A renowned German-born pioneer in the new age of rocketry, Willy Ley was exploring the theories of missile travel more than three decades before man's initial probing of outer space. In 1927 he helped found the German Rocket Society, whose members gathered much of our fundamental knowledge of rocketry. Later he became vice-president of the society and a world authority on rocket and missile development. Hitler's rise to power caused Ley to take an "extended vacation" from his homeland in 1935. He settled in the United States, became a citizen, and made outstanding contributions to the understanding of man's future in outer space. Author of 10 books and numerous articles, Ley is a member of the American Rocket Society, Institute of Aeronautical Sciences, Society of American Military Engineers, and the American Association for the Advancement of Science. He is also a fellow of the British Interplanetary Society and the Meteoritical Society.

Where We Stand in the Rocket Race

BY WILLY LEY

Here is an expert's post-Sputnik analysis of the U.S.-Russian struggle for missile supremacy.

EVER SINCE the first Sputnik appeared in the evening sky last Oct. 4, I have been answering questions from the press, from radio and television commentators, from chairmen of lecture groups, and from the public generally. The following, of course, isn't a complete list of all the questions I've been asked, but it covers those which were asked most frequently about Sputnik and rocket development.

1. What did the Russians do and how did they do it?

The method of putting an artificial satellite into an orbit around the earth has been discussed in scientific circles since 1923. It was known to scientists that two things would have to be done:

A. A rocket would first have to rise to a height of more than 150 miles. It would not have to go straight up, but could go at a slant (after vertical take-off); in fact, the slantwise ascent was deemed better for various scientific reasons.

B. Once the rocket had attained such a height, it would have to move parallel to the ground and increase its speed to 4.6 miles per second. That would put it into an elliptical path around the earth. Traveling in this path—on momentum only—it would produce enough centrifugal force to counterbalance the earth's gravitational attraction at that distance.

This is what the Russians did: they got their rockets into the upper atmosphere and provided them with the necessary velocity.

2. What kind of rockets did the Russians use? And did they use new and unknown fuels?

The Russians must have used two different kinds of rockets for their first two satellite shots. For Sputnik I they certainly used the missile which they call T-2. This is the kind that we call IRBM (intermediate range ballistic missile) and which has a range of 1,500 miles when used as a weapon. It is a two-stage missile with liquid fuels. For the satellite shot they put a third stage on top of it, instead of a warhead. The third stage carried the satellite.

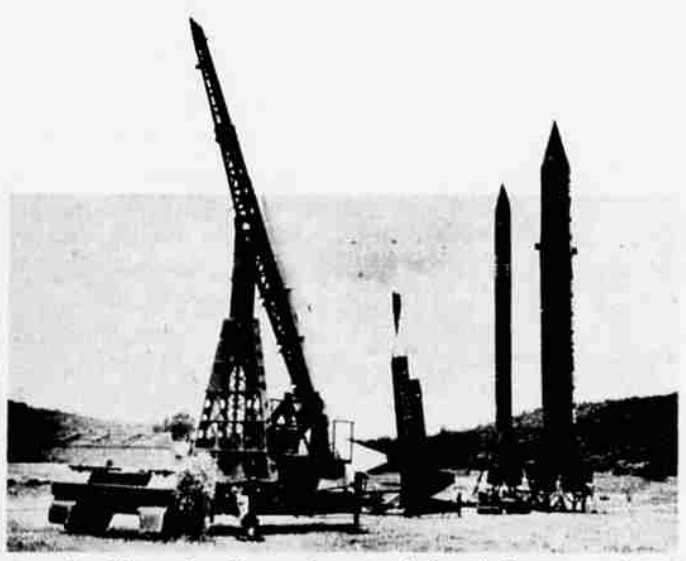
For Sputnik II they probably used the missile which they call T-3 and which is their ICBM (intercontinental ballistic missile). This Soviet missile when used as a weapon has a range of 4,000 miles or better.

In spite of much talk, they probably did not use a new and secret fuel; their official reports say that the fuel for these rockets is highly refined kerosene and liquid oxygen, and American observers have found no reason to doubt this statement.

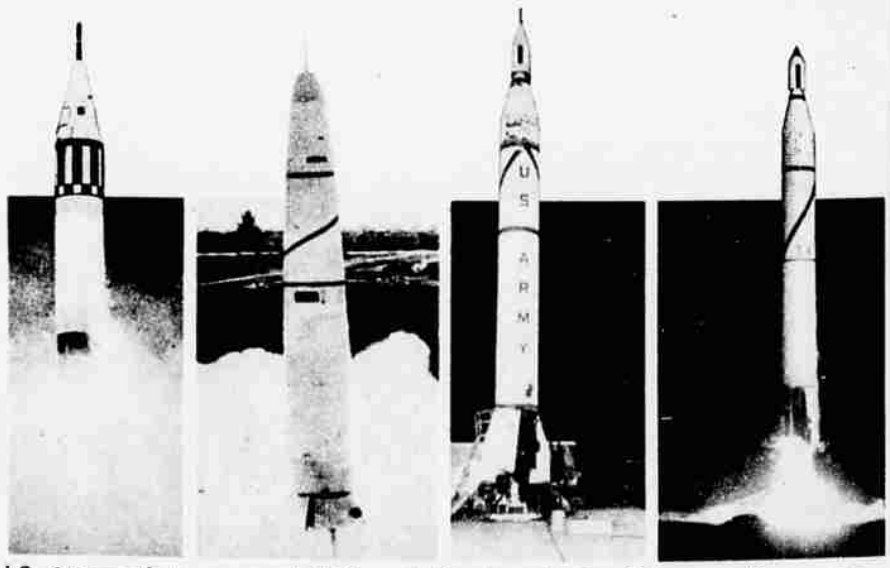
3. Could such a Sputnik drop on our heads?

No. If a rocket, or the satellite it carried, has enough speed to stay in an orbit, it will remain in an orbit. There is no known method of suddenly stopping it in its orbit and making it come straight down. What will happen is that these rockets will gradually come closer to the earth because they still find a little bit of air resistance at the height where they are. Finally they will hit denser air at a height of about 20 miles and will be heated by air friction to such an extent that they will be vaporized. This will happen about a year from now, but it may take longer.

Ley claims Army Redstone, shown here in flight, is "an excellent weapon."



Army's "big four" rockets include (left to right) Honest John, Nike, Wac Corporal, and Redstone.



U.S. intermediate range ballistic missiles include Army Jupiter (left) and Air Force Thor. Jupiter-C was used in successful test of re-entry nose cone.