn't release the financial resources it was committed to do. (20)

Third period (1990-1992)

In March 15, 1990, the new President of Brazil, Fernando Collor de Mello was inaugurated. The Ministry of Science and Technology, reborn in December 1989 at the José Sarney government, was once more turned into a Secretary of Science and Technology. To head it, professor José Goldemberg was invited, who didn't put CBERS among his priorities. So, the new government kept unchanged the low level of attention the project had in 1989 and refused it all the means. Brazil, this way, didn't meet its responsibilities and didn't perform the tasks foreseen at the CAST-INPE Agreement. The project was then practically paralyzed because of the obvious failure from the Brazilian side.

The Chinese side got to the point of thinking to demand the payment of a fine, from Brazil, as a reparation in regard to the delay on the implementation of CBERS. There was a legal basis to that. According to Article 7 of CAST-INPE Agreement, "it is the duty of each party, among others, ... to bear the responsibility for any consequences and losses caused by itself during implementation its committed duty." By failing to honor its contractual duties, the Brazilian party had, at least, gone through a deliberate neglect, liable to some kind of penalty. But the demand for a fine or reparation, as far as it is known, was never formalized.

Chinese government, it appears, was very pa-

CBERS Development Plan		
Phases	Objectives	First schedule
Phase A	Mission specification and others	
Phase B (Definition phase)	* Determine satellite system scheme and technical specifications * Determine subsystem's preliminary scheme and subsystem's technical specifications	February 89
Phase C (Detailed design phase)	* Determine subsystem scheme and their technical specifications * Determine preliminary design scheme of equipment and their technical specifications * Develop subsystem equipments * Complete integration and test of the structure model (SM), thermal test model (TM) and electric test model (EM)	April/May 90 February 91
Phase D (Manufacturing phase)	* Freeze the equipment schemes and their technical specifications * Manufacture the equipment for Flight Model (FM) subsystems * Integrate and test FM * Launch FM	December 91 September 92 December 92
Phase E (Flight phase)	* Mission management during the normal operation in orbit after orbit injection * In orbit test	

tient and wise on its way to treat the crisis that had fallen over both countries about the CBERS. It was probably thought that it would be better to bet on a change on positions from Brazilian government, timely, than to get from it some financial compensation that could take the controversies to a point of no return, and lose everything, this way.

In this period, the Chinese President, Yang Shan Kun, visited Brazil and the Brazilian Foreign Minister, José Francisco Rezek, visited China, being received in the highest governmental level. Yet the abnormal situation didn't change.

Brazil has never stood at the uncomfortable situation of having to pay any fine or reparation, but it certainly suffered moral and material discomforts, aside the serious diplomatic embarrassment, for not having met such an important international commitment. (21)

During this period, the JPC had met only once, in June 11-16, 1990, in Beijing. There was already a lot that the JPC, being exclusively technical and executive, could perform. However, there was nothing they could do without any money. All that both countries had agreed to, so far, was under the threat of not coming to fact. The survival of CBERS became dependent on a political decision at the highest level of Brazilian government.

The Brazilian management of the project used constructively this opportunity to discuss with the Chinese side three relevant proposals:

1) To explicitly establish the technological transfer as one of the CBERS objectives, improving, this way, the 1988 agreement;

2) To integrate and test the second satellite (CBERS-2) at the Integration and Test Laboratory (LIT) of INPE, having the technical teams of both countries working together; and

3) To broaden the Brazilian participation in the satellite tracking and command activities.

These claims were so reasonable that they ended up by being accepted. Nevertheless, they cannot be used at all as a justification to disrespecting the agreements.

As says Fabíola de Oliveira, "the CBERS program gained impetus in 1991, when Brazilian firms started to be contracted for the fabrication of equipment for that part of the satellite under the responsibility of INPE". (22) It seems to be a polemical assertion. In fact, during the second semester of 91, contracts amounting to US\$ 15 millions were signed, for the assembly, by Brazilian companies, of the CCD (Charged Coupled Device) chamber, of computers and of the test systems. That was doubtless a positive deed, for it helped to avoid the total dismantling of the project from the Brazilian side. But it was still a quite weak sign, because it didn't reflect a clear position from the government part towards the resuming of the project.

The critical general picture remained unchanged. It could be shown by two facts: 1) In 1992, the Brazilian government didn't plan any

resources to CBERS; and 2) JPC, the most important executive part of the project, after the meeting on June 11-16, 1990 didn't come together again until two years and eight months later, in February 25-March 2, 1993, while it has been a consensus that it should meet at least once a year.

Fourth period (1992-1996)

This is the period of the resuming or the CBERS project and the steps ahead, towards its consolidation. Which would be the turning point for the moving of the previous period to this one? It is not easy to answer this question.

It must be said that the Brazilian Ambassador Roberto Abdenur, during his long mission in Beijing, from January 1989 to August 1993, was a untiring advocate of the space cooperation with China. At that time, during more than two years, he was a lonely fighter. He wasn't supported in his efforts by the highest levels of Brazilian Government. He just had the backing of INPE management personal. This way, the persistent work of Roberto Abdenur can be seen as a very important factor to the CBERS survival. He was so convinced of the far-reaching relevance of the Brazilian-Chinese cooperation in high technology fields that he coined the expression "strategic partnership" to qualify the kind of relations that should be adopted between two countries. This expression was right way accepted by the Chinese Vice-First Minister of Economic Affairs, Zhu Ron Gji, who used it in a meeting with the then Brazilian President, Itamar Franco, in Brasilia, early 1993.

In September 1992, at the beginning of the yearly session of United Nations General Assembly, the Chinese delegation met the Brazilian one and apparently exerted strong pressure on them to normalize the space cooperation between both countries.

Surely enough, right at the beginning or October a committee, lead by the then Secretary of Science and Technology, Edson Machado, was sent to China to promote the necessary understandings toward the CBERS project with Chinese officials.

In December 1992, President Collor was impeached by the National Congress, being forced to leave the government to be charged with corruption. His successor, vice-president Itamar Franco, even before being inaugurated, had shown an enthusiastic intention on supporting the CBERS.

In December 1992 and in January 1993, two Brazilian technical delegations (from INPE) have been in Beijing, reestablishing operational contacts and reorganizing the tasks and the project conditions. Soon after, the JPC itself resumed its activities at a historical meeting in February 25-March 2, 1993, in São José dos Campos.

Closing this resuming cycle, the Supplementary Protocol of March 5, 1993, was signed in Brasilia by both Brazilian and the Chinese For-

eign Ministers. It was the most important act of the visit to Brazil of the Chinese Foreign Minister, Qian Quichen. The Brazilian Foreign Minister at that time was the present day President of the Republic, Fernando Henrique Cardoso.

This Protocol meant the official renewing of the Brazilian-Chinese space cooperation. By the Protocol, the Parties decided to make all necessary efforts in order that the first flight model of the CBERS be placed in orbit by October 1996. This intention certainly expresses both side's wishes to accelerate the implementation of the project after such a long delay. As we know today, this plan, however, was not accomplished.

This Protocol ratifies the Brazilian proposition in order that the activities of assembly, integration and testing of the second flight model of the CBERS take place at the Laboratory of Integration and Testing (LIT) or INPE, with the additional costs under Brazilian responsibility. It was also noted that the Parties have made progress on the question of control orbit revision of the CBERS, as was Brazil's wishes.

As a first step towards reaffirming the CBERS, this Protocol announces that the Ministry of Science and Technology of Brazil and the Ministry of Aerospace Industry of China will sign a Protocol on Main Points for the Further Development of the CBERS.

Six months later, in September 15, 1993, actually, the new Protocol was signed - again in Brasilia - by the Brazilian Ministry of Science and Technology and the China National Space Administration (which, at that time, had replaced the Ministry of Aerospace Industry). This new Protocol ratifies the agreed decision of the 5th JPC Meeting held in July 26-August 6, 1993, in Beijing. Its expressed objective was "to speed up" the development of the CBERS.

To this end and to assure the launching of the first satellite in October 1996, the Protocol records that "both sides shall endeavour to allocate sufficient financial resources to guarantee the work schedule for the development of the satellites and the subcontracted items". By the end of 1993, other contracts were signed, amounting to US\$ 16 millions for the assembling of the structure, power supplier, transponders for data collection, all the aeriels, solid state power amplifier (SSPA).

In general, from 1993 on, the flow of resources from the Brazilian side went much better, apart from a few delays, which, notwithstanding, didn't jeopardize the high priority given to the project. However, the plan to launch the first satellite in October 1996 was not accomplished for technical and other reasons rather than financial ones. In 1995, the chief Brazilian company contracted for the fabrication of equipment for the CBERS project, ESCA, went bankrupt. This resulted on a delay of at least six months. ESCA was a branch of the American Raytheon Corporation in Brazil.

This Protocol of September 1993 reaffirms the agreed decision to assembly, integrate and

test (AIT) the second flight model of satellite (FM2) at LIT of INPE. It also establishes that (a) the task or AIT of FM2 should be performed during a maximum period of 14 months from the date of the arrival of FM2 equipment in Brazil and that (b) after the completion of AIT work, FM2 shall be shipped to China by charter flight for launching.

Both sides hoped that, within one year of the signature of this Protocol, a separate agreement concerning satellite safety and protection of proprietary rights should be signed and be effective after the approval by their respective governments. This hope didn't come true at the scheduled time. The intergovernmental agreement on technical security in connection to the joint development of CBERS was signed over two years later, in December 12, 1995.

As a last point in the Protocol of September 1993, both sides had confirmed that in the first half of November 1993, they would sign, in Beijing, the contract of CBERS Launching Services. This point has been strictly fulfilled. The contract was signed in November 9 of that year.

1993 was the year of reconstruction. It ended up with the signature of two other Protocols, in November 9 and 23, respectively in Beijing and Brasilia. Both of them display a nature of understanding and perspectives from both countries. The November 9 Protocol, "on further developments" of the CBERS records that "the Chinese side agrees, during the launching of CBERS-1, to carry, as passenger load, a Brazilian scientific experiment micro-satellite with approximately 60 kg of mass".

According to this Protocol, "both sides agree to set up a joint group in the first half of 1994 and to make joint efforts to advertise the products of CBERS in the international market so as to enlarge its potential users". However, this joint group has not yet been created. Besides, it was agreed that "the Brazilian agencies concerned and CAST would establish a team in order to prepare an all-encompassing feasibility report for the joint development of a communication satellite, and would provide the feasibility report in the first half of 1994. That issue hasn't yet been fulfilled either. In 1994, the then president of the Brazilian Telecommunication National Company, (EMBRATEL), Renato Archer, has visited China, envisaging a possible joint project in that field. However, as President Fernando Henrique Cardoso was inaugurated on January 1st, 1995, the differences between Brazilian and Chinese telecommunications policies became more evident than ever before, which, if doesn't make it impossible, it certainly makes it difficult to reach an agreement.

The November 23rd Protocol, rather broader than the previous one, is similar to a framework agreement. Its Article 1st says that "the Parties shall encourage, with due account for the widely accepted international laws and rules, exchange and cooperation in the exploration and use of outer space for peaceful purposes on the basis

of equality and mutual benefits, in accordance with the laws and regulations in force in each country and through their respective competent organizations in the areas of space science, technology and applications..." In the same sense, its Article 3 affirms that "the parties will endeavor to coordinate their positions on the matter regarding the peaceful uses of outer space in the relevant bodies of the United Nations system". This Protocol, therefore, seems deeply concerned to present very clearly the peaceful and legally adequate purposes of the Brazilian-Chinese space cooperation. We can suppose that it would be necessary to dissipate the suspicions of developed countries, mainly the United States, on the eventuality of a future military space cooperation between Brazil and China. It should be remembered that Brazil, soon after this, in February 10, 1994, assumed unilaterally the compromise of following the rules of the missile Technology Control Regime (MTCR), aiming at being accepted as an informal organization.

After the Protocol of November 1993, just one year later, the framework Agreement on cooperation in the peaceful applications of outer space science and technology came forth under the same spirit, signed in November 8, 1994. For the first time, the Agreement mentions the Brazilian Space Agency (BSA) as the organism designated by the Brazilian Government to implement the agreement. The RSA was founded in February 10, 1994. In practice, however, it has been seen that the chief role at conducting the CBERS project has been played by the Ministry of Science and Technology. Just as did the Protocol, the Agreement establishes the creation of a joint working group to develop the binational space cooperation, but until now this haven't been done.

In January 1995, it was defined, through a contract, that Brazil would also have autonomy in the tracking and command processes of CBERS satellites.

The two more recent documents from the list of Brazilian-Chinese space agreements point to the considerable level of confidence achieved by both countries. The Agreement on Technical Security in Connection with the Joint Development of Earth Resources Satellites and the Minutes of Understanding on the Strengthening and Expansion of the Brazil-China Space Technology Cooperation were both signed at the same day, December 13, 1995, during the visit of the Brazilian President, Fernando Henrique Cardoso to China.

The Brazilian Ministry of Science and Technology and the Commission of Science, Technology and Industry for National Defense of People's Republic of China were appointed as the executive organism for the Agreement on Technical Security. According to its Article I, this Agreement is applicable to all stages, including the development assembly, integration and test (AIT), transportation and launching of the CBERS satellites, as well as the CBERS

satellites' engineering models and flight models, the satellites' support equipment, auxiliary equipment and all components, parts, software, technical data, technical parameters, plants, information, as well as every other matter bearing on the security and economic interests of both Parties. Article II settles that neither Party shall gain access to and acquire any item developed or assembled by the other Party without its consent. Article III lists the items that both Parties shall classify by appropriate degree of confidentiality. This Article also foresees that three months before starting the assembly, integration and test of the finalized prototype of the satellites, both Parties shall reach a specific agreement for technical security in order to carry out all this operations, covering the safety and monitoring requirements of the satellite's models in the course of transportation between Brazil and China as well as during ground operations in both countries. The Agreement establishes that the launching of the satellites CBERS 1 and 2 will take place at the *Tai Yuan* Satellite Center in China. In accordance with the Article VI, 'any disputes arising from the interpretation and implementation of this Agreement shall be settled through negotiation by both Parties'.

On the other hand, the Minutes of Understanding considers the tasks set at the 7th JPC Meeting, held in September 1995 in Beijing, as the foundation for the expansion of bilateral space cooperation. It records the intention of both Parties to establish a joint group to perform a study to ascertain the feasibility of two additional satellites (CBERS 3 and 4). The costs of the two additional satellites' development and launching would be shared by both sides on equal basis (at the current system, China is in charge of 70% and Brazil of 30% of the project's costs). It also points out that 'both sides decided to establish a bilateral enterprise with a view to marketing the CBERS joint-developed products internationally'. It is still reiterated, in addition, that both sides will continue the expansion of cooperation in the five areas stipulated in the Protocol of November 1994. As for the telecommunication satellites, both sides agreed that they will further explore the cooperation in the third generation of Brazilian telecommunication satellites and in the low-earth-orbit satellite mobile telecommunication system (Echo System), approved by the Brazilian Government.

Conclusions

Both Brazil and China - each one having its way and making worth its best political and technical talents, accomplished a terrific job at saving, resuming and enlarging its historical joint project on space cooperation.

As for Brazil, since 1993 it has made a remarkable effort to meet, as well and as quickly as possible, its part at the enterprise. However, to make the reached conquests worthy, it seems necessary and convenient to promote a strict

evaluation of the faults, inadequacies and inefficiencies recognized in both sides that still compromises the best accomplishment of the cooperation. This would certainly help to perfect and vitalize all the institutions, steps and staffs involved in the project. This way, both countries will be able to reach a proper level of legal performance for the demands on agility, efficiency and competitiveness of the space activities of our time, and thus, turn its joint work even more into an example.

Notes

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2) Briefing from the Strategic Studies Center at the Presidency of Republic Secretary of Strategic Affairs about the Symposium on International Space Cooperation Perspectives, held in Brasilia, in July 23, 1996.

3) Yilin Zhu, *Fast-track development of space technology in China, Space Policy*, Vol. 12, N° 2, May 1996, pp. 139-142.

4) Amorim, Celso Luiz Nunes, *Por que a China?*, Revista Brasileira de Tecnologia (review published by National Council for Scientific and Technological Development - CNPq, of the Ministry of Science and Technology), Vol. 19, N° 8, August 1988, pp. 48-49.

5) Id Ibid.

6) *O Desafio do Sul (The Challenge to the South)*, The South Commission 1990, Portugal: Edições Afrontamento, 1990, p. 207.

7) Morgenthau, Hans J., *Politics Among Nations - The Struggle for Power and Peace*, New York: Alfred A. Knopf Inc., Sixth Edition, 1985, p. 297.

8) Hoffmann, Stanley, *International Systems and International Law, in The Strategy of World Order - 2 International Law*, edited by Richard A. Falk and Saul H. Mendlovitz, New York: World Law Fund, 1972, p. 162.

9) Schachter, Oscar, *International Law in Theory and Practice*, The Netherlands: Martinus Nijhoff Publishers, p. 61.

10) *Journal of Space Law*, Volume 23, Number 1, 1995, pp. 117-120.

11) Conde, Carlos, *Diálogo com Pequim: resistências e avanços (Dialog with Beijing: resistance and advancements)*, Revista Política Externa (Review of External Politics), Vol. 3, N° 3, December, 1994, pp. 125-130.

12) The other areas were: agriculture, cattle-

raising and fishery; forestry; health; electric energy; microelectronics and computing; standardization.

13) Biton Tabia has divided the process of CBERS Program implementation in three periods: 1988-90, 1990-92 e 1992-95 (Biton Tabia, Jorge Rubem, *O Desenvolvimento de Sistemas de Produtos Complexos: o Caso do Satélite Brasileiro (The Development of Systems of Complex Products)*, in Coutinho, Luciano; Cassiolato, José Eduardo; and Silva, Ana Lucia G. da, (coordenadores), *Telecomunicações, Globalização e Competitividade (Telecommunications, Globalization and Competitiveness)*, Campinas, São Paulo: Papirus, 1995, p. 249).

14) Archer, Renato, *Ciência e Tecnologia - Soberania e Bem-Estar (Science and Technology - Sovereignty and well-being)*, Ministry of Science and Technology, INPE, Vol. I, 1996.

15) Biton Tabia, Jorge Rubem, Id Ibid, p. 249.

16) Biton Tabia, Jorge Rubem, Id Ibid, p. 250.

17) Monserrat Filho, José, *The Place of the Missile Technology Control Regime (MTCR) in the International Space Law*, Proceedings of The 36th Colloquium on The Law of Outer Space, October 16-22, 1993, Graz, Austria, AIAA, pp. 89-92. Published in *Space Policy*, Volume 10, Number 3, August 1994, pp. 223-228.

18) Amorim, Celso Luiz Nunes, Id Ibid.

19) Fast-track development of space technology in China - Report of Secretary-General of Science and Technology Commission of Chinese Academy of Space Technology, in *Space Policy*, May 1996, pp. 139-142. The report says: "At present, services and operation in the field of meteorology, navigation and remote sensing are essentially dependent on foreign satellites. China's own applied satellites have been built slowly. Not only we not satisfy domestic demands, but also whole domestic markets ay be lost and a favorable development opportunity missed - which is not appropriate to China's international position as a spacefaring nation - unless the development of applied satellites can be speeded up."

20) Biton Tabia, Jorge Rubem, Id Ibid, p. 252.

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