Brazil's ambitious program points toward continent-wide space agency

by Lorenzo Carrasco Bazúa

In November 1979, the Brazilian Commission on Aerospace Activities drew up a plan, the Comprehensive Brazilian Space Mission (MECB), which, by the end of the present decade, projects the construction of a launch base in Alcantara, in northern equatorial Brazil, the construction of a satellite launch vehicle (SLV), and the launching of four scientific satellites.

The program is ambitious for a "Third World" country, but its greatest importance lies in the hope that it could be the starting point for a long-dreamed-of Ibero-American Space Agency. Only the combined efforts of the nations of the continent, would make possible their meaningful participation in the great projects of space colonization that should occur during the first decades of the next century.

Brazil's program is a joint effort of the Institute of Space Activities (IAE), the Aerospace Technical Center (CTA), and the National Institute for Space Research (INPE), part of the Ministry of Science and Technology. The INPE is responsible for the design and construction of satellites, related facilities on Earth, and the testing and operation of satellites in orbit. The CTA is responsible for developing the launch vehicles and building launch facilities.

The CTA has, to date, launched four sub-orbital test rockets and will launch three more to complete the preliminary phases for placing the first Brazilian satellite in orbit at the end of this decade.

The most recent test launch was in November 1985, from the launching pad at Barreira do Inferno in the north. One meter in diameter and 12 meters in length, with 4 meters of cargo space, the two-stage Sonda IV rocket traveled at 11 times the speed of sound during its 20-minute flight, reaching an altitude of 700 kilometers. It carried 7.3 metric tons, including 500 kilograms of experimental equipment developed jointly by the CTA and the U.S. Air Force.

The Integrated Test Laboratory

The National Institute for Space Research's timetable lists February 1989 as the date for launching BRASA, the first of the four satellites, designed for collecting meteorological, climatological, and hydrological information for transmission back to Earth. It will weigh 115 kilograms, will take two years to assemble, and will orbit 700 kilometers above the Earth. Its lifetime will be six months, after which it will be replaced by a more sophisticated model, to be launched at that time.

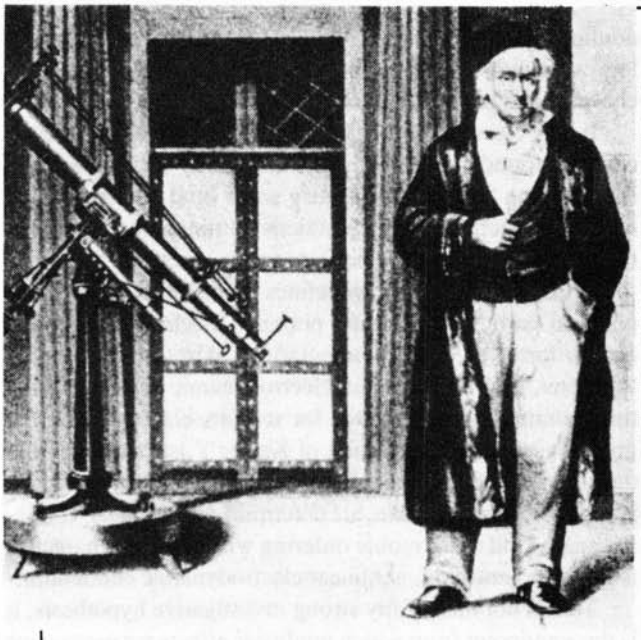
The second series of satellites will be designed to provide information on natural resources through visual observation of Brazilian territory. By picking up infrared images from the subsoil, these remote-sensing satellites will be an important tool for research on mineral, agricultural, forestry, and oceanographic resources. It will weigh 150 kilograms and will orbit the Earth at 642 kilometers.

In satellite building, the INPE is about to make its most important technological leap, by putting on line this September an Integrated Test Laboratory (LIP). It is the first of its kind to be built in the Southern Hemisphere and will be capable of simulating launch, orbit, and reentry of spacecraft.

This lab is really a battery of laboratories spread over 10,000 square meters. It is equipped with several Hewlett-Packard HP-1000 mini-computers. In one section, thousands of satellite components will be subjected to space-environment simulations, such as extreme temperatures, from 169° Celsius below zero to 150° above zero. They will also be subjected to electromagnetic interference, and other tests. Shielded echo-free chambers will be built by INPE for these tests.

In another section of LIP, the satellite will be put on vibration machines which simulate the acceleration and shock effects of the launch process. These tests will be performed in cylindrical chambers approximately three meters in diameter, which will have to be recalibrated constantly. A support section will take charge of calibrating the chambers.

But, beyond building a test lab for the development of the four satellites, which could be used in collaboration with other countries, the new installations will permit the development of scientific equipment and technological capacities, pushing Brazil's space sector toward an internationally competitive position. Then, in the opinion of the director general of INPE, Marco Antonio Raupp, "Brazil will have definitively reached its maturity in space activities."



From left: Karl Gauss, Johannes Kepler, G.W. Leibniz. The scientific tradition represented by these men formed the basis for LaRouche's understanding of the way in which the revolutionary new weapons now emerging accomplish their nonlinear effects.

cance of such weapons among relevant senior military specialists of several nations with which I have been in communication.

The exploration of technologies of electronic warfare has been under way since no later than the 1930s. This field has had increasing importance since the war-time development of radar, and has become more and more sophisticated with the development of more ingenious uses of increasingly powerful individual and coupled gyrotrons.

Until recently, most of the attention was concentrated on what were called the thermal effects, such as the destructive heating of targets irradiated with microwaves. It was only with great reluctance that Western nations recognized the importance of nonlinear electromagnetic effects, in which thermal effects have an almost irrelevant, or merely subsidiary role relative to the crucial effect produced.

My estimate is, that in the West, such nonlinear effects, such as electromagnetic solitons, began to be studied seriously from a military vantage-point, only during the early 1980s. Even today, much missionary work is needed to convince many working in the area of radio-frequency weapons, that the most significant effects are predominantly certain among the non-thermal effects of sometimes very complexly constructed, nonlinear forms of such radiation.

As a matter of emphasis, my own attention has been focused upon biological effects achieved with what conventional standards for thermal effects in electronic warfare would consider very low wattages per square-centimeter of target-area. Outside biology, some senior scientists are working on the harmonics of the periodic table, an area of fundamental research essential to understanding better the design of weapons and tools designed for inorganic target-materials. I shall limit my observations today to the biological targeting.

My approach to the field

It is drawn into this area of technology. A brief description of that may help to make the subject more intelligible to those who are still perplexed by the topic of nonlinear effects.

My original work in the profession of economic science, initially during the 1948-52 period, was in refuting the doctrine of "information theory" associated with such names as Norbert Wiener and John von Neumann. I attacked this matter of controversy from the vantage-point of what Leibniz was first to define rigorously as "physical economy," the study of cause and effect relations between advances in technology and physical productivity of labor. In this aspect of economic science, our primary researches ignore the roles of money and prices.

My task was to show, that contrary to Wiener and von Neumann, the mental-creative processes which generate scientific revolutions and technological progress, as causes, have an implicitly measurable correlation with their effects, the increases in physical productivity of operatives obtained through advances in applied technology.

For elementary mathematical reasons, the transformations in economies caused by technological progress are intrinsically nonlinear. Similarly, if we restate scientific revolutions in the proper choice of mathematical representation, technological progress, as a product of the individual human