Toward the Heavens
Latin America’s Emerging Space Programs
A Report of the CSIS Americas Program and Space Initiatives

August 2009
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TOWARD THE HEAVENS: LATIN AMERICA’S EMERGING SPACE PROGRAMS

Johanna Mendelson Forman, Vincent Sabathier, G. Ryan Faith, and Ashley Bander
with assistance from Thomas Cook and Ana Janaina Nelson

Background

The United States has a new opportunity to use civil space and cooperation in science and technology as a powerful tool of engagement in Latin America, and especially with Brazil. U.S. leadership in space exploration comprises not only government achievements but also powerful commercial opportunities that arise from the sale of U.S. inventions to its allies. As the United States loses market share in satellites and other related technical equipment to countries such as China, India, Russia, and Europe, it should consider what steps are needed to reassert U.S. leadership. Cooperation on space activities such as earth observation and space exploration can be one path toward restoring the traditional leadership credibility of the United States for this emerging interest in space technology in the Americas.

In the last decade, Latin America has been increasingly involved in space. Not only has new technology to support earth observation and space exploration been supplied by China, the Ukraine, Russia, and Europe, but also the opportunities to engage with these countries have expanded. Yet this involvement in space, an area once dominated by U.S. knowledge and technology, has gone mostly unnoticed by U.S. policymakers. With the high value that the Obama administration has placed on the importance of science and technology as an engine of U.S. leadership, the United States is again poised to use science, and space in particular, as a tool for greater engagement with its neighbors in Latin America. Actively pursuing international cooperation in space could represent a greater component of the United States’ search for partnerships in an important facet of multilateral relations that has been dormant for many years.

The United States is particularly well suited to make very effective use of space as an instrument of smart power for a number of reasons. First, as the CSIS Commission on Smart Power notes,

the United States is the only global nation, and the expansion of the human sphere of influence into space is indisputably a global undertaking. Second, the successes and challenges of space exploration, from the Moon landing to the harrowing Apollo 13 mission, are dramatic examples of key American ideals such as hope, enthusiasm, and optimism. Third, unlike other countries, U.S. civilian space activities have always been explicitly kept apart from the national security space activities of the defense and intelligence communities.

Space is a unique field of endeavor in which virtually no technology, practice, or technique is inherently limited in its application to the exercise of either hard or soft power. Nearly all space activities are, either directly or consequentially, axiomatically dual use. Therefore, a more active civilian space program can ultimately bolster the underlying infrastructure and technology needed to support hard power applications. Attempts to isolate a national space program can foster the development of broad indigenous capabilities, in much the same way that an arms embargo can encourage the rapid development of a robust national defense industrial base. International cooperation in civil space applications makes the costly independent pursuit of dual-use capabilities much less attractive to other nations.2

Historically, Latin America has had less contact with this scientific and technological field. Although Chile is home to three important observatories and a space-tracking station, and other sites in the Americas also figure in the international space system, Latin America has only recently become aware of the importance of space technology.3 Mexico, Peru, and the countries of the southern cone have all participated in space activities beyond the operation of telecommunication satellites. The launch of a Venezuelan telecommunications satellite, named the Simón Bolívar, in the summer of 2008, which did not rely on American technology or support but rather came from the Chinese commercial satellite industry, is emblematic of the shift away from historical U.S. leadership. The desire to establish a Latin American space agency among countries like Brazil, Chile, Argentina, and Mexico indicates that not only are the heavens becoming a new frontier for Latin America, but they are also a means of asserting independence from U.S. leadership.4 These events underscore the urgency for greater U.S. engagement in Latin American on civilian space technology for both diplomatic and commercial reasons.

3 Chile’s Atacama Desert is home to the Cerro Tololo Inter-American Observatory, the Las Campanas Observatory, and the European Southern Observatory.
Space Technology in the Americas

Since the late 1990s, several countries in Latin America developed national space programs. These efforts, however, are still works in progress. Brazil, Argentina, Chile, Venezuela, and others have launched their own satellites. As table 1 shows, the bulk of the satellites operated by Latin American countries are for telecommunications purposes.

In 2003, at Alcântara, Brazil attempted a rocket launch with catastrophic results. The launch nearly undermined the entire Brazilian space program. Since then, it has concentrated on improving its satellite making and global positioning system technology and on getting a man into space, which was achieved in 2006 when Brazilian astronaut Marcos Pontes flew with Expedition-13 to the International Space Station. Brazil is not alone in its astronaut ambitions; Cuba and Mexico have had astronauts on U.S. or Russian flights, and Chile has an astronaut in training.

For at least a decade, there have been talks about a regional space agency. Recent investments throughout the region may signal that its time has arrived. Currently, Brazil and Mexico have a joint educational initiative on science and technology, known as CRECTEAL (Centro Regional de Enseñanza en Ciencia y Tecnología Espacial para América Latina y el Caribe), to share educational and technical knowledge throughout the region. Technological cooperation is an essential component of the space programs. A Latin American space agency would diminish costs and increase access to geospatial information and results of space research conducted by these countries. Strong technical cooperation has also been established out of the interregional sphere. For instance, Brazil and Venezuela have built and launched satellites with Chinese know-how and components. It is no coincidence that this technical support is being offered to bolster the Chinese stronghold on resource-rich nations of Latin America.

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5 The Argentinean space agency, CONAE (Comisión Nacional de Actividades Espaciales), has cooperated with NASA since the mid-1990s on a series of three scientific and earth observation satellites. In this case, CONAE built the satellite, while NASA provided selected instruments and launch services. This cooperation is ongoing, with a fourth satellite, SAC-D/Aquarius, expected to launch in 2010.
6 In 2006, Peru’s space program launched its first space probe, the Paulet I, from Punta Lobos Air Force Base, south of Lima. Its mission was to explore and measure conditions of the upper atmosphere, according to Peruvian space agency (CONIDA).
9 Although Franklin Chang-Diaz was born and raised in Costa Rica, he entered the astronaut program through NASA, not as an official representative of Costa Rica.
10 Author’s interview with Everton Lucero, head of the Science and Technology Division of the Ministry of Foreign Affairs, April 16, 2009.
11 For more information, see http://www.crectealc.org/.
Table 1. Satellites Operated by South American Countries

<table>
<thead>
<tr>
<th>Name</th>
<th>State</th>
<th>Launch</th>
<th>Status</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROSAT 4 [LUSAT, OSCAR 19]</td>
<td>Argentina</td>
<td>1/22/1990</td>
<td>in orbit</td>
<td>Amateur radio satellite</td>
</tr>
<tr>
<td>MICROSAT 2, DOVE, Oscar 17</td>
<td>Brazil</td>
<td>1/22/1990</td>
<td>in orbit</td>
<td>Amateur radio satellite</td>
</tr>
<tr>
<td>UNAMSAT 2 OSCAR 30</td>
<td>Mexico</td>
<td>9/5/1996</td>
<td>in orbit</td>
<td>Amateur radio satellite</td>
</tr>
<tr>
<td>MUSAT</td>
<td>Argentina</td>
<td>8/29/1996</td>
<td>decayed</td>
<td>Experimental telecommunications</td>
</tr>
<tr>
<td>SAC C</td>
<td>Argentina, USA</td>
<td>11/21/2000</td>
<td>in orbit</td>
<td>Scientific and earth observations satellite</td>
</tr>
<tr>
<td>SCD 1 [COLETA DE DADOS 1]</td>
<td>Brazil</td>
<td>2/9/1993</td>
<td>in orbit</td>
<td>Scientific and earth observations satellite</td>
</tr>
<tr>
<td>SCD 2</td>
<td>Brazil</td>
<td>10/23/1998</td>
<td>in orbit</td>
<td>Scientific and earth observations satellite</td>
</tr>
<tr>
<td>CBERS 1 [Zi Yuan 1]</td>
<td>Brazil, China</td>
<td>10/14/1999</td>
<td>in orbit</td>
<td>Scientific and earth observations satellite</td>
</tr>
<tr>
<td>FASAT BRAVO</td>
<td>Chile</td>
<td>7/10/1998</td>
<td>in orbit</td>
<td>Scientific and earth observations satellite</td>
</tr>
<tr>
<td>LIBERTAD 1</td>
<td>Columbia</td>
<td>4/17/2007</td>
<td>in orbit</td>
<td>Scientific and earth observations satellite</td>
</tr>
<tr>
<td>SAC-8</td>
<td>Argentina, USA</td>
<td>11/4/1996</td>
<td>decayed</td>
<td>Scientific applications satellite</td>
</tr>
<tr>
<td>SAC I</td>
<td>Brazil, China</td>
<td>10/14/1999</td>
<td>in orbit</td>
<td>Scientific satellite</td>
</tr>
<tr>
<td>SAC A</td>
<td>Argentina</td>
<td>12/4/1998</td>
<td>decayed</td>
<td>Technology</td>
</tr>
<tr>
<td>PEHUIENSAT 1</td>
<td>Argentina</td>
<td>1/10/2007</td>
<td>in orbit</td>
<td>Technology</td>
</tr>
<tr>
<td>NAHUEL 1A</td>
<td>Argentina</td>
<td>1/30/1997</td>
<td>in GSO</td>
<td>Telecommunications</td>
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<tr>
<td>LATINSAT B</td>
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<td>12/20/2002</td>
<td>in orbit</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>LATINSAT A</td>
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<td>12/20/2002</td>
<td>in orbit</td>
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<tr>
<td>BRAZILSAT 1</td>
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<td>2/8/1985</td>
<td>in orbit</td>
<td>Telecommunications</td>
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<tr>
<td>BrasilSat-A2</td>
<td>Brazil</td>
<td>3/28/1986</td>
<td>in disposal orbit</td>
<td>Telecommunications</td>
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<tr>
<td>BRAZILSAT B1</td>
<td>Brazil</td>
<td>8/10/1994</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>BRAZILSAT B3</td>
<td>Brazil</td>
<td>2/4/1998</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>BRAZILSAT B4</td>
<td>Brazil</td>
<td>8/17/2000</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>ESTRELA DU SOL-TELSTAR 14</td>
<td>Brazil</td>
<td>1/11/2004</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>STAR ONE C1</td>
<td>Brazil</td>
<td>11/14/2007</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>STAR ONE C2</td>
<td>Brazil</td>
<td>4/18/2008</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>MORELOS 2</td>
<td>Mexico</td>
<td>11/27/1985</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>MORELOS 1</td>
<td>Mexico</td>
<td>6/17/1988</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>SOLIDARIDAD 1</td>
<td>Mexico</td>
<td>11/20/1993</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>SOLIDARIDAD 2</td>
<td>Mexico</td>
<td>10/8/1994</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>SATMEX 5</td>
<td>Mexico</td>
<td>12/6/1998</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>SATMEX 6</td>
<td>Mexico</td>
<td>5/27/2006</td>
<td>in GSO</td>
<td>Telecommunications</td>
</tr>
</tbody>
</table>

Source: UN Office of Outer Space Affairs (UNOOSA).

Brazil: The Rising Power

Brazil, the largest regional power, is asserting its strategic political position on the world stage. Brazil made its debut as a strong actor on the international stage in 2003 with the Doha Round of
trade negotiations, and in 2004, it took the lead of the UN Stabilization Mission in Haiti (MINUSTAH). Its emergence as an active participant in the G-20 in 2009 demonstrated its increasingly important role as an economic powerhouse. Brazil is also involved in several multilateral initiatives in the hemisphere as a means of engaging with the rest of the world (e.g., renewable energy based on ethanol). Part of the process of its insertion into the global scene is acquisition and production of high-end technology. Brazil already dominates deep sea oil-extraction technology and has a well-developed aircraft industry. Space is a logical next step.

Civil space exploration is still a requirement for achieving great power status. This lesson has not been lost on Brazil. Its star in world affairs has been rising since it was linked along with Russia, India, and China in a group of fast-developing economies known in the financial community as BRIC, but among these states, Brazil has the most limited space capabilities. A country that does not have independent access to space cannot pretend to the ranks of greatness.

The need for this technological capacity is something that Brazil has made a priority, as evidenced by the focus on space in its 2008 National Defense Strategy report. Brazil not only wants to develop greater launch capacity, but it also wants to build satellites for earth observation and enhanced communication capacity. Its new strategy also indicates that Brazil wants to devote more resources to exploration of space for its national security needs.

Currently, the Brazilian space program is the most developed in the region, highlighted by the Sino-Brazilian project known as the China-Brazil Earth Resources Satellite (CBERS). This satellite platform, used to monitor climate change in the Amazon using earth observation, was originally launched in 1999 in China, with a second satellite launched in 2003. Recently, the Brazilians increased their investment from 30 percent to 50 percent with plans to launch new satellites in 2011 and 2014. The Brazilians have been developing their own launch facility at Alcântara. This facility is ideally located because of its proximity both to the equator, making it easier and cheaper for satellites to get into orbit, and to the ocean, avoiding flyby of populated areas during the initial boost phases and making maritime recovery a viable option.

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The top priority of the Brazilian space program is the use of satellites to monitor the Amazon rainforest in the global fight against climate change. Brazil has been a key actor in making environmental protection a major national and international priority. Recent policy shifts on climate change from the Obama administration open a new avenue of cooperation to achieve American, Brazilian, and international goals. A recent meeting between the two heads of state reaffirmed this joint commitment to reducing carbon emissions. President Obama has specifically called for an 80 percent reduction in CO2 emission by the year 2050, and the recently passed stimulus bill allocated $400 million to study global climate change. When focusing on controlling global CO2 levels, the Amazon is a large part of the lungs of the planet. Without protecting and preserving the Amazon, all CO2 initiatives might be compromised. These facts underscore the importance of a growing need for continued U.S. involvement in the development of Brazil’s earth observation programs in order to protect Brazil’s vital global resource.

Beyond the Space Race: Civil versus Military Uses of Space Technology

Space programs across the region have been under civilian, rather than military, control since the early 1990s. Even with civilian leadership, however, these programs are still in their infancy. The return to civilian control of security policy was a by-product of the democratic openings of the 1990s. Control of space programs is part of this process. Today, as Brazil and its neighbors pursue independent space exploration as part of a larger effort to boost research and development in public-private partnerships, we see important opportunities for Latin America to bridge the technology gap. The region will move forward through support from Europe, China, and Russia. France, under the governments of Nicholas Sarkozy and his predecessor, Jacques Chirac, made Latin America, and Brazil in particular, a priority for its international cooperation in space.

Access to space exploration is a ripe opportunity for technological advancement. Some worry that the technology could also be used for military purposes. After their defeat in the Malvinas War, the Argentines considered the development of a long-range ballistic missile. This was abandoned after protests from Brazil. Argentine leaders also realized that they would be unable to gain access to fissile material for a nuclear warhead and thus would not have the capacity to develop a complete missile project. This project, known as Condor II, lasted from 1984 until it was

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21 Brazil’s space program was transferred to civilian control in 1994 by decree #8854 and Argentina’s program was transferred in 1991 by Decree #995/91.
dismantled in 1991, immediately at the end of the Cold War.\textsuperscript{22} Argentina gave up its missile aspirations and joined the Missile Technology Control Regime (MTCR) in 1993.\textsuperscript{23} Brazil had developed tactical short-range ballistic missiles for export but abandoned its program as a condition on joining the MTCR in 1995.\textsuperscript{24} Although its vertical launching system was not dismantled before Brazil joined the MTCR agreement, Brazil’s space program was removed from military control in 1994, indicating that the current development of launchers is largely for civilian and commercial purposes.\textsuperscript{25}

The development of Latin America’s space capabilities should not be confused with what some have considered the emergence of a new arms race taking place in Latin America. Brazil has made clear its space program is a civilian one. There has been no indication that Venezuela’s modernization of military capability looks to space as a new frontier for weapons. The recent investments cannot be characterized as a new militarism. Rather, it is a manifestation of a new security alignment in the region that does not necessarily include the United States as its sole security guarantor. This is evidenced by the source of the new arms purchases. Russia, Eastern and Western Europe, and other arms merchants feature as prominent suppliers of arms to the Latin American countries.\textsuperscript{26} What is important, however, is that U.S. engagement with the region on science and technology should be used to reinforce this peaceful tradition as part of a broader strategy for collaboration on earth observation and telecommunications policies.

**Turning Space into Smart Power in the Americas**

The region gains several geopolitical advantages from entering the international space race. Among these, two are most important: Latin American nations lessen their dependence on other countries for data transmission, and they gain technological innovation in areas that fit their specific needs. In the future, this know-how can be traded or offered as part of international cooperation with smaller countries that might have similar needs.

The relationship between Latin America and the United States with regard to space exploration is at times strained. This is especially true in the case of Brazil. Although there is a strong U.S.-Brazil alliance in energy-related areas, there is still a distrust of the United States among Brazil’s senior


leadership. While these old attitudes are dying, they create an underlying tension inside Brazilian policy circles as the nation seeks a repositioning of its role in regional and hemispheric politics. Chinese provision of technology and know-how to Brazil is a further cause for tension in Brazil-U.S. foreign relations. In the early 1990s, the United States invoked the MTCR treaty to stop Brazil from producing a rocket. This prevented Russia from providing technology, but did nothing to stop China. Since then, tensions have lessened, and Brazil cooperated in several U.S.-led initiatives such as Landsat. Through this program, in which both Brazil and Argentina participate, the United States provides a direct downlink from the Landsat land remote-sensing satellites to ground receiving stations in cooperating countries.

U.S. engagement in the region on space-related issues is hampered by the International Traffic in Arms Regulations (ITAR). These U.S. government regulations, which control the import and export of defense-related items and expertise, extend to satellites and launch vehicles.\textsuperscript{27} Official U.S. engagement with Latin America on space development is therefore limited, as are the commercial opportunities for U.S. launch and satellite providers. Many have called for revising the U.S. export control regime, including, most recently, the National Academy of Sciences.\textsuperscript{28} Revising ITAR will open up valuable commercial avenues, as well as extraordinary opportunities for the United States to exercise smart power through space.\textsuperscript{29} However, U.S. involvement in space development in Latin America must not wait on a revamped export control regime. Initiatives like Landsat, however limited by current controls, allow the United States to create partnerships that will have both technical and foreign policy benefits.

In this context, the United States is losing an opportunity to exercise its smart power by not engaging Latin American nations in the creation of their space programs. Science and technology are essential to projecting power. One path would be to use remote sensing to address environmental concerns in the Western Hemisphere. Alternatively, cooperation in global positioning systems could help solve the aviation crisis that Brazil is experiencing.\textsuperscript{30} It is also an essential tool that Brazil and other countries bordering the Amazon need to determine the extent of environmental damage that is taking place as a result of global warming and climate change. Some work has been done in this area, but more is still needed. Looking at this new drive to reach

\textsuperscript{27} Title 22 of U.S. Code Section 2778 of the Arms Export Control Act (AECA) provides the authority to control the export of defense articles and services and charges the president to exercise this authority. Executive Order 11958, as amended, delegated this statutory authority to the secretary of state. See http://pmddtc.state.gov/regulations_laws/aeca.html.


\textsuperscript{29} Sabathier and Faith, “Smart Power through Space.”

the heavens could also provide an important mechanism for integration and positive globalization with important benefits for all countries involved.

The United States will have to identify its niche in this new alignment of the regional “stars.” By including space exploration and technology-related developments as part of its broader geopolitical engagement with the hemisphere, the United States will gain greater opportunities to rebuild relationships in Latin America that could benefit other areas of its regional security needs.

Conclusion

With new attention being placed on the importance of science and technology as a driver of economic growth, innovation, and trade, looking at the United States’ relationships with potential new markets in Brazil and other Latin American countries should become a central part of any new diplomatic agenda toward the region. Moreover, any serious approach to mitigating climate change must also deal with the importance of preserving the region’s massive rain forests through earth observation and other technologies that support these goals.

The Brazilian space program is the most developed in the region, highlighted by the CBERS program. The top priority of the Brazilian space program is the use of satellites to monitor the Amazon rainforest in the global fight against climate change. Brazil’s 2008 National Defense Strategy report discusses the use of space for its national security needs. This new strategy also indicates that more resources will be used for space exploration in the future. Brazil not only wants to develop greater launch capacity, but it also wants to build satellites for earth observation and enhanced communication capacity. These efforts reflect a broader geopolitical agenda to advance its role on the international stage.

The United States has a new opportunity to use civil space and cooperation on science and technology as a powerful new tool of engagement in Latin America, and especially with Brazil. The United States should not let ITAR prevent its discussion with the region. There are strong reasons why the United States should be talking to its partners in the Americas about all kinds of potential technology projects as a means of expanding both research and commercial interests.

U.S. leadership in space exploration comprises not only government achievements but also powerful commercial opportunities that arise from the sale of U.S. inventions to its allies. As the United States loses market share in satellites and other related technical equipment to countries such as China, India, Russia, and Europe, it should consider what steps are needed to reassert U.S. leadership. Cooperation in space activities such as earth observation and space exploration can be one path toward restoring the traditional leadership credibility of the United States for this emerging interest in space technology in the Americas.
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G. Ryan Faith is an adjunct fellow and former program manager for Space Initiatives at CSIS. He was previously a CSIS intern working on international security issues and later the program coordinator for the Abshire-Inamori Leadership Academy. He has worked on publications on regional military balances, the Iraq War, the proliferation of weapons of mass destruction, and international trade. Currently, he consults on issues related to combat vehicle procurement. Mr. Faith holds a B.Sc. in engineering mechanics from the University of Illinois at Urbana-Champaign, as well as a B.A. in chemistry and mathematics (with minors in business administration and economics) from Rosary College (now Dominican University).
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