LETTER FROM TOKYO

In space at last

A first success may mark the end of innocence

by Stuart Griffin

After four failures, Japan's poor-man space program can finally boast a satellite success: the 50-pound Ohsumi, launched by a 9.4-ton Lambda 4S-5 rocket from Uchinoura Space Center last week. The successful launch makes Japan the fourth nation, after Russia, the United States and France, to launch a satellite.

But Japanese scientists and commentators are not overwhelmed or overjoyed by the success. It is too limited a success, and leaves unanswered too many of the questions that still divide the country's space effort.

Japan's space program orbits around several sets of polar positions.

■ One pair of opposed forces is the splitting of the program within two centers: the Tokyo University Institute of Space and Aeronautical Science, where Japanese space was born and which launched Ohsumi, and the Government's more-recently formed Space and Technology Agency, which is aiming at more powerful rockets.

■ Another polarization, and a bitter one, is over the question of building Japanese rockets or relying on United States help to build bigger ones.

■ A third split is over the question of guidance systems. Orbiting satellites do not need as precise control as ballistic missiles that must be aimed at small targets. There is continual pressure in war-conscious Japan to keep rocket guidance systems so simple that they would not be accurate enough to use in missile weapons.

And behind the controversy is the floundering pace of the space effort over the past 15 years. The Ohsumi is typical: It took two years to launch, due to funds shortage, technical mishaps, interagency bickering, postponed schedules and protests by local fishermen.

Ohsumi was launched by a Japanese-built rocket, with a guidance system kept as close to the minimum as possible. The satellite's objectives, according to Tokyo University's Masamichi Murokawa, were modest: to obtain data on electron and ion density, electromagnetic noise in the shortwave band and on cosmic rays. It carried few instruments and its radio signal stopped after less than a day because its battery expired sooner than was anticipated.

Prof. Yosuke Iwai is even more modest. The sole significance of the launch, he says, was to demonstrate that it is possible to orbit a satellite using the rocket's unique nonguidance system.

The Tokyo University group is also developing a more powerful rocket, the Mu, with which it hopes to orbit a satellite this summer. This REXS-A satellite will carry instruments to monitor fringes of the ionosphere. The Mu, which was tested successfully in the fall (SN: 9/27, p. 288) but has not orbited a satellite, also has no guidance system.

Most rockets use a more-or-less complex navigation and guidance system that computes where the rocket is and where it should be, and controls its flight so that it gets there.

These navigation and guidance systems can be complex and complete, allowing for correction in flight if necessary. Such closed-loop systems, as they are called, make it possible to put a satellite in a precise orbit. A simpler system, as in the United States Scout rocket, is open-looped: There are a programmed series of guidance commands and perhaps a few navigational indicators to show where the rocket is going, but no precise control and no way of correcting for guidance errors are included.

The Japanese Lambda rocket that launched Ohsumi had, strictly speaking, no navigation or guidance system at all. Two of its four stages were given a spin, like a rifle bullet, to keep them flying straight. And on the third stage were four preset motors that fired at a 22-degree angle from the rocket surface, tipping the rocket off the vertical. During the fourth stage gravity pulled the rocket farther, so that at the end of powered flight the satellite was flying horizontally, in orbit.

Such a shoestring system is logical on a small rocket, where weight taken up by guidance hardware must be subtracted from the disproportionately small satellite payload. But the Lambda rocket, smaller than the Scout, is not a very logical size for satellite operations, either for scientific research or for the more lucrative communications satellite technology. And with larger rockets —like the Mu—there is less reason to use the chancy no-guidance system to save pounds.

So the next step will be larger systems. Probably they will involve more guidance—at the cost of drawing on United States technology. And each step will bring with it the debate over nationalism, over weapons technology, over costs and over who runs the space program. Few scientists believe that the age of innocence represented by Ohsumi will last.