

TOWARDS A CHILEAN SPACE AGENCY

- A FIRST ANALYSIS -

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This document has been created by the students of the Space Policy and Law department in the course of their Summer Session Program, which was organized by the International Space University and held in Valparaiso, Chile, from 1 July to 2 September 2000.

This paper contains the point of view of the Policy and Law students. The ideas developed do not necessarily reflect the position of the International Space University.

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Introduction

At the Opening Ceremony of the Summer Session Program (SSP) 2000 of the International Space University (ISU) held at the Universidad Tecnica Federico Santa Maria (UTFSM) in Valparaíso, Chile, Senator Ramón Vega and the head of the Armed Forces, General Venegas raised the idea of a Chilean Space Agency. In a subsequent workshop of the SSP 2000 Policy and Law Department, Senator Ramón Vega invited the students to study the issue of such an agency.

As a consequence, on July 7 the students of the department voted unanimously to adopt this issue as their primary assignment. During the course of the SSP 2000, several meetings, workshops and discussions regarding this issue were organized with representatives of Chilean authorities and entities interested or active in space-related subjects. Additionally, studies were made of other space agencies, under the guidance of international faculty in various disciplines. Assignments written by individual students have been compiled into this report.

It is hoped that this report will be useful to the Chilean authorities and to space-related organizations in Chile as a discussion paper.

1 Organization of Space-Related Activities in Chile

1.1 Governmental Activities

In Chile, the highest executive power rests with the President of the Republic who is in charge of the government and the state administration. There are also 18 ministries. Those most concerned with space-related activities are the Ministry of Foreign Affairs (Ministerio de relaciones exteriores, MINREL), the Ministry of Defense (Ministerio de defensa nacional) and the Ministry of Transport and Telecommunications (Ministerio de obras públicas, transportes y telecomunicaciones). Both civilian and military entities carry out space-related activities in Chile; these activities are discussed in more detail below.

1.1.1 Civilian Organizations with Space-Related Activities

1.1.1.1 The Department of Outer Space, Telecommunications and Aeronautics

Currently, the principal body that deals with civilian space activities in Chile is the Ministry of Foreign Affairs, which is the state organization in charge of the direction, coordination, execution, and control of the foreign policy formulated by the President. Within this entity, space activities are coordinated by the Special Politics Direction (Dirección de política especial) and more specifically by one of its departments, the

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Department of Outer Space, Telecommunications and Aeronautics (Departamento de aeronáutica, telecomunicaciones y espacio ultraterrestre).

The main objective of this department is to contribute to the development of the country, through the coordinated actions that allow the integration of capabilities, international cooperation and the unification of efforts of national institutions in those areas that use space technology. In order to fulfill this objective, the Department carries out the following activities:

- Negotiating space cooperation agreements with other countries, e.g. with Brazil, Russia, Germany, France, etc.;
- Educating the public about the benefits of space technology;
- Coordinating the efforts of both public and private institutions involved in issues pertaining to this area;
- Linking the scientists and technicians devoted to space issues with foreign organizations, in order to develop meetings and projects together; and
- Coordinating and studying projects for the installation of new astronomy observatories.

It is also important to note that the Special Politics Director, Ambassador Mr. Raimundo González, is currently the President of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). He was also the Vice-president of the third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III)¹.

1.1.1.2 The Under Secretariat of Telecommunications (Subsecretaría de comunicaciones, SUBTEL)

The administration of telecommunications is the responsibility of the Under Secretariat of Telecommunications, in the Ministry of Transport and Telecommunications. Among other duties, the Under Secretariat regulates fixed-based and mobile satellite communications. For instance, this body has underwritten the GMPCS international protocol² in order to facilitate the development of personal mobile satellite communications and to coordinate frequencies of mobile telephone services with those used by other satellites, e.g. ICO, Global Star, etc., so that they do not interfere with each other. The Under Secretariat is also responsible for financing the installation of fixed-based satellite telephones in rural communities, as a way to assure effective communication between isolated areas and the rest of the country.

In the areas of satellite procurement and operations, the Under Secretariat has supported a number of initiatives, including tracking the FASAT Alpha and Bravo satellites, projects of the Chilean Air Force. Another area of interest for the entity involves radio telescopes;

¹ Held in Vienna, July 19-31, 1999.

² Memorandum of Understanding to Facilitate Arrangements for Global Mobile Personal Communications by Satellite, Including Regional Systems (GMPCS-MoU).

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the Undersecretariat has to assure that the several new radio telescopes in the north of the country are not affected by other radio sources.

1.1.1.3 The National Council for the Investigation of Science and Technology (Comisión nacional de investigación científica y tecnológica, CONICYT)

This Council was created in 1967 and manages a fund, the FONDECYT, in order to promote scientific and technological research. Funding for projects is awarded through a dedicated competition open to anyone.

The main duties of this Council are:

- Defining the national scientific and research policy;
- Increasing and financing Chilean research through a special fund created in 1982 and exclusively dedicated to this objective, the FONDECYT;
- Supporting several national academic programs and the mobility of researchers;
- Promoting international cooperation between scientific organizations; and
- Facilitating access to all science and technology information.

1.1.2 Military Organizations with Space-Related Activities

1.1.2.1 The Chilean Air Force (Fuerza Aérea de Chile, FACH)

Besides its national defense-related duties, the FACH is also involved in numerous other space-related activities including:

Activities that use space technology, such as:

- Providing communications and transport to remote zones;
- Conducting medical campaigns;
- Managing disaster relief operations.

Activities that educate or promote space-based activities, such as

- Organizing the bi-annual International Air and Space Fair (FIDAE) and other space events in order to promote and increase the use of space applications, international cooperation, and the knowledge of space law;
- Encouraging the development and use of new space technologies to support national security and the welfare of the country;
- Promoting the creation of a civilian national space agency.

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Other activities executed with the support of national air bases and other space-related organizations, such as the CEADE (see below), the FASAT satellite control ground station and the mission control center for the COSPAS-SARSAT³ system:

- Using satellite navigation systems and remotely sensed meteorological data;
- Assisting the government on aerospace-related legal and technical matters;
- Supporting private and academic space projects;
- Studying strategic, social and economical variables concerning aerospace activities;
- Operating the LUT and GEOLUT stations for the COSPAS-SARSAT system for the South American Region.

Lastly, FACH, in cooperation with the General Directorate of Civil Aviation (Dirección general de aeronáutica civil, DGAC) is responsible for the first Chilean satellite, FASAT Bravo⁴, which was put in orbit in July 10th, 1998. FASAT Bravo is an experimental Earth observation micro-satellite dedicated to the monitoring of the ozone layer.

1.1.2.2 The General Directorate of Civil Aviation (Dirección general de aeronáutica civil, DGAC)

The DGAC is the governmental institution in charge of all matters related to national civil aviation. Placed under the authority of the Chilean Air Force, it carries out six essential missions:

- Providing daily, necessary services for the security and regulation of air navigation to Chilean aviation and foreign operators in Chile;
- Insuring the security of the civil aviation system;
- Guarantying the quality of aeronautical personnel;
- Conducting negotiations with all national and international air-related organizations (ICAO⁵, WMO, airline companies, maintenance centers, etc.);
- Protecting the environment according to the Chilean national legislation; and
- Managing the Meteorology Direction of Chile, an organism in charge of the collection and diffusion of meteorological information.

The DGAC is currently involved in different projects using space technologies, including those related to GPS and telecommunications activities (e.g. CNS-ATM⁶, WAAS⁷ and WAFS⁸ programs). However, DGAC's main endeavours concern the use of remote sensing tools for climatologic predictions and industrial needs (agriculture, fishing and mining).

³ COPAS-SARSAT: search and rescue system that provides radio-localization of aviation, maritime and ground emergencies as well as data collection capabilities.

⁴ FASAT Alpha was launched on August 30th, 1995 by an Ukrainian Cyclone 3 rocket. Unfortunately, this mission was a failure.

⁵ The DGAC is a member the ICAO, the International Civil Aviation Organization, which is the UN specialized body for this particular matters.

⁶ The CNS-ATM: Communication, Navigation, Surveillance / Air Traffic Management.

⁷ The WAAS: Wide Area Augmentation System.

⁸ The WAFS: Worldwide Area Forecast System.

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1.1.2.3 The Center for Aeronautical and Space Studies (Centro de estudios aeronáuticos y del espacio, CEADE)

This Center operates under the authority of the Senior Staff of the Chilean Air Force (Estado Mayor General de la Fuerza Aérea de Chile, FACH) and has the mission to study, research and disseminate information about strategic, political, economic and social aspects related to aerospace activities.

CEADE is involved in three areas of activities:

- Research – CEADE has more than one hundred associate members whose activities in the space field are mainly focused on the FASAT project;
- Education – CEADE has organized several events for enhancing public awareness of space activities in various high schools. It also offers courses to post graduate students of military schools, e.g. Academia Nacional de Estudios Políticos y Estratégicos, Academia de Guerra Aérea, etc.;
- Public Outreach – CEADE organizes seminars for the academic world and the general public on space activities and their importance for Chile. CEADE pays special attention to national activities supported by space technologies and environmental protection.

1.2 Universities and Research Institutes

Various Chilean universities are currently developing their own research programs related to space. The oldest and most important one is the Center of Space Studies of the University of Chile (CEE).

1.2.1 The Center of Space Studies (Centro de estudios espaciales, CEE) – University of Chile

The Center for Space Studies was established in 1959 as a result of a cooperative agreement between the Government of Chile, represented by the University of Chile, and NASA for the construction of a satellite tracking station in Santiago. Since its implementation, the station has provided telemetry, tracking and command (TT&C) support to more than 350 foreign space missions⁹. Recently CEE has also been working with international private companies to host remote ground control stations and to offer support in other space services.

In the national context the CEE has carried out many activities, in particular remote sensing data applications to various areas for both private and governmental sectors, applications of Geographic Information Systems (GIS) to a wide variety of data

⁹ Missions: NASA – USA, NASDA and ISAS – Japan, ESA – Europe, DLR – Germany, CNES – France and the Chinese space agency.

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organizations, and in-situ measurements of environmental variables via the GOES¹⁰ data collection system (DCS). It is also important to note that the first southern hemisphere satellite COSPAS-SARSAT terminal was created and established at this center in 1987.

The Center is the exclusive Southern Pacific distributor of SEASTAR SEAWIFS information¹¹. This service is offered to users located in an area from Chile to the southern United States. The CEE also participates in additional international projects, for example CEE works with NASA and its Space Geodesy Applications Program Office, as well as with the French National Geographic Institute (IGN) for the DORIS orbitographic project.

1.2.2 Remote Sensing Multidisciplinary Program (Programa multidisciplinario de percepción remota, PMPR) – University of Concepción

This special program in remote sensing is a research program whose main goals are to support and develop projects with researchers, academic units and industry. PMPR deals with almost all areas of remote sensing since it uses a spectral radiometer instrument mounted both in airplanes and on satellites, such as Spot, Landsat, NOAA, SEAWIF, etc., and also uses the instrument directly in fieldwork for local measurements. One of the main applications of *in-situ* radiometry is validation of data provided by satellites or airborne platforms in order to decide which sensor must be used for a specific application.

Currently, PMPR is performing projects involving research and development, infrastructure and equipment, technical assistance, as well as projects with an extension at the international level. Some activities performed by this program have already been presented to the Committee for Space Affairs of the United Nations Organization.

1.2.3 SAVAL

SAVAL (Sociedad Astronomica de Valparaíso y Viña del Mar), was founded in 1956 and is a member of the Latin American Astronomy League. The importance of this organization is related especially to the different cultural and educational initiatives that have been developed by them. The main objective of the organization is to develop astronomical research and educate the public about astronomy. For this purpose they organize annual courses of astronomy, forums, conferences and expositions. They also have an Internet site dedicated to the activities of the organization and sector information.

1.3 The private sector

¹⁰ GOES: Geostationary Operational Environmental Satellites (satellites developed by NOAA, one of the US state agencies – National Oceanic and Atmospheric Administration).

¹¹ Note that the data collected by this sensor, which detects ocean chlorophyll concentrations, can be combined with NOAA (temperature) data in order to provide fish location maps.

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It is difficult to have a global view of the space activities carried out by the Chilean private sector. However, it seems that there are at least two major actors operating in this field: the ENTEL telecommunications company and the Compañía de Telecomunicaciones de Chile S.A. (CTC).

1.3.1 The ENTEL Company

ENTEL is the largest communications carrier in Chile. This company was created in 1964 as a corporation belonging to the Chilean government, with a goal of improving the quality of telecommunications in Chile and creating a domestic long distance network.

In 1965, ENTEL was designated by the government to be the national signatory in the International Telecommunications Satellite Organization (INTELSAT). Three years later, the first ground station for satellite communications in Latin America was built in Longovilo, Chile to operate the fixed satellite system of the Intelsat Consortium. In 1979, ENTEL was appointed by the government to be its representative in another international entity, the International Mobile Satellite Communications Organization (INMARSAT).

ENTEL was finally privatized in 1987, and the long distance telephone market was subsequently opened to competition. In 1994, ENTEL established “Americatel Corporation”, its subsidiary in the USA, with headquarters and its own teleport for fixed satellite international traffic in Miami. Americatel is a public and private long distance telecommunications service provider.

In 1998, ENTEL inaugurated the first PCS digital mobile telephone network in Latin America. Additionally the company is currently operating one of the twelve ICO Ltd. Satellite Mobile System world gateways, through the Longovilo station.

Thanks to these facilities, currently ENTEL is able to provide several kinds of satellite services. Note however that the installations owned by the company rely on foreign or international space facilities. As long as this is the case, ENTEL will not be able to develop an independent space communications program.

1.3.2 The Compañía de Telecomunicaciones de Chile S.A. (CTC)

CTC is currently one of the most important agents of development in Chile, offering services through a state-of-the-art telecommunications infrastructure based on a fully digital network. CTC’s direct contribution to Chile’s GDP is estimated at 2.1% in 1998, providing 11% of the 3.4% GDP growth observed during the year.

CTC was created in 1880 and was officially incorporated as a stock company, in accordance with private law regulations, by public deed dated November 18, 1930. Like ENTEL, CTC was privatized in December 1987 when Bond Corporation acquired 30% of the company for approximately US\$ 114.8 million. In 1990, Telefónica Internacional Chile S.A., a subsidiary of Telefónica de España, purchased approximately 50% of CTC

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from Bond Corporation for US\$ 392.0 million, becoming CTC's principal shareholder. By the end of 1998, Telefónica held 43.6% of CTC.

Since 1990, CTC has experienced significant development. To date, the number of lines in service have tripled, and the density of telephones nationwide has increased from 6.6 lines per 100 inhabitants in 1990 to 17.6 in 1998. Furthermore, CTC's market capitalization rose from US\$ 741 million in 1990 to US\$ 4,739 million as of year-end 1998. Over the same period, CTC has evolved from a local telephone company into a supplier of a wide range of telecommunications services, providing long distance¹², wireless mobile communications, equipment marketing, public telephone service, cable TV, Internet access, data transmission and telemarketing services, among others. In addition, as a result of its strategic alliance with SONDA S.A., CTC will also participate in the provision of advanced and integrated telecommunications and information systems solutions.

1.3.3 The AMSAT-CE Foundation

This non-profit foundation was established in 1993 by the Chilean Federation of Amateur Radio Clubs in order to design, build and launch experimental satellites for radio amateurs, to promote international technology transfer and to develop other experiments related to space telecommunications.

AMSAT-CE is currently carrying out the CESAR program, which involves the construction of satellites to perform several experiments in space. The first satellite, Cesar-1, is planned to be launched in 2001. It will be placed in a sun synchronous low earth orbit (LEO) at an altitude of 800 km.

Because the project costs about US\$ 1 million, external sponsors have been sought to help finance it. The main supporter of this program is the ENTEL Company. In addition to ENTEL, other national entities such as the Subsecretaría de Telecomunicaciones de Chile, the Universidad de Chile, the Armada de Chile and the Canal Recreativo Nacional support the project.

2 Space Agencies of the World

We surveyed space programs in twenty-five countries in Western and Eastern Europe and South America, in order to determine if a space agency, or centralized space organization, had been created. For those countries with a space agency, we studied the reasons why the agency had been created, the general structure of the agency and the agency's duties (Appendix C). We found several common trends.

¹² CTC provides long distance service using submarine fiber-optic networks and international satellite systems like INTELSAT and PANAMSAT.

2.1 Typical Reasons for Countries to Create Space Agencies

One of the most common reasons why many countries, such as Germany, Austria and Sweden, created a space agency was to centralize administration of their various space activities. Centralization allowed for more effective and efficient coordination among activities, resources, budgets and management. Smaller programs could potentially benefit from being part of an organization with larger resources. Moreover, centralized coordination could help reduce redundancy in programs and stimulate increased awareness and participation by other underused sectors, e.g. users, academia and industry, of the country.

A second reason for many countries to create a space agency was that they wished to participate in international space activities at some level. International participation can take place in a variety of ways and includes both regional cooperation and other individual cooperative agreements between two or more countries. Regional cooperation can occur as cooperation with groups of nearby countries on one particular project, e.g. Norway and Sweden working on a satellite station project, to more structured and long-term cooperation with a regional space agency like the European Space Agency (ESA). Individual international cooperation can also occur, such as an individual agreement between a country and NASA for work on the International Space Station. Having a space agency provides a recognizable contact and organization to implement or coordinate cooperative programs.

Lastly, many countries establish a space agency to promote research, and technological and industrial development of a country. For instance, the main reason for creating ESA was to stimulate European space industries. Many individual countries, including Brazil and Argentina, cite technological and economic development of their country as a major reason for establishing a space agency; some countries explicitly list promoting national development as a duty of their agencies. For instance Italy's space agency, ASI, is tasked with promoting national industry, and France's space agency CNES is tasked with creating industrial policy. Centralized coordination of space activities and increased participation in international space activities naturally help lead toward economic development.

2.2 Existing Structures for Space Agencies

The majority of Space Agencies were established by governmental initiatives and are usually accountable to a ministry or other governmental body. The agencies were established in two ways: most commonly by parliament through the enactment of law, (e.g. Italy, Canada, and Germany) or directly by the ministries (Netherlands, Norway).

The agency usually consists of a board responsible for policy and decision making, although sometimes the decisions remain with the ministry (Sweden, Netherlands), with

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the board advising the ministry. The members of the board are appointed by the ministries or by other governmental bodies under advisement from the ministries (e.g. Norway).

One or more committees commonly support the board, advising the decision makers and sometimes also proposing policies. The committees can provide representation for many ministries and also a forum for their discussion of space-related matters.

The goals and duties of the agency determine the composition of the committees. The industries and bodies represented are usually in areas that the country already has a good foundation in, or wishes to develop expertise in, e.g. Sweden and remote sensing. Separate committees are also established to represent large multifaceted industries, e.g. technology in the Netherlands.

In addition, academia, ministries of education, research institutes and scientific bodies are represented. Most agencies also have responsibility for telecommunications and these are usually represented in a committee.

2.3 Typical Space Agency Duties

In the countries surveyed, space agency duties fall into two main categories. In some countries, such as Italy, the agency only manages space programs. That is, the agency directs the running of the programs, and thus is primarily concerned with budgets, funding, and administration. This means that the agency does not itself execute the programs, i.e. the agency does not itself build laboratories, and hire its own agency scientists and engineers to build and operate hardware for space programs. Rather, the agency contracts with other national organizations, which have the appropriate pre-existing expertise, to execute space activities. By contrast, in other countries the space agency is responsible for both managing and executing national space activities. For instance, in France, the French space agency (CNES) does everything from proposing the national space policy, to managing programs and executing activities, such as building and operating launching infrastructure.

In terms of more specific space agency activities, there is some variation among countries. Typical areas of space activities overseen by the space agency can include science research and technology development; Earth observations, which can have applications for agricultural and mineral resource location and management, as well as disaster warning and mitigation; telecommunications; navigation and launchers. Additionally, some agencies, such as CNES in France, are involved in commercial activities, while others, such as ASI in Italy, undertake only public functions.

2.4 The example of Canada and France

2.4.1 Canadian space agency

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2.4.1.1 Introduction

Canada has been developing activities in space since the beginning of the space era, in order to answer their needs concerning telecommunications, Earth observation for natural resource management and environmental control, and industrial and economic development.

The implementation of the agency was necessary to unify all the responsibilities related to space under a single civil entity, in order to better cope with the organization of the existing Inter-ministerial Committee headed by the Ministry of Science and Technology.

The agency has two main purposes: developing government programs, such as RADARSAT, and investing in activities for private industry in Canada to develop competitive products for the international market. Thus the private sector is an important concern of the agency.

2.4.1.2 Scope

According to the Act establishing the Canadian Space Agency, the objective of the agency is “to promote the peaceful use and development of space, to advance the knowledge of space through science and to ensure that space science and technology provide social and economic benefits for Canadians”.

2.4.1.3 Structure

The Agency is a governmental organization, which is under the control of a Ministry chosen by the Cabinet.¹³ The Ministry in charge designates the President of the Agency.

There are two Committees coordinating the different parties: the Interdepartmental Committee on Space and the General Committee of Space Programs. In the former, all the ministries and federal bodies are represented. The latter has a wider range of participants that include, besides those mentioned above, representatives of the provinces, industry, and the scientific and academic worlds.

The agency, in consultation with all the related entities, proposes programs and projects to the Ministry. The Ministry, in turn, then submits the proposals to the Cabinet for their decision. The endorsement from the government, however, does not control the granting of funds to the projects. Instead, the *Conseil du Trésor* (Ministry of Finance) grants the funds for space projects.

2.4.1.4 Activities

The agency implements, directly or by means of external bodies, important research and development activities. Some examples of the activities in which the agency is currently involved are robotics, telecommunication systems and Earth observation. It is worth noting that the Canadian Space Agency, compared to NASA in the United States, has a small budget. Hence the CSA concentrated its efforts in a few specific areas, e.g. robotics, in which they were able to develop expertise and through which they were able

¹³ Today the Ministry in charge is the Ministry of Industry.

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to enter the international market. Additionally, Canada participates in several programs of ESA. Lastly, for some years the CSA has been developing the RADARSAT satellite and constructing the Mobile Services System (MSS) for the International Space Station.

Most of these activities are not performed directly by the agency; private industry is contracted to carry out the projects. The private sector also undertakes research activities and participates in the improvement of space infrastructure.

2.4.2 The French Space Agency (Centre national d'études spatiales, CNES)

The CNES was created in 1961 to implement the space policy of the French government. Its rationale was to provide France with an autonomous body to carry out international and European cooperation and to develop a domestic space capacity in the fields of science, industry and space applications.

CNES' missions go beyond space studies¹⁴ and currently encompass, without being limited to:

- Proposal and management of space development programs;
- Support of science related to space;
- Space research and technology;
- Operations, e.g. management of the Guyana Space Center (CSG), satellite in-orbit positioning and control, and outer-stratosphere balloon launches;
- Industrial policy;
- Defense programs (space-segment responsibility);
- International space cooperation; and
- Co-representation of France in the ESA organization.

The French agency is an “industrial and commercial state organization” (Etablissement public industriel et commercial, EPIC). This status allows CNES to cooperate with industry on joint space development projects using specific partnership arrangements. CNES can also engage in commercial activities directly or indirectly, by creating subsidiaries with space activities, to facilitate their full transfer to the private sector when economically mature¹⁵.

The activities of CNES are based on an organization established June 1, 1998. The agency is now structured around four main centers and different operational divisions placed under the authority of the Director General:

- A General Secretariat is in charge of policy in the areas of general administration, financial management and human resources. Attached to it are a Financial Affairs Division and a Human Resources Division;

¹⁴ “CNES” is the acronym for “National Center for Space Studies”.

¹⁵ CNES is a shareholder of eight limited liability companies (two subsidiaries and six holdings), a partner in a Private Limited Liability Company, and a member of four Economic Interest Groups, five Public Interest Groups and a non-trading company.

Towards a Chilean Space Agency

- A Program Division has responsibility for proposing, establishing and monitoring programs;
- Several functional divisions are also attached to the management: a General Inspection Division, an Industrial Development Division, an International Relations Division, a Division responsible for Strategy, Quality and Evaluation, a Space Forecasting Division, and an External Communication Delegation, as well as a Science and Research Adviser.

Three divisions are based in the Toulouse Space Center, with the following missions:

- The Orbital Systems Division has the ability to conduct preliminary projects and carry out system architecture analysis, as well as developing approved projects;
- A Space Techniques Division acquires space skills, which are then provided to the orbital systems projects; and
- A Toulouse Operations and Establishment Division is responsible for the operational management of scientific and application projects as well as multi-mission facilities.

Further, a Launcher Division, located in Evry, conducts projects of CNES, or by delegation of ESA, connected with launchers and space launching systems. Lastly, a French Guiana Space Center Division carries out operational missions connected with launches.

2.4.3 The Peruvian Space Agency

On the 11th of June 1974, the Peruvian Government created the National Commission for Aerospace Research and Development (CONIDA),¹⁶ responsible for the development of space activities in Peru.¹⁷

The purpose of the agency is to promote space technology research, distribute space-related information and knowledge throughout the country and train space-related professionals. Another important goal of the agency is to stimulate cooperation and technology interchange with foreign institutions. In pursuit of these objectives, Peru has today several cooperative agreements, for example with Canada for activities related to remote sensing.

Peru is also planning a satellite, CONIDASAT, a small remote sensing satellite¹⁸ to develop aerospace engineering and remote sensing technology in the country. The satellite will be used for environmental observation (land and marine), pollution control, agriculture improvement, cartography and infrastructure planning for motorways, telecommunication networks and water and oil pipelines.

¹⁶ Comisión Nacional de Investigación y Desarrollo Aeroespacial, D.L. 20643, Lima, Peru, June 11th, 1974.

¹⁷ Webpage: www.conida.gob.pe

¹⁸ CONIDASAT 01 is a 200 Kg mini-satellite for earth observation. It is situated in LEO orbit at 560 km from the earth. It will cover a 400 km surface and fly over a given territory 15 times a day.

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The programs developed by CONIDA are often targeted at improving national expertise in a specific 'niche' sector, such as in remote sensing. By concentrating their effort in only one activity, which has high economic and social value for the country, Peru can acquire a large amount of expertise and enter the market more easily.

3 Rationales for establishing a Chilean Space Agency

3.1 Economic rationales

Creating a space agency will help Chile to enter an economic sector that is prestigious, highly visible and highly valued. The size of the space industry is estimated to represent 0.4% of world economic activity in commercial and governmental space business (100 billion US\$). Investing in space will open or expand sectors like communication, data processing, sensor technology, etc.

An agency, with the role of making decisions based on a long-term strategy in space matters, can assure that space science and technology will contribute to the growth of national industry. Instead of just being a user of space technology, Chile can play a role in the development of technology, thereby creating expertise within the country. This expertise can benefit the economy if it permeates to other sectors and increases the general capacity and ability of the industry.

Important sectors to the Chilean economy, like fishery and agriculture can be affected by various kinds of natural hazards. For this reason, the utilization of remote sensing data is critical for Chile, as for every country whose economy is based on land or sea resources. The areas in which remote sensing can be applied range from agriculture, mapping, surveillance of coastal and oceanic resources, environmental monitoring, meteorology, emergency access route planning, etc.

Chile's unusual geography and population distribution results in the focus of economic activity and population in the capital, which is in the centre of the country. Communication with the regions is difficult, and for this purpose the Chilean government implemented a project a few years ago to install public phones in every town of the nation.¹⁹ Increasing the investment in telecommunications infrastructure will support the economy and make Chilean regions more attractive to industry and investment.

3.2 Scientific/Technological

The primary reason for creating a space agency is to centralise the planning and control of projects. With regard to scientific and technological development, Chile should concentrate its activities in a few niche areas preferably where expertise already exists.

¹⁹ Website <http://www.subtel.cl>

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The agency can provide long-term planning, ensuring the continuation of the development of the niche area. This fuels growth that can eventually lead to Chile becoming a centre of excellence in a particular field.

The agency can co-ordinate the many interests in scientific research, to provide a more coherent approach to national activities. This is accomplished by focusing on a long-term strategy, while also concentrating efforts in a specific field. Investing in the future of science, through education, should also be a role of the agency. This can be accomplished by improving general space science knowledge among students of all ages, as well as by providing funds for academic research.

The knowledge gained by the agency through fostering niche technologies could then be applied to areas not directly related to space. Depending on the technologies, it may be possible to adopt them for private use or commercial markets. Also, if Chile develops a unique niche specialty, then it has the opportunity to be a supplier to other space agencies.

Moreover, the agency can act as a forum for science and technology ideas. This allows for more effective communication and facilitates the distribution of information and resources within those sectors. To this end, the agency can organise seminars and conferences, inviting other international specialists to Chile to exchange and share knowledge.

3.3 Social

The products of space technology are essential tools for the growth of developing countries. Tangible social benefits from a space agency include the ability to provide warning and information about pending national disasters. Thus, remote sensing information can lead to both preventative and emergency procedures, which can be instituted to save lives and property.

Unplanned urban growth is affecting most large cities in South America and remote sensing can be used to show the growth patterns. Alleviating the social problems caused by lack of planning of adequate infrastructure, for instance, is a direct benefit to the public.

3.3.1 Education

The space agency could coordinate a global education program, involving both space science education and bringing more general education resources to remote areas (tele-education). The agency could bring together any current programs, such as SAVAL, which introduces space to children aged 10 to 18, and the Distant Education Program, under development at the Universidad Austral de Chile.

Several universities offer undergraduate and postgraduate programs in astronomy. The agency should aim to increase the number of courses available in space studies, to

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Towards a Chilean Space Agency

include for example satellite applications. In general, the agency should promote the study of space sciences, technologies and law at Chilean universities, and familiarize high school students with the most significant matters related to space. In this way, the Chilean government will contribute to the education of professionals who will be able to assume all the challenges the country will have to face in the future.

3.3.2 Public awareness

The agency should construct a website to provide information to the general public on its current activities, goals and history. The site could also be used to promote the agency among students and could act as a platform for public competitions and other similar activities.

Additionally, with a space agency the country can implement a program that demonstrates that Chile has the capability to achieve in space. By joining the space-faring nations, national pride will increase. It would also be advantageous for foreign investors to see the country as accomplished in the space technology sector.

The agency should consider selecting a Chilean astronaut. This program, if properly publicised and coordinated with educational programs, should be capable of capturing the imagination of the country. After a space flight, the Chilean astronaut could promote space activities and the agency to the general public and especially to students.

3.4 Political

Large-scale co-operation in space with other countries is not only technically advantageous, but can also improve international relations at the ministerial level. An agency is a useful instrument in improving co-operation with other space-faring nations, in that it provides a visible point of contact for anyone interested in working with Chile on space-related activities.

Co-operating in space allows Chile to participate in larger scale projects that would otherwise not be possible. The agency can also benefit by gaining some technological expertise and knowledge from working with other countries.

3.4.1 Regional and international cooperation

Cooperation with Brazil, France, Germany, Italy United States and Canada seem to be reasonable objectives for Chile. We also suggest that a Chilean space agency should place special emphasis in strengthening regional South American cooperation in space matters, possibly within the framework of MERCOSUR²⁰. A space agency could

²⁰ The Common Market of the South (MERCOSUR) is an economic integration project in which Argentina, Brazil, Paraguay and Uruguay participate. Chile is a special member of MERCOSUR.

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also serve as a first step to promote more integrated regional space cooperation in South America, with a view to maximizing return in space investments. Such regional cooperation could be established through bilateral arrangements with existing counterparts in other South American States or through the establishment of a regional Space Agency.

As one example of regional cooperation, the agency could consider supporting research in the International Geosphere Biosphere Program (IGBP). This research would require significant effort in the space field, and is of interest for developing effective management of renewable natural resources and the biodiversity of a region, as well as for forecasting social and economic changes that may affect a country and the hemisphere.

3.4.2 Cooperation in the UN framework

Cooperation at the international level is not only a necessity for Chile, but for the entire world community as well. In order to improve the interchange of technology and to extend the benefits of space activities to humankind, the United National Committee for Peaceful Uses of Outer Space (UNCOPUOS), promotes international treaties, which regulate activities in space.

The first such treaty, the 1967 Outer Space Treaty, underlines in Article 1 the necessity of States to use space for “the benefits and in the interests of all mankind”. To this end, international cooperation was strongly recommended. Moreover, in 1996, with the declaration on International Cooperation in the Exploration and Use of Outer Space,²¹ the UNCOPUOS further promoted such cooperation, especially between developed and developing countries.

Through the creation of a space agency, Chile will have a national space representative who could foster the presence of Chile in international space programs and activities, such as in the UN Satellite Application Program.²²

The principal objectives of this organization are the improvement of the economies of the member countries by making them more efficient and competitive and by enlarging their markets and accelerating their economic development by means of a more efficient use of available resources. The Mercosur tries also to take into consideration the preservation of the environment, the improvement of communications and the coordination and harmonization of the economic policies of the region.

²¹ 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 (resolution 51/122 of 13 December 1996).

²² Website <http://www.oosa.unvienna.org/>. The primary objective of this program is to put space technology to work for sustainable economic and social development on a global basis. For this purpose the program provides country capacity-building, education, research and development support and technical advisory services, which have all helped to reduce the gap between the industrialized and developing countries.

Towards a Chilean Space Agency

4 Proposed Framework for a Chilean Space Agency

One of the main duties of a space agency is to communicate with other entities; to serve as a point of contact. International communication often takes place via other national agencies, which are in most cases of civilian nature. Further, an agency will need to be able to communicate with institutions and the private sector in its own country. The Chilean agency, therefore, should be created as an independent civilian agency in which several entities can be represented, although it should be able to take into consideration the importance of the background of the military in space activities issues.

Currently the governmental space activities in Chile are performed by different entities, which depend directly or indirectly on different ministries.²³ One of the main purposes in establishing an agency is better coordination of these existing activities and resources. Thus, it would be advisable not to attach an agency to a single ministry, which could limit the areas of operation as well as the sources of financing. The agency should therefore have a certain level of independence from the governmental powers. This can be achieved by attaching the agency to the President of the Republic, which will allow the different ministries interested to be represented in the agency and to participate in its activities without one ministry dominating the others.

In addition to giving the space agency ministerial independence, the agency will need a legal personality. These two characteristics are fundamental to creating an entity able to operate at national and international levels and capable of representing the interests of the country.

Thus, we propose that the space agency be composed of a board, containing representatives of the various relevant ministries, and several departments (See Chart. I). The board will be the political body of the agency, dealing with long-term policy, budget and decision-making, while the departments will be in charge of implementing the board's decisions and managing the programs. The board will receive inputs from an advisory committee and from other institutions interested in space activities, including other Chilean ministries interested in space applications.

The board will be composed of representatives from the ministries that are directly involved in space activities, such as the Ministry of Foreign Affairs, Education, Defense, Transport and Telecommunications, and other ministries that have an indirect interest such as the Ministry of Finance and the Ministry of Economy, Enterprise & Rebuilding. The representatives on the board, one for each ministry, will then elect from amongst themselves the President of the Board, who is head of the Agency. The duration of this office will be limited in time.

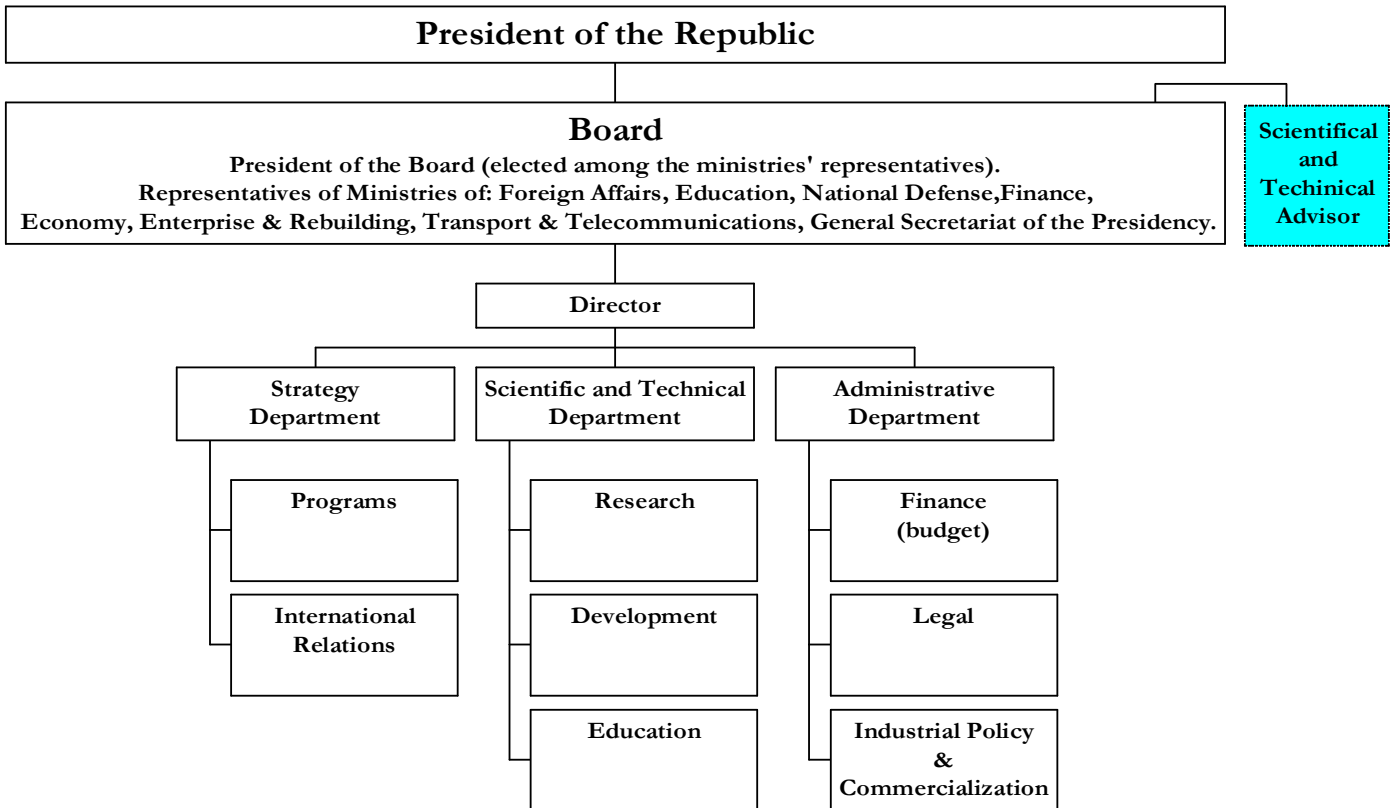
The board will meet three or four times a year to decide on the programs for research, development and utilization of space resources. It will present the multi-year plan for the national space policy and budget every 3-4 years to the congress for approval.

²³ See Section 1.1 "Governmental Activities"

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The different departments will carry out the execution of the board's decisions. The Director supervises the departments and is the legal representative of the agency. The Director will oversee the functions of the agency, ensuring that the activities meet the long-term objectives of the agency.

Proposal for Internal Structure



Congress should establish the agency via an *ad hoc* law. This law should define the scope, structure and general functioning of the agency. The specific functions of the Director and Departments of the agency should be subsequently specified in a regulation, approved under a Decree or under the most suitable means for this purpose.

We recommend that a Chilean space agency coordinate and manage the activities currently undertaken in Chile by the different entities discussed in Chapter 1. The agency should also promote the development of new programs and activities. Further, it will contribute at the financial level by allocating funding, as well as at the organizational level through international cooperation and exchange, organization of meetings, forums, etc. The agency will thus oversee programs, but will not directly execute them itself; rather the agency will contract the execution to external bodies and will oversee their work.

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Greater involvement by the agency than coordinating and managing as described above, would create problems. If Chilean space activities were managed and also executed by the agency itself, the agency would have to hire in-house scientists and engineers and build laboratories and facilities in order to do the work of the programs. In doing so, the organizations currently performing these space activities would, at best, suffer from competition with their own space agency and, at worst, lose the reason for their existence. Directly related to this problem, would be difficulties in transferring knowledge and technology from currently functioning space-related entities to the agency. This is not the best path to follow, especially when the development and diffusion of space technology to the private sector is one of the main goals of the agency. Further, an agency that both manages and executes programs requires a large budget, while a coordinating and managing agency could take advantage of a lighter structure and smaller financial needs, using some of the funds allocated to it to promote research and private initiatives. The trend towards “externalization” of the executing function is followed by several space agencies in the world, for example the Canadian and Peruvian Space Agencies (CSA, CONIDA).

Also, given that the agency described above is independent, interacts with different institutions at national and international levels, and allows access to and coordination of input from different bodies, the agency will naturally act as a forum for space matters. This means that the Chilean space agency can receive contributions from every sector interested in space, gather new projects and ideas, and thus foster new space program proposals.²⁴

The Chilean congress should review the space programs and overall budget every 3-4 years, while the agency reviews program progress and awards funding annually. It should be stressed, that space programs are long-term investments. Additionally, it is important to keep in mind that the cooperation and coordination of activities needs to be carried out on a regular basis. This consideration is important, given the fragmentation of current Chilean space-related activities, which are performed by different bodies and on a non-continuous basis.

Further it is worth noting that the establishment of a space agency will only make sense if there is a certain critical mass in terms of personnel and annual budget. There is a point under which such a structure will not have any benefit.

²⁴ This funding can be sourced also from funds for scientific research that are currently allocated by other institutions. For example the Ministry of Economy, through the Program of Technologic Innovation (Programa de Inovación Tecnológica, PIT) currently provides funding for the technological development of projects in the private sector (FONTEC). It is also worth mentioning the foundation CORFO (Corporación de Fomento de la Producción). The Ministry of Education, through CONICYT (Comisión Nacional de Investigación Científica y Tecnológica), finances scientific and technological research (FONDECYT, FONDEF, FONDAP).

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5 Conclusion

Currently, Chile has a wide range of space activities. These activities are coordinated by different entities within the government, universities, other institutions and the private sector.

As a reference, we studied common traits of several space agencies of the world. The reasons for countries to establish a space agency, the existing structures of space agencies, and typical duties carried out by different agencies were discussed. Specifically, the agencies in Canada, France and Peru were examined in detail. Further, economic, scientific and technological, social and political rationales were given for establishing a space agency.

The authors conclude from the research they have undertaken that a civilian space agency or other independent centralized entity could be beneficial to Chile. As envisioned here, such an organization would centralize, co-ordinate and manage national space programs, and increase the participation of Chile in international initiatives, for example within the UN. The agency will be the main point of contact for foreign entities willing to cooperate with this country, and the reference for space-related initiatives and needs at the national level.

Lastly, the geographical, sociopolitical and economic situation of Chile indicates that Chile relies on space capabilities, such as remote sensing and telecommunications, to address several national needs related to education, disaster management etc. Through centralization of space activities in an agency, Chile could achieve more effective and potentially increased utilization of the space technology tools mentioned above to benefit the country. Though Chile is involved with tools of space technology, the country is still only a user of space. A Chilean space agency, for all the reasons discussed in this paper, can help Chile become more actively involved with space technology and progress toward having major involvement in the international space community.

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Appendix A - Acronym List

AJR	Juridical Advisory
AMZ	Amazonia Program
ASI	Agenzia Spaziale Italiana (Italian Space Agency)
CAD	Administrative Affairs Coordination
CBERS	Chinese-Brazilian Program
CEA	Space and Atmospheric Sciences General Coordination
CEADE	Center for Aeronautical and Space Studies
CEE	Centro de Estudios Espaciales (Center of Space Studies)
CEP	Education, Documentation and Special Programs Coordination
CES	Cachoeira Paulista Space Center
CESAR	CE Satellite for Amateur Radio
CNES	Centre National d'Études Spatiales (French Space Agency)
CONAE	National Commission for Space Activities (Argentina)
CONICYT	National Council for the Investigation of Science and Technology
CONIDA	Comisión Nacional de Investigación y Desarrollo Aeroespacial (Peruvian Space Agency)
COPUOS	Committee on the Peaceful Uses of Outer Space
COSPAS – SARSAT	Search and Rescue Satellite Aided Tracking
CPN	Planning Coordination
CPT	Center for Weather Forecast and Climatic Studies
CRC	Satellite Tracking and Control Center
CRH	Human Resources Coordination
CRI	Institutional Relations Coordination
CTE	Center for Special Technologies
DCS	Data Collection System
DGAC	General Directorate of Civil Aviation
ECO-8	ECO-8 Program
ESA	European Space Agency
ETE	Space Technology and Engineering General Coordination
FACH	Fuerza Aérea de Chile (Chilean Air Force)
FIDAE	International Air and Space Fair
FONDECYT	National Fund for Scientific and Technologic Development
GB	Director's Head Office
GEOLUT	Geosynchronous LUT
GIS	Geographic Information Systems
GMPCS	Global Mobile Personal Communications by Satellite
GOES	Geostationary Operational Environmental Satellite
ICO	International Communication Organization
IGBP	International Geosphere Biosphere Program
INPE	National Institute for Space Research
ISU	International Space University
LIT	Integration and Tests Laboratory
LUT	Local User Terminal

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MCT	Ministry of Science and Technology
MECB	Brazilian Complete Space Mission
MERCOSUR	Southern Common Market
MET	Meteorology General Coordination
MINREL	Ministerio de relaciones exteriores (Ministry of Foreign Affairs)
MoU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration (USA)
NIVR	Nederlands Instituut Voor de Ruimtevaart (Dutch Space Agency)
OBT	Earth Observation General Coordination
ONEMI	Oficina Nacional de Emergencia (National Office of Emergency)
PAN	Antarctica Project
PMPR	Remote Sensing Multidisciplinary Program
SACI	Scientific Applications Microsatellites Project
SSP	Summer Session Program
SUBTEL	Undersecretary of Telecommunications
TT&C	Telemetry, tracking and command
UTFSM	Universidad Técnica Federico Santa Maria

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Appendix B – Brazil and Argentina

Brazil

Brazil's space policy is coordinated by INPE (National Institute for Space Research). INPE's mission is to expose possible benefits from new developments in space science and technology to all members of Brazilian society. This will be accomplished by focusing on:

- Increasing Brazil's autonomy in a number of strategic areas;
- Providing the means for Brazilian industry to participate and become competitive in the space area;
- Encouraging the development and dissemination of space technology; and
- Contributing to the expansion of scientific knowledge in the institute's fields of activity.

The main goal of INPE is to foster scientific research, technological applications and in qualifying personnel in the fields of Space and Atmospheric Sciences and Applications, Space Engineering and Technology, which is defined by the Ministry of Science and Technology. It primarily focuses on:

- Developing research and related activities, which focus on exchanging technical and scientific information, as well as national and international cooperation and partnership;
- Installing and managing physical plants and systems, directly or through partnerships;
- Rendering services to third parties and commercializing products developed by the Institute, within the limits of its legal mandate;
- Stimulating the industrial development of space-related components, systems and equipment with the aim of encouraging the development of Brazilian space industry;
- Fostering and supporting the development of human resources in the Institute's specific areas of activity;
- Promoting and sponsoring national and international events, such as conferences, workshops and seminars on technical and scientific topics of interest;
- Contracting and establishing partnerships with national and international organizations;

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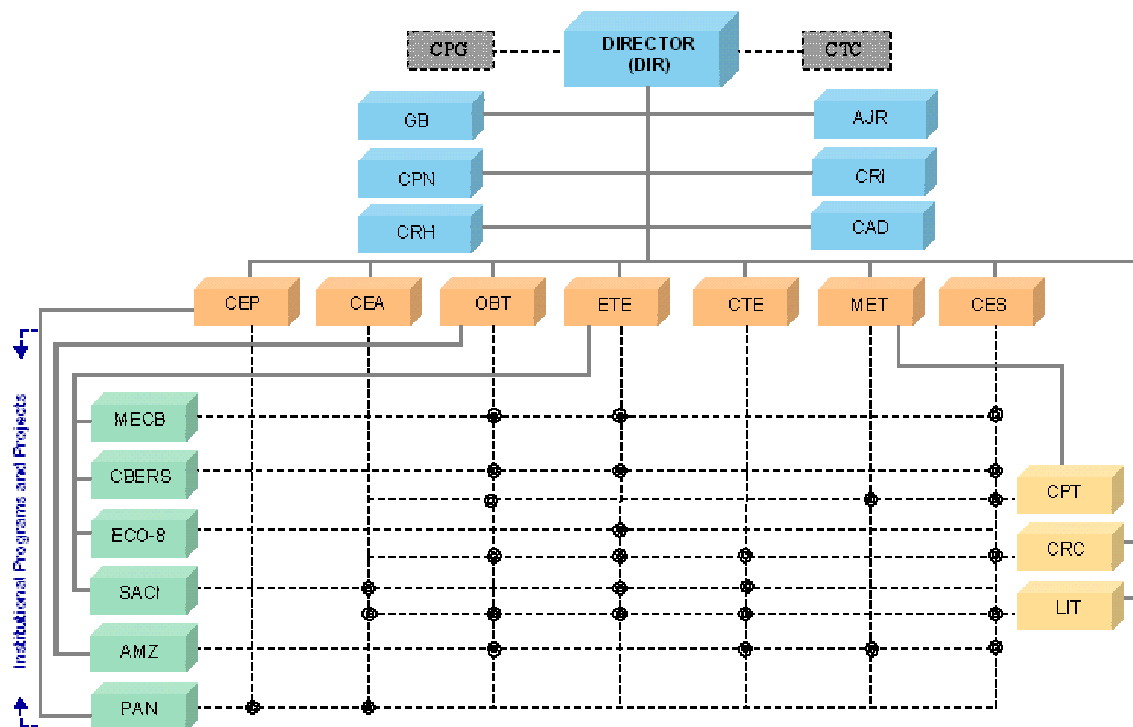
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- Organizing and coordinating space-related programs, activities, and research and educational projects within the framework of both national and international institutions;
- Providing evaluation and expertise on technical matters relating to space activities; and
- Publishing technical and scientific reports on subjects within the Institute's area of interest.

INPE's ORGANIZATIONAL STRUCTURE:



Argentina

Since the creation of the National Commission for the Space Activities (CONAE) and the approval of the National Space Plan, which sets out the short, medium and long-term goals, Argentina may be considered as a Space Power, or as the plan itself defines it, a “space country.”

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Towards a Chilean Space Agency

Argentina is a user of a wide variety of products and services from space science and technology fields, and it is foreseen to have a greater role in the space sector, because of the following:

- Argentina covers an extensive geographical territory, ranging from the tropic to the pole, which is similar to Chile
- Economic activities are strongly influenced by extensive primary exports (agricultural, fishing, forestry and mining products, and petroleum)
- The society requires everyday use and exchange of detailed and quantitative data on its own structure and economy
- Argentina's distinctive distribution of its population demands an intensive use of telecommunications. A significant portion of the population lives in a few large cities while the remaining live in rural areas of the country
- Argentina's large agricultural areas are vulnerable to natural and anthropogenic catastrophes.
- Argentina's regional and international associations and commitments will oblige the nation to generate and use goods and services deriving from space science and technology
- CONAE considers that it is of the utmost importance for Argentina to develop "spin off" technologies, which will place Argentina in a more favorable light in technology transfer, economical development and foreign relations.

Argentina's space sector is presently aimed at giving priority to satellite voice and data telecommunications. CONAE's role and responsibility is to serve as a "space architect" by assisting the selection of design and engineering options for telecommunications issues. CONAE is structured to assist in developing non-massive data transmission technologies that involve a significant economic and social relevance for Argentina's society (education, safety, isolated human settlements, maintenance of extensive networks such as gas pipelines, high-voltage lines, etc.).

CONAE's Policies:

- a. Offering society a complete cycle of space data, promoting their best utilization.
- b. Developing space technologies for environmental protection.
- c. Promoting the use of space technology for social, scientific, educational and production purposes.

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- d. Developing light satellites for remote sensing, scientific use and communications, supplementing the available international services and responding to specific national demands.
- e. Promoting actions supplementing those in the private sector concerning initiatives with a high technological and innovation content, or the use, diffusion and utilization of space data.
- f. Encouraging the training and qualification of human resources and of organizations contributing to and participating in the national space program.
- g. Assisting in promoting national participation and initiatives aimed at enhancing the tasks of international forums where juridical regulations related to space activities are discussed and prepared.
- h. Promoting international cooperation actions, supporting Argentine participation in multinational cooperation programs converging with short and long-term policies.
- i. Favoring joint international actions and programs with shared goals that contribute to regional integration within the framework of MERCOSUR²⁵
- j. Complying with the legal mandate of being present and of contributing to the technical and scientific elements needed to coordinate actions with other governmental agencies.

CONAE's Integration Concept:

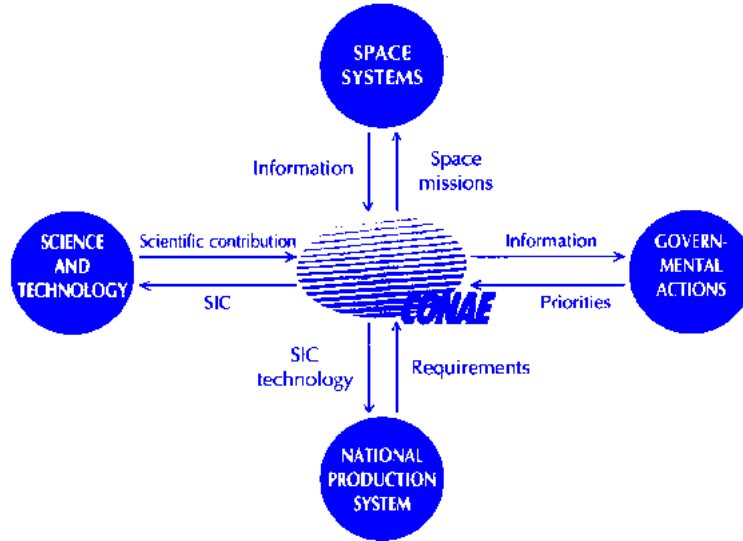
²⁵ Economic cooperation between South-American states, founded in ...

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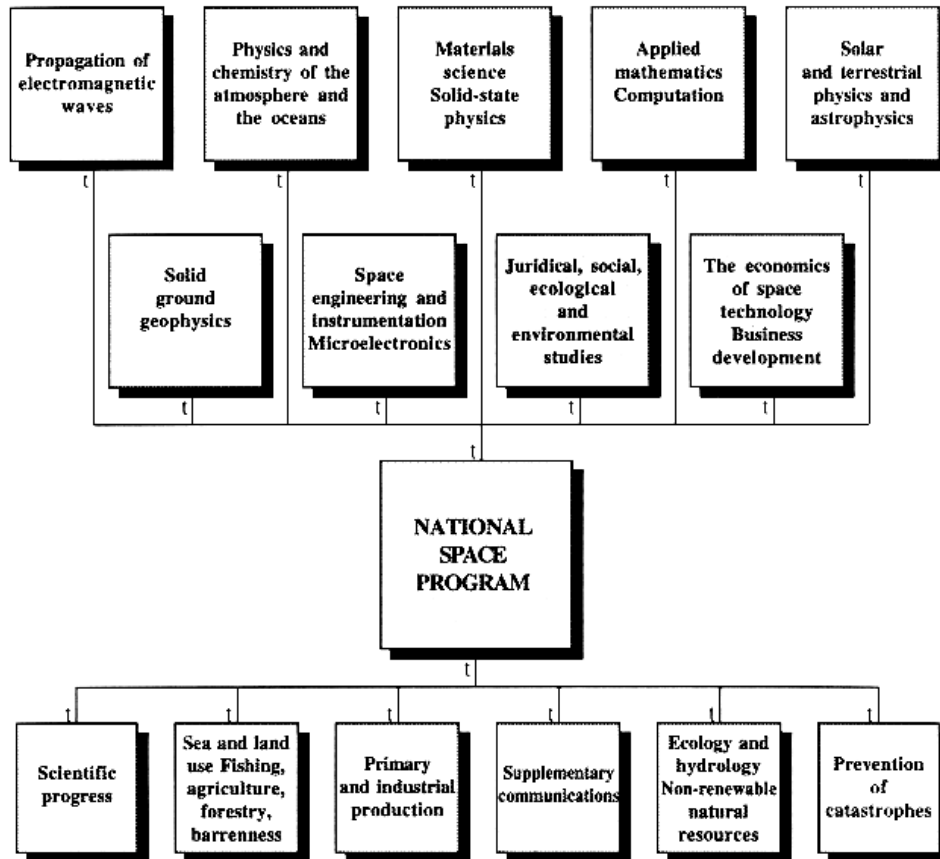
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Integration of Argentina's national space program in its scientific system:



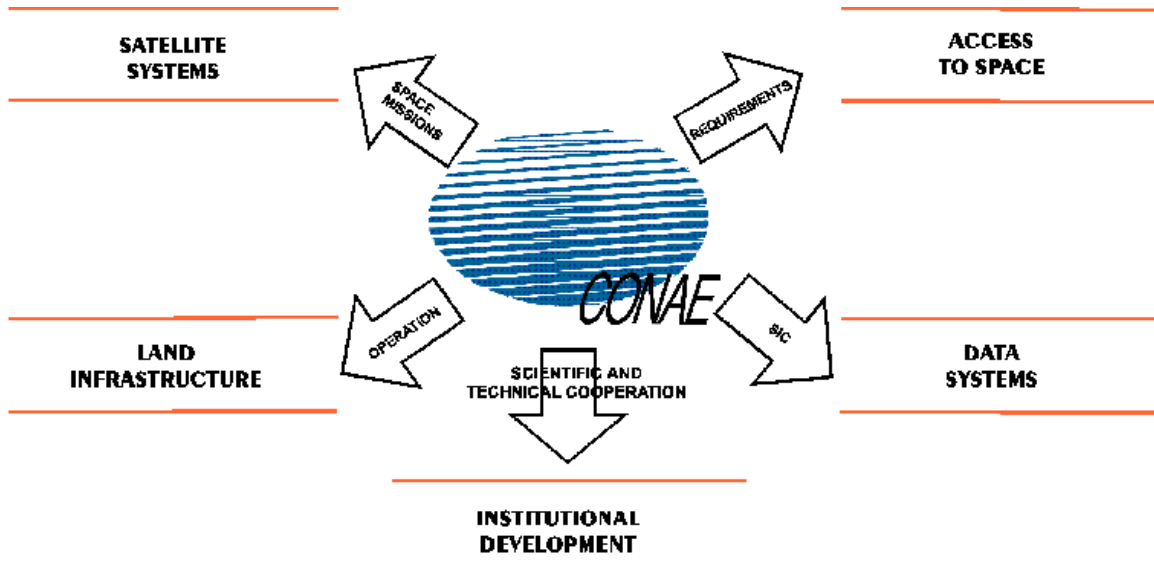
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Appendix C – Overview of Space Agencies of the World

Country or Region	Agency or Organization	Reasons for Starting Agency	Body responsible for Space Agency/Activities	Space Agency Duties
Germany	DARA Agency, 1989 (Note: combined with DLR in 1996, now known as DLR)	<ul style="list-style-type: none"> • Government participation in a long term plan with a regional space agency (ESA) required a reorganization of management of German space activities. • Comparison with other space organizations (NASA, CNES) showed that Germany lacked <ul style="list-style-type: none"> ○ a central institution for space matters, ○ effective coordination among space activities and management of them, ○ and sufficient involvement of industry, science and space users. 	<ul style="list-style-type: none"> • Government at a political level, private company at a managerial level • Government is the only shareholder in DARA; DARA has public employees, not civil servants • RAUeG law transfers Federal (i.e. Ministry) competences to DARA for DARA to carry out space activities in their name. • DARA supervised by Federal Government, and Supervisory Board (Ministries, industry and academia) • Cabinet Committee for Space to coordinate Ministries created <p>Note: do not know new DLR structure.</p>	<ul style="list-style-type: none"> • Planning; plans approved by Government • Implementing programs <ul style="list-style-type: none"> ○ Contracts ○ Financial grants • Represent German space interests at international level (e.g. at ESA)
France	CNES (Centre National d'Études Spatiales) Agency, 1961	<ul style="list-style-type: none"> • Provide France with an autonomous body to carry out international and regional (European) cooperation in space • To develop domestic capabilities in science, industry and space applications 	<ul style="list-style-type: none"> • Government run, ministry it is under varies with particular government (now under Ministry of Research, before under Ministry of Industry). • CNES is an “industrial and commercial state organization” (EPIC) and thus has a more flexible status than a state administration organization (EPA). 	<ul style="list-style-type: none"> • Propose and manage space programs • Support space science, research & technology • Run space operations: e.g. manage Guyana Space Center launch site, satellite in-orbit positioning and control... • Create industrial policy

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			<ul style="list-style-type: none"> ○ CNES employees are not subjected to a civil servant regime. ○ CNES has public responsibilities like creating industrial policy, international relations, etc. 	<ul style="list-style-type: none"> ● Cooperate in international activities ● Participate in regional (ESA) activities
Italy Note: there is no centralized coordination of all space activities.	ASI (Agenzia Spaziale Italiana) Agency, 1988	<ul style="list-style-type: none"> ● Create an organization to plan and coordinate public-sector space efforts involving scientific, technological and operational activities ● Coordinate participation in national, regional (ESA) and other international space programs 	Ministry of University and Scientific and Technological Research (MURST) – established 1989 <ul style="list-style-type: none"> ● Public employees 	<ul style="list-style-type: none"> ● Only plans and manages space programs financed with public funding, does not do the research/work of the programs. The work is carried out by other organizations. ● Promote national industry ● See that the Italian National Space Plan is integrated into regional (European) and international programs. ● Education and public outreach ● Cooperative agreement with Univ. of Rome to maintain and operate San Marco launch site
	Ministry of Universities & Scientific and Technological Research (MURST) 1989	<ul style="list-style-type: none"> ● Coordinate activities in universities and other research institutes 	Government	<ul style="list-style-type: none"> ● Supervise ASI ● Supervise CIRA (Italian Center for Aerospace Research) ● Preside over interministerial space commission when ASI involved in foreign affairs

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	Ministry of Defense	<ul style="list-style-type: none"> No centralized coordination of space activities, so developed independent defense related space program 	Government	<ul style="list-style-type: none"> Carry out military, security space activities <ul style="list-style-type: none"> Uses own resources, budgets Deals directly with other countries and industry
United Kingdom	British National Space Centre (BNSC) Agency, 1985	<ul style="list-style-type: none"> Coordinate the civil space activities of government departments and research councils Coordinates work with ESA (regional space agency) Main government point of contact with UK space industry 	Government Dept. of Trade and Industry Specifically supervised by the Minister for Space who is also the Minister responsible for Science and Technology within the Department of Trade and Industry <ul style="list-style-type: none"> Employees are civil servants 	<ul style="list-style-type: none"> Coordinates UK civil space policy and implements governmental space policy Work with Ministry of Defense to coordinate dual use space activities Promotes UK industry Education and public outreach
	Ministry of Defense	Military space activities	Government	Responsible for UK's military space program
Austria	Austria Space Agency (ASA) Agency, 1972	<ul style="list-style-type: none"> Coordinate space activities Participate in regional (ESA) activities Participate in international activities 	Ministry of Science and Research Federal and private partners <ul style="list-style-type: none"> Committee on Space makes recommendations to ASA Industry members on Committee on Space 	<ul style="list-style-type: none"> Coordinate national space activities Coordinate activities with ESA Coordinate other international activities (e.g. with Russia, Sweden, Norway, Germany, etc.)

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Netherlands	NIVR Agency, 1946	<ul style="list-style-type: none"> Historically, NIVR developed Dutch aeronautical programs. Eventually space activities were added. Promote national aerospace industries, and be a part of the future space market 	Semi-governmental non-profit agency Made up of 3 parts <ul style="list-style-type: none"> Governmental ministries Industry Scientific community 	<ul style="list-style-type: none"> Manages and coordinates Dutch industrial space policy (does not execute the programs itself), e.g. research institutes, industry Counsels the government on space policy and space industry Represents the Netherlands to ESA and other international organizations (US, Indonesia, Italy)
	SRON (Space Research Organization Netherlands)	Responsible for space research		<ul style="list-style-type: none"> Astronomy, Earth observations, microgravity
	NLR (National Aerospace Laboratory)	Responsible for space technology		
Norway	Norwegian Space Center Agency, 1980	<ul style="list-style-type: none"> To promote research and development To become active in European space politics and activities 	Ministry of Industry <ul style="list-style-type: none"> Private foundation 	<ul style="list-style-type: none"> Develop, coordinate and evaluate national space activities Create a long term national space plan Cooperate with regional (ESA, Scandinavian) and other international space programs
Sweden	Swedish National Space Board (SNSB) Agency,	<ul style="list-style-type: none"> Coordinate Swedish space activities (space science research, industry) Coordinate activities with ESA (the principal goal) and other international space agencies 	Ministry of Trade and Industry	<ul style="list-style-type: none"> Science, remote sensing and industrial policy Coordinate national and international policy and activities
Belgium	No space agency		Ministry of Science Policy, Science Policy Office	<ul style="list-style-type: none"> Manages Belgian space activities

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				<ul style="list-style-type: none"> • Works with ESA
Denmark	No space agency		Ministry of Education and Research: <ul style="list-style-type: none"> • Danish Space Board and • Danish Space Research Institute 	<ul style="list-style-type: none"> • Manage Danish space activities • Works with ESA
Finland	No space agency		<ul style="list-style-type: none"> • Ministry of Trade and Industry • Academy of Finland, Helsinki • Space Technology Development Center (TEKES) 	<ul style="list-style-type: none"> • TEKES (1983) promotes and coordinates space activities in Finland. Finances over 60% of Finnish space research. • Works with ESA
Ireland	No space agency		Department of Industry and Energy, Direction for Scientific and Technological Affairs	<ul style="list-style-type: none"> • Coordinates Irish space activities • Works with ESA
Spain	No space agency	<ul style="list-style-type: none"> • INTA – National Institute for Aerospace Technology • CDTI - Center for the Development of Industrial Technology • CICYT – Committee for Science and Technology 	<ul style="list-style-type: none"> • Ministry of Defense oversees INTA • Ministry of Industry oversees CDTI • Ministry of Education and Science oversees CICYT • Ministry of Communications oversees Telefonica, Intelsat, Inmarsat & Eutelsat. 	<ul style="list-style-type: none"> • INTA oversees and certifies research, provides technical assistance and services related to space • CDTI carries out industrial innovation policy and works with ESA • CICYT carries out research activities of bodies subordinate to State Administration
Switzerland	No space agency		<ul style="list-style-type: none"> • Intergovernmental organizations (IGO's) e.g. ESA, Intelsat, Inmarsat, Eutelsat • Directorate for International Organizations of the Federal Department of Foreign Affairs • Federal Office for Education and Science, Federal Dept. of Home Affairs • Dept. of Transport, Communications and Energy 	<ul style="list-style-type: none"> • IGO's conduct Swiss space activities • Foreign Affairs conducts financial, political and legal aspects of Swiss space cooperation • Office for Ed. and Sci oversees space science • Dept. of Transport, etc. Oversees satellite operating organizations

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			<ul style="list-style-type: none"> • Interdepartmental committee for Space Affairs 	<ul style="list-style-type: none"> • ICSA recommends space activities
Greece	No space agency		National Space Committee, Ministry of Industry, Energy and Technology	Has an agreement with ESA to participate in space activities
Portugal	No space agency		National Committee for Science and Technology (JNCT): an interministerial committee.	Became ESA's 15 th member state in December 1999 (the Portuguese Congress has not yet ratified the Agreement).
Argentina	National Commission for Space Activities (CONAE)		President of the Republic	<ul style="list-style-type: none"> • The only state organization to plan, propose, execute, manage, and control space activities • Only peaceful, non-military purposes
Brazil	Brazilian Space Agency (AEB) Agency, 1994	<ul style="list-style-type: none"> • Previously was a classified military space agency, focused on national security, underestimated development benefits • End of Cold War, changed focus. Gave priority to transferring space technology to Brazil to promote internal development. Had to eliminate military connection to get international technology transfer. 	President of the Republic	<ul style="list-style-type: none"> • Conducts “space activities of national interest” - may be civil and/or military • Propose and update the National Space Policy • Promote national and international space activities • Sign international space cooperation proposals • Stimulate research and industry • Issue standards and regulations for space activities
Czech Republic	No space agency		Ministry of Education, Youth and Sports	Coordinates space activities, create space policy, financing space programs, international cooperation, etc. Works with ESA
Hungary	No space agency		Hungarian Space Organization (1992), Ministry of Research and Technology:	<ul style="list-style-type: none"> • Coordinates space activities • Works with NASA, Russia and

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			<ul style="list-style-type: none"> • Hungarian Space Board • Scientific Council on Space Research 	ESA
Poland	No space agency		<ul style="list-style-type: none"> • Academy of Sciences and State Committee of scientific research • Ministries of Education, Defense and Environment 	<ul style="list-style-type: none"> • Coordinates space activities • Works with France, Russia and ESA
Romania	Romanian Space Agency (ROSA) 1991	<ul style="list-style-type: none"> • Created to continue to use the space competence (authority, expertise) gained during the Intercosmos program • To promote Romania in cooperative international space activities • To stimulate space research and technology development which will benefit industry and the economy 	Ministry of Research and Technology	<ul style="list-style-type: none"> • Authorizes all civil space activities • Plans and executes the civil space R&D program • Acts as interface between science research and space activities • Works with ESA and other international bodies • Does not deal with commercial space activities
Russia/CIS	RKA Agency, 1992	<ul style="list-style-type: none"> • Implement Russian space program in association with Russian Academy of Sciences and Defense Ministry 		

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