



Space satellite ambitions

Recent success has Japan thinking big, but design problems abound

by Stuart Griffin

Japanese space efforts have been stimulated by the successful flight test of the Mu 3D-1 rocket, the largest vehicle yet developed in this country by Tokyo University's Institute of Space and Aeronautical Science, the pioneer organization in these efforts.

The university now expects to try to orbit the first in a series of scientific satellites with another Mu rocket early in 1970.

This project had virtually fizzled out after a series of four abortive attempts to launch an experimental satellite with a less powerful Lambda rocket. Even now the program is far behind schedule because of Japanese fishermen's protests, which brought on suspension of all launch activity in April 1967. The hold lasted until mid-August.

The impasse has been breached, however, and the Science and Technology Agency's National Space Development Center is now launching its own rockets from its Tanegashima Island Test Center in Kagoshima Prefecture at the southern tip of the Japanese island chain. The fishermen have finally agreed on terms of Government compensation for damage to fishing by rocket firings, and are in the process of receiving lump-sum payments.

The university's satellite project is still being plagued by a major technical problem—vehicle guidance-control, or rather, the lack of it. In the four previous satellite attempts no launching vehicle was equipped with a system to move it by remote control in the direction desired in flight. Only the last stage, which was to work after reaching an appropriate altitude, was equipped with gyroscope-aimed thrusters designed to place it in a horizontal position before releasing a satellite into orbit. The trouble invariably developed in flight before the final-stage mechanism ever got to work.

Japan is still working with the Lambda 4S-4 rockets and Lambda 4T-1 rockets, but these are used only for satellite orbiting tests, while Mu vehicles are to be employed in launching a series of scientific satellites. Just this week a Lambda 4S-4 again failed to put a satellite in orbit when the third stage touched the satellite and knocked it off course.

Tokyo University still has no plans to develop guidance-control technology. Without it a successful orbiting might be possible but lack of a predetermined, accurate orbit would virtually eliminate any scientific value to the flight.

Project leaders are encouraged, how-

ever, by the recent Mu 3D-1 flight test, in which the fourth stage flew to a 108-kilometer height. Its mechanism worked perfectly and placed it in a horizontal position. But the rocket, carrying only a dummy third stage for the test, lacked power to orbit a satellite.

The flight version of the first in the scientific satellite series is ready for launching; the second, the Radio Exploration Satellite, is on order.

Tokyo University scientists once boasted that Japan's first satellite would be the world's cheapest, costing about \$300,000, but such thinking has forced space efforts to inch perilously along on a shoestring budget. In the past 10 years, the agency has spent a total of only \$95 million on space projects, an amount less than the cost of a single U.S. lunar module.

The National Space Development Center, unlike Tokyo University, is working on liquid- and solid-fueled hybrid rockets with full guidance-control systems. A new organization, the Space Development Corporation, will be inaugurated this October to coordinate Japan's splintered space efforts, including taking over the center's work.

So far the Science and Technology Agency has lagged behind Tokyo University in hardware, having started six years later in rocket development work. However, it has developed the small LSC and JRC rockets, hoping thus to gain mastery of rocket technology basics, and has sought U.S. aid in completing the powerful Q and N rockets for use in future satellite launches. The U.S. has agreed to supply Japan its unclassified rocket technology and help Q and N vehicle development, and the agreement has stimulated a rush by U.S. aerospace firms to link up with Japanese producers.

Satellites planned for launches by these rockets in the early 70's include ionospheric, navigational, meteorological and geodetic satellites as well as a communications satellite. This program sounds ambitious on its face; taking into account that Japan must first master basic technology in guidance and control, it may be overly ambitious.

Following the success of the Mu flight test, however, it is now once again beginning to seem that Japan may somehow be able to orbit an all-Japanese satellite with an all-Japanese launch vehicle. But the country definitely needs American technological assistance in developing the guidance and control systems, essential to placing any satellite into any accurate orbit.