

THE SPACE SECTOR IN BRAZIL – AN OVERVIEW

Brazil In Space

1. Brazil's geographic and economic characteristics are such that there is a great potential to employ space technology to meet national needs. Those include the country's continental size, its under-populated land borders, its huge coastline, its tropical rainforest regions and the enormous areas characterised by difficult access and sparse population distribution. In addition, there are extensive natural resources still to be surveyed within its boundaries. At present, space applications are directed towards the solution of national concerns, particularly in the fields of Earth observation (ie. for agriculture, environment, natural resources), meteorology, oceanography, communications and navigation.

Organisation

2. The Brazilian Space Agency (abbreviated in Brazilian Portuguese as AEB) was established in 1994 as a civilian authority within the direct purview of the Executive Office of the President of Brazil. It is responsible for pushing forward Brazil's space activities and for coordinating the national and international co-operation necessary to help further the country's strategic goals in space.

3. AEB also has a central role in co-ordinating the major activities carried out by the institutions of the National System for the Development of Space Activities (SINDAE). These include the Department of Research and Development of the Ministry of Aeronautics and the National Institute for Space Research (INPE). INPE falls under the aegis of the Ministry of Science and Technology and is very active, being responsible for satellite development and related technologies, and pursuing R&D in the field of space applications, Earth observation and space and atmospheric sciences. The Institute of Aeronautics and Space, under the Ministry of Aeronautics, is responsible for the development of Brazil's satellite launchers and extensive sounding rocket programme. This Ministry of Aeronautics is also responsible for the development of a fully operational launch range at the Alcantara Launch Centre (CLA), and for running the Barreira do Inferno Launch Centre and overseeing the Colonel Abner Propellants Utility. The private sector and Brazilian universities and research institutes are also involved in space related R&D projects and are contracted to develop and supply systems, equipment and services.

4. The map below identifies the major space related sites in Brazil.



5. The National Policy on the Development of Space Activities (PNDAE) establishes the major principles, objectives and guidelines for Brazilian space activities. The policy outlines several specific objectives, namely : to establish within Brazil the scientific and technical competence in the space area which will make it possible for the country to act with real autonomy in some well identified situations, including the selection of technological solutions to Brazilian problems, and pursuing its national obligations under relevant international negotiations, agreements and treaties; to promote the development of space systems, and related ground infrastructure, that may provide data and services desired by the country; and to prepare the Brazilian industry to participate and become competitive in the global market for space related goods, services and applications.

6. The National Institute for Space Research (INPE) was founded in 1961 in order for Brazil to benefit from new developments in space science and technology. In particular, to increase Brazil's autonomy in strategic areas, namely to provide a means for industry to become competitive in the space sector and to encourage the development of a national space technology capability. INPE's main goals are the fostering of scientific research, technological applications and to qualify personnel in the fields of space and atmospheric sciences, space engineering and technology.

7. The budget for the Brazilian space activities has been steadily increasing, albeit from a low base, as part of a long-term governmental policy to increase the country's investment returns on science and technology. The 1998 budget has focused mostly on the development of satellites (37 per cent), space infrastructure (32 per cent), and launchers (19 per cent). The budget is estimated at between US\$120 and US\$170 million per annum. This budget could reach US\$221 million in 2002, although unforeseen financial difficulties such as the problems experienced by the Brazilian Real in 1999 can have serious effects on the budget.

8. Commercial activities include Embratel's *BRAZILSAT* telecommunications network, developed by Spar (of Canada) and launched on *Ariane* in the mid 1980s. A second generation of satellites was launched in the early to mid 1990s. A constellation of twelve EO satellites (*ECO-8*) is currently under development, with an estimated cost of some \$600 million. There are also plans to open the Alcantara launch centre to foreign users.

Brazilian Space Expenditure in US\$m	
Year	Total
1981	60
1982	63
1983	66
1984	70
1985	74
1986	78
1987	82
1988	100
1989	100

(latest publicly available, confirmed figures)

Main Domestic Players

9. In 1993 the Brazilian Aerospace Industries Association was established to represent the interests of those Brazilian companies working in aerospace (and space) engineering. Although Empresa Brasileira de Aeronautica – usually known as EMBRAER dominates the Brazilian aerospace/space industry, other companies have established expertise in key areas and these include AVIBRBS (sounding rockets and missiles); Aeroeletrifica (avionics and other electronics); CENIC (composite materials); Elebra / NORCAL Group (Electronics); TECNASA (electronics for air navigation support, radar countermeasures); Mectron (defence systems); Digicon (transducers, precision mechanics); and AKROS (structural analysis and CAD).

Active Space Programme

10. The current Brazilian National Space Programme (PNAE) covers a 10 year period from 1998 to 2007 (copies available from AEB, see Contacts on Page). The Programme currently consists of eight major initiatives: Space Applications, Satellites and Payloads, Satellite Launching Vehicles and Sounding Rockets, Space Infrastructure, Space Sciences, R&D on Space Technologies, Training and Development of Human Resources and Support to the Qualification of the National Space Industry.

11. Notable activities include the four small data collection satellites developed by Brazilian engineers. *SCD-1*, was launched in 1993 and remains operational, with *SCD-2* lost on the first VLS launch, and *SCD-3* having been launched in 2000. Also, since 1988 China and Brazil have been collaborating on a programme to develop two remote sensing satellites. The first *CBERS* (China-Brazil Earth Resources Satellite) satellite, *CBERS-1* was launched in 1999 and is the first in a programme of remote sensing satellites designed for global coverage using optical visible and infrared cameras. Initially a two satellite system, China and Brazil have now agreed to develop two second-generation satellites *CBERS-3* and *-4*. The two second-generation *CBERS* satellites will include a significant improvement in the imaging resolution of the High Resolution CCD Camera - a resolution of better than 5 meters against *CBERS-1*'s 20 meters. China and Brazil have also agreed to explore the feasibility of the joint development of a Geo-stationary meteorological satellite and a telecommunications satellite, based on the *CBERS* satellite bus.

12. In addition, *SACI* a micro-satellite launched in 1999 carrying four experiments conceived by Brazilian scientists and their foreign partners is providing much useful information and other small scientific satellites are expected in the short and medium term. Finally, two small Earth observation satellites, *SSR-1* and *SSR-2*, projected to operate in equatorial circular orbit at an altitude of 900 km, are under development. The first was launched in 2000, while the second is scheduled for launch in 2003. A low Earth orbit equatorial satellite constellation, aimed towards providing low cost communications to remote areas around the Equator is also now under consideration.

13. As a result of the co-operation agreement signed between NASA and AEB, a Brazilian CCD remote-sensing camera is scheduled for two experimental flights on board of the Space Shuttle. Brazil is also developing a humidity sensor (with much input from Astrium in the UK) to integrate the payload of NASA's *EOS-PM1* satellite, part of the EOS program. Several other international projects are under consideration.

14. AEB will be responsible for the development and provision to NASA of equipment for the International Space Station (ISS) programme. In exchange, AEB will receive rights from NASA's allocation to utilise the ISS. Some \$120 million of hardware is to be provided by Brazil: the Unpressurized Logistics Carrier (ULC), EXPRESS Pallet, Z1 Attachment Site, Cargo Handling Interface Assemblies (CHIA), Window Observation Research Facility (WORF), and Technology Experiment Facility (TEF).

15. Since the early 1970s Brazil has been engaged a long-term launcher development programme which started with the development of a successful family of sounding rockets named *SONDA*. The sounding rocket sub-programme continues and is now benefiting from technologies developed for the satellite launcher sub-programme. The first and second flights of the *VLS* launcher (in 1997 and 1999 respectively) both failed. A smaller launcher, *VLM*, is also planned for the near future as an alternative for the launching of micro-satellites. The next launcher in the programme will be the *VLS-2* which is designed to have an enlarged capacity over previous Brazilian launch vehicles.

16. The Alcantara Launch Centre (CLA) is capable of launching solid fuel sounding rockets and research vehicles, as well as satellites into low Earth orbit. Located on the Brazilian North Eastern Coast, near the Equator, CLA's geographical position increases the Centre safety conditions and allows for lower launching costs. In the coming years the Centre is expected to enlarge its capacity and become commercially competitive both for national and international users and Infraero, the organisation responsible for managing Brazil's airports, has been appointed to administer those areas of CLA which will be open to foreign launchers and operators.

Opportunities for the UK

17. Brazil's market for space technology, applications and systems is growing, and has potential as an export market for UK industry. Brazil is quite a sophisticated market for space technology and applications but due to a variety of factors has been a difficult one for British companies to enter effectively. However, the Brazilian Government actively supports international co-operation in the fields of space science and technology and its applications. This covers microgravity science, space physics, space astronomy, space material science, biological technology, telecommunications, meteorological and navigational satellites, launcher propulsion systems, remote sensing, data transmission, disaster and environment monitoring, and remote education and telemedicine applications.

Defence Related Sales

18. Much of the output of the UK space industry falls under the categories of dual-use and defence related and it is therefore worth noting that the Ministry of Defence's Defence Export Services Organisation (DESO) can help UK companies to market and sell their defence products and services in Brazil. DESO can also provide advice on defence market prospects in Brazil generally. DESO are also sometimes able to provide military assistance in support of sales. For more detailed information, please contact DESO's Business Development Unit on Tel: 0207 218 9000; Fax: 0207 807 8175 or visit their Web site at <http://www.deso.mod.uk>

UK Export Controls

19. The Government maintains export controls on certain dual use and defence related goods, services and technology. These controls are imposed for a variety of reasons, including arms embargoes and UN sanctions, where the supply of goods and the provisions of services is also sometimes controlled. If your goods, services or technologies are subject to UK export controls you will require a licence from the DTI to cover various forms of technology transfer and direct exports. If you require information about export licensing, please contact the DTI's Export Control Organisation (ECO) Helpline on 0207 215 8070/8078; Fax: 0207 215 8564. Alternatively, the ECO web site at <http://www.dti.gov.uk/export.control> gives very detailed information on current export controls by both country and type of goods and allows you to download an electronic Export Licence Application Form.

Further Information

20. For further information on how BNSC might be able to assist your company's export efforts please contact :

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<http://www.agespacial.gov.br/english.htm>

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Satellite Testing and Systems Integration Laboratory

<http://www.lit.inpe.br/>

Institute of Aeronautics and Space

<http://www.iae.cta.br/>

Aerospace Technical Centre

<http://www.webnexus.com/users/paik/space/wsg/br.html#cta>

Department of Research and Development

<http://www.webnexus.com/users/paik/space/wsg/br.html#deped>

Alcentara Launch Centre

<http://www.cla.aer.mil.br/>

Barreira do Inferno Launch Centre

<http://www.digi.com.br/users/clbi/>

Department of Research and Development

<http://www.maer.mil.br/Conheca/Organi/DEPED/index.htm>

Ministry of Defence

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