Japan's H-II Rocket to Bolster Remote Sensing Projects

TOKYO—Next week Japan hopes to launch a new, homegrown rocket that can carry more and fly higher than earlier rockets. But a successful maiden flight for the H-II rocket won't just be a victory for national pride. It will also open the way to a series of launches that will catapult Japan into the elite club of nations with sophisticated, long-term remote Earth sensing programs—and provide other governments with an additional inexpensive way to get their sensors into a geosynchronous orbit.

The H-II sitting on the launch pad of the Tanegashima Space Center at the southwest tip of Japan has cost nearly $2 billion since 1984 and been delayed 3 years because of a succession of technical problems relating to its two-stage, liquid fuel propulsion system. Although its first payload is modest—two small test instruments that will remain in orbit for only a matter of hours—by 1997 it is expected to have put six satellites into orbit, two of them remote sensing packages including U.S. and French instruments. Those launches will also propel its developer, the country's National Space Development Agency (NASDA), which traditionally has been responsible for space applications, into a more visible role as a supporter of scientific missions.

Until now, that role has been dominated by the Institute for Space and Astronautical Science (ISAS). Funded by the Ministry of Education, Science, and Culture, ISAS has since 1969 put 22 modest but carefully targeted satellites into Earth orbit and carved out high-quality research niches in x-ray astronomy and solar physics on a budget one-sixth the size of NASDA's. Meanwhile, NASDA, part of the Science and Technology Agency, has confined itself for the most part to engineering problems—in particular, building the rockets needed to put government satellites into orbit and launching commercial payloads such as weather and communications satellites.

H-II is likely to change all that because of an unplanned development: a shortage of commercial payloads for the rocket, which can put a 2-tonne payload in geosynchronous orbit. The strengthening of the yen against other currencies and H-II's troubled developmental history has raised its per-flight costs to at least twice that of its closest competitors, the European Space Agency's Ariane 4 and General Dynamics' Atlas Centaur. That has discouraged commercial customers, and the lack of demand spurred NASDA to look for a new way to showcase its rocket's capacities. Earth-sensing payloads seemed a natural match, since the agency is not completely new to remote sensing—in 1978 it created an Earth Observation Center to process and analyze data from U.S. and European satellites.

New era. Japan's H-II rocket should be a boon to space scientists with payloads that need a lift.

The first of the planned remote sensing launches—the Advanced Earth Observing Satellite (ADEOS), to be launched in 1996—will carry Japanese, American, and French instruments in a polar orbit to allow monitoring atmospheric conditions, in particular the ozone layer, at both poles. Other sensors on board will gather data on ocean wind speeds, currents and sea surface temperatures; solar radiation reflected by the atmosphere; and concentrations of greenhouse gases.

In 1997, the H-II is scheduled to orbit a package of five instruments aboard the Tropical Rainfall Measuring Mission (TRMM). Three of these, one from NASDA and two from the U.S. National Aeronautics and Space Administration (NASA), will for the first time give comprehensive measurements of precipitation over a wide segment of the tropic latitudes. "We really don't know just how much rain is falling where," says Taroh Matsuno, head of the University of Tokyo's Center for Climate System Research. Two other NASA sensors will measure the radiant energy reflected by clouds and the earth and gather information on lightning.

The H-II also offers NASA a cheaper way to launch significant components of its massive Earth Observing System (EOS), a welcome development after Congress in the early 1990s imposed an $8 billion cap on what had been envisioned as a $17 billion program. And that need to economize meshes well with Japan's inability to attract any commercial customers for the H-II. The result is an agreement in which Japan will swallow the cost of launching NASA's payloads in return for a chance to keep its H-II busy and build a record of successes.

The data flood from these missions is a welcome prospect, but some researchers worry that NASDA may not have the people and facilities to analyze and disseminate it all. In recent years, the H-II has consumed nearly one-third of NASDA's annual $1.5 billion budget. In contrast, NASDA will spend only $49 million this year to manage the Earth observation data.

The variety of agencies taking part in the new remote sensing effort could also hamper access to data. As Japan's shepherd of industry, the Ministry of International Trade and Industry (MITI) has long monitored industrial emissions, and it is contributing a sensor to monitor carbon dioxide, methane, and other greenhouse gases from the ADEOS satellite. The Environment Agency has already been studying the degradation of the ozone layer and is supplying two ozone sensors to the ADEOS mission. The Central Research Laboratory of the Ministry of Posts and Telecommunications, looking for additional uses for microwaves, expects to put its latest version of a microwave rain sensor on TRMM; it will also process some of the data.

The bigger problem, however, lies outside NASDA, in what Matsuno calls "a shortage of researchers." With Japan spending more on satellites than most scientists had dared hope, he says, the relatively small earth science community in Japan—the result of a dearth of university and institute positions and a lack of interest from industry—could be overwhelmed by the data that will have been collected by the end of the decade. Fortunately for all, the data from ADEOS and TRMM will be available to U.S. scientists through NASA, and Japan is promoting an international network to share the data being collected by existing space-based sensors. Foreign scientists welcome the hardware contributions; Japanese scientists would like to see equal attention to supporting actual research.

But most researchers aren't fretting yet about how the data will be made available or who will analyze it. After 3 years of disappointment, they'll be satisfied with good news next week from Tanegashima Island.

–Dennis Normile

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