

Brazil's space programme comes of age

Tony Reichhardt

This year, if schedules hold, Brazil will finally realize its 20-year ambition to join the first rank of spacefaring nations. The agenda for 1999 has all the ingredients of a mature space programme, from the debut of a new Brazilian rocket to the selection of astronauts to fly on the international space station.

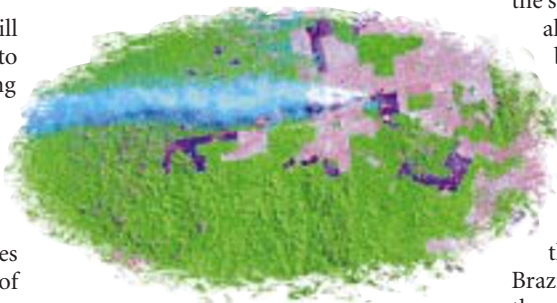
Although the space programme dates back to the 1960s, it was the 1979 approval of the so-called Brazilian Complete Space Mission that set Brazil on the road to self-sufficiency. The goal of this plan has been to develop the independent means to build and launch satellites, and Brazil has invested more than a billion dollars to that end.

This year the plan comes to fruition. The new VLS rocket, modest in size but 100 per cent Brazilian, should make its debut after a failed attempt to reach orbit in 1997. The first of two China-Brazil Earth Resource Satellites (CBERS) will be launched in July on a Chinese rocket. Brazil paid for 30 per cent of the satellite's US\$100 million cost and built one of its three cameras. The country hopes to reduce its dependence on US Landsat and French SPOT images, and also to obtain more frequent pictures of the Amazon region.

Largely owing to the vastness of its territory, remote sensing remains "very important for this country," says Luiz Bevilacqua, a professor of mechanical engineering at the Federal University of Rio de Janeiro, who represents the scientific community on an advisory committee to the Brazilian space agency. Moreover, the government seems to recognize that importance. Several years ago, President Fernando Henrique Cardoso ordered the National Space Research Institute (INPE), the lead agency for space science and applications, to improve the timeliness of space data on Amazonian deforestation. Now, says Thelma Krug, INPE's head of Earth observation, Brazil has "the largest programme in the world" for monitoring forests from space.

INPE hopes to launch the first of a pair of small, \$30 million Earth-observation satellites within the next two years. The satellites, dubbed SSR, will be placed in an equatorial orbit tailored to observing Brazil and other tropical nations.

Historically INPE, which receives about half of Brazil's annual budget of \$200 million for space activities, has also been the nation's lead centre for interpreting remote-sensing images. The institute used to be reluctant to



Satellite images, such as this one from Landsat, enable Brazil to keep track of forest burning.

share data with outside researchers, but the situation is improving. A private industry is slowly developing in remote-sensing analysis, particularly for agricultural applications. And Brazilian scientists have been striking their own relationships with foreign space agencies, independent of INPE. Roberto Calheiros, an atmospheric scientist at São Paulo State University, is scientific manager for a humidity sounder instrument scheduled to fly on NASA's PM-1 satellite.

A key question, however, is how much of a space programme Brazil can afford. In the early 1990s, when INPE's budget was in decline, institute director Marcio Barbosa made a choice to cut back on space science in order to fund higher-priority projects. Bevilacqua believes Barbosa "did the right thing" at the time. But the agency has accomplished little in space-based astronomy or planetary science as a result.

But that may change with the launch of Brazil's first science microsatellite, SACI-1, on the same Chinese rocket carrying the CBERS remote-sensing satellite in July. On board will be four small experiments focused on space physics. Because of recent declines in the size and cost of satellites, SACI-1 will cost INPE less than \$5 million.

The Brazilian-made VLS rocket will be launched this year.

The most recent addition to Brazil's space portfolio is microgravity research. Five experiments have already flown on the US space shuttle, and a research community is "growing rapidly" to take advantage of the country's new role in the international space station, says Bevilacqua.

The Brazilian government has pledged about \$150 million to become a partner in the station. The first Brazilian astronaut has already been named, and another will be chosen this year. Among the country's contributions will be a high-optical-quality window for Earth observation, which can be used to test instruments that would later be fitted on remote-sensing satellites.

Reactions to Brazil's participation in the project have been mixed among Brazilian scientists. Whereas some see it as a threat, others say the commitment of funds is relatively small. Most, however, agree that it is too early to say whether the new focus on astronauts and microgravity research will divert funds away from other parts of the space programme.

The threat of budget cuts is much on the mind of Brazil's space scientists. José Monserrat, editor of the *Journal of Science*, which is published by the Brazilian Society for the Advancement of Science, complains that "we have no clear priorities" in space, and that each project is left to fight for its own interests in a time of cutbacks. Money is scarce not only because of the reeling national economy, but also because funds appropriated by the government to INPE are often siphoned off for some other purpose before they reach the institute. The INPE budget, claims Monserrat, is a "fantasy," a charge that Bevilacqua backs. Brazilian scientists in all fields, not just space research, are angry that they are "not getting what's written in the contract," he says. He also worries that the agency is "not attracting good young scientists," because it cannot pay competitive salaries.

Despite these problems, most scientists inside and outside INPE believe that the programme will not only survive, but move forward. According to Calheiros, the government and the Brazilian people have come to understand the value of the space programme, not just for Earth observation but for its ability to spur technology development in Brazil.



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