

ICBM

# China joins the Space Age

Primitive though it may be,  
Communist China's first satellite  
adds fuel to the ABM debate

Celestial music is supposed to be inspiring, beautiful and harmonious. But last week a jarring note was wrung from the heavens. It was "Tung Fang Hung" ("The East is Red"), the Chinese Communist version of "My Country 'Tis of Thee."

Broadcast from Red China's first orbiting space satellite, it heralded that country's entry into the select group of Space-Age nations—now there are five—and raised the specter of a Chinese Intercontinental Ballistic Missile.

Although the first-try statistics sound impressive—a 380-pound satellite compared with 184 pounds for the Soviet's Sputnik I, 30 pounds for the United States' Explorer I, 90 pounds for France's A-1 and 50 pounds for Japan's Ohsumi—United States defense officials, rocket specialists and China watchers were not surprised.

"We've been waiting for this for years," says Alice L. Hsieh of the Institute for Defense Analyses in Arlington, Va. "I anticipated this development taking place as early as 1967."

The Chinese feat, it is deduced from the satellite data, indicates the capability of launching a medium-range ballistic missile (600- to 1,500-mile range) and that there is no cause to ring the ICBM alarm bell yet.

One reason for ruling out an ICBM capability at present is the known state of the art of Chinese rocketry and the size of the satellite.

The Russians had given the Chinese missiles in the late 50's. Those were comparable to the medium-range missiles deployed in Cuba in 1962.

"The weight of the satellite is compatible with that type of booster," says Dr. Merton Davies of the Rand Corp. in Santa Monica, Calif. "I assume China has gone ahead and perfected this

kind of a booster and then, by adding maybe two more stages, put it into orbit."

A second reason is that no Chinese tracking vessels have ever been sighted in the Pacific, and tracking is a requisite for any ICBM test launch.

In addition, a satellite does not need the sophisticated guidance system that an ICBM does.

For aiming an ICBM, two options are open: an all-inertial system, where the missile is directed by its own internal guidance, or a command guidance system, which gives the missile orders from the outside. Because the command guidance is above ground and vulnerable to attack, advanced missiles use the more difficult inertial guidance.

To orbit a satellite, on the other hand, the task is much simpler. The main problem is getting it up high enough so that it does not fall back into the atmosphere. Essentially what is involved is to launch the satellite a few hundred miles up, then employ rocket thrust to move it horizontally. It is before reaching its highest point that the guidance system properly orients the spacecraft so that when the rocket is fired at this point, the satellite goes into orbit. If too little thrust is used, it will fall back to earth; with just the right amount it will go into circular orbit, and extra thrust will put it into elliptical orbit. Since the Chinese have not developed instrumentation with the precision necessary for circular orbit, they played it safe and put their satellite into elliptical orbit, thus avoiding the danger of having it fall back to earth. The Japanese did the same thing earlier this year (SN: 2/28, p. 232), when they put up their first satellite, which had practically no guidance system at all.

Despite the vital statistics of the

Chinese launch (a perigee of 263 miles, an apogee of 1,430 miles, a speed of 17,500 miles per hour and one orbit every 114 minutes), it has not impressed everyone.

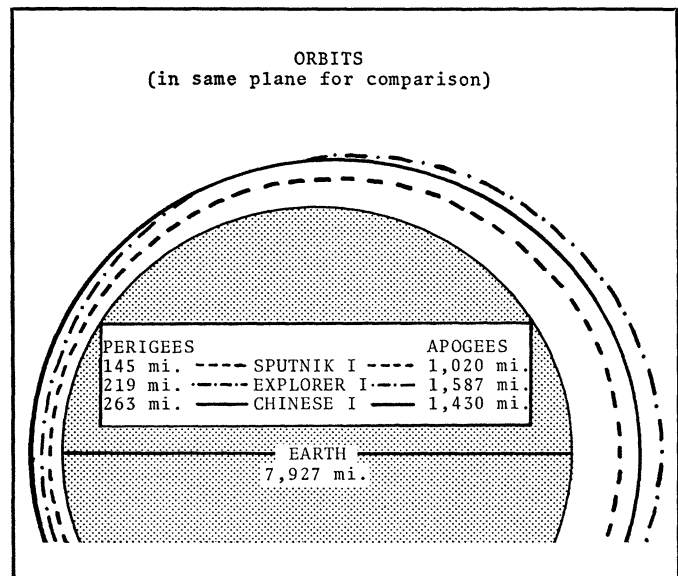
"This is pretty primitive," says Mrs. Hsieh. "Technologically, it's a fairly primitive thing." Jumping to the conclusion that they have an ICBM capability is highly premature, she says. "It's going to take a lot more technologically and scientifically to get into the ICBM class."

However, she does admit that it is a first step, and the worry in some quarters is that the step might be enough to stampede the Congress into appropriating funds for deploying an extended Safeguard antiballistic missile system (SN: 8/6, p. 127).

"We have been saying for months that the Chinese will have a space capability," says a Defense Department spokesman. "Whether this will have any influence with Congress, I don't know. If anyone is wavering on a fence, it could help him make up his mind."

This concern is not universal. "I assume this will give the Administration a little leverage," says physicist Dr. Ralph Lapp. But he still expects the Senate to put down any present Administration move toward expansion, as does a Senate staff member who believes, "We have enough to kill Phase II (an expanded ABM program)."

Even Secretary of Defense Melvin R. Laird has tempered earlier estimates of Chinese progress. In his most recent defense posture statement in February, he said, "Should an ICBM become available for testing within the next few months, IOC (Initial Operational Capability) could be achieved by early 1973. It is more likely, however, that IOC will be later, perhaps by as much as two or



Robert Trotter

*Soviet, U.S. and Chinese orbits: Ellipse is easier.*

three years. If the earliest IOC were achieved, the number of operational launchers might fall somewhere between 10 and 25 in 1975. In the more likely event that IOC is later, achievement of such a force would slip accordingly."

Which leads to the conclusion that the Chinese missile program is lagging. "The ICBM has slipped from what has been forecast," notes Dr. William W. Kaufmann of the Massachusetts Institute of Technology. "The original expectation was for at least a small operational capability for the early 70's for the ICBM. Now it's the mid to late 70's."

The cause of the lag is uncertain. One possibility is that since the Chinese have the theoretical knowledge—credited in large measure to Dr. Chien Hsueh-shen of the Massachusetts Institute of Technology, who was driven out of the United States in 1955—they must be short on engineering and logistical know-how. Another potential factor could have been Mao Tse-tung's aborted Cultural Revolution, which disrupted the country in general and the ministry responsible for missile development in particular.

It is also considered likely that the prestigious launching of a space satellite might have been a trade-off against the Chinese missile effort. "The space capability takes energy from the military impetus," points out Dr. Davies. "It takes the same aerospace industry to work on other components of the ICBM."

For that reason, he sees the launching as a political move on the part of the Chinese.

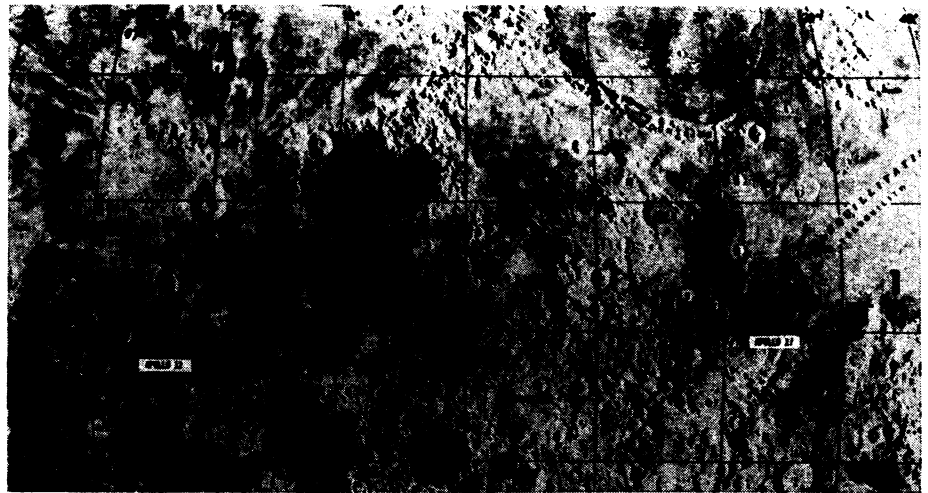
There is another possibility. The satellite may actually represent a new direction in the Chinese military program. Rather than going to conventional launchings from land based sites, the Chinese may be on their way to developing an orbiting satellite system to launch nuclear warheads.

The suggestion comes from analysts in Hong Kong, who although they admittedly have little technical information to go on, base their thesis on China's ability to leapfrog, or bypass, intermediate technological stages and so gain ground. If so, such a system would be supplemented by a submarine missile fleet. But the capability for this is still down the line since present Chinese missile subs cannot fire from underwater.

But if the Chinese feat was political, a Soviet multiple launch on Saturday, one day later, had the earmarks of something far bigger.

Eight unmanned satellites were put into orbit from one rocket, and Heinz Kaminski, director of West Germany's Space Research Institute, infers from the positions of the eight that this could be a Soviet attempt to set up a space station. □

## Back to time one



NASA

*Ages of the Apollo 11 and 12 sites differ by only a few hundred million years.*

If there is a lesson in the Apollo rocks for investigators of the moon's history, perhaps it is that they should not become too firmly attached to any one conclusion; the findings may soon change.

This was brought home to scientists at the American Geophysical Union's annual meeting in Washington last week. The preliminary analysis of the rocks brought back from the Ocean of Storms by the Apollo 12 mission had tentatively dated them at 2.6 billion to 2.9 billion years old (SN: 12/20, p. 573), based on potassium-argon dating. This was nearly a billion years younger than the Apollo 11 rocks from Tranquility base and it set into motion a round of speculation.

The considerable difference between the times of crystallization of the rocks at the two sites seemed to imply that the events responsible for surface melting on the moon continued over a considerable period of the moon's history. It lessened the possibility that the moon's rocks were shaped during an intense and relatively brief interval of activism about 3.6 billion years ago, as many scientists felt was implied by the Apollo 11 samples.

Then last week at the AGU meeting Dr. Gerald J. Wasserburg of the California Institute of Technology, one of the principal lunar sample investigators, dropped his surprise. In strontium-rubidium analysis of two Apollo 12 rocks just completed at their Caltech laboratory, he and Dr. D. A. Papanastassiou and others had determined that the rocks were 3.4 billion years old.

The Apollo 12 site is thus almost the same age as the Apollo 11 site, not a billion years younger. The Caltech workers conclude that there was widespread outpouring of lavas over the

mare regions, in a relatively narrow time interval of 200 million to 300 million years, about 3.5 billion years ago. "This must represent a major episode of physical and chemical differentiation of the moon," the Caltech group suggests.

The result is making lunar scientists wonder whether the other maria are the same age, and if so where the energy for such a major episode came from.

"If there are no younger rocks on the other mare sites," says Dr. Wasserburg, "we must attempt to understand what the precise mechanism is by which the thermal energies of the moon were shut down to prevent further volcanism."

Dr. Wasserburg believes the melting was due to buildup of internal heat from radioactive decay during the time after the moon was formed 4.6 billion years ago. The similarity in ages between the oldest rocks on earth and the Apollo samples, he suggests, may be due to a similar length of buildup of internal heat within the earth. In fact Dr. Wasserburg believes that most of the terrestrial planets underwent the same melting period.

Some other scientists feel that it is too early to attribute the lunar melting to internal heating rather than to impacts by an intense barrage of meteoroids sometime around 3.5 billion years ago. More definitive data should come from the forthcoming Apollo missions.

For now, the new age determination seems to have had the effect of wiping away smugness. Some geologists who had attempted to calculate the age of the Ocean of Storms by the number of impact craters visible had decided they could show good agreement with the preliminary dating of the Apollo 12