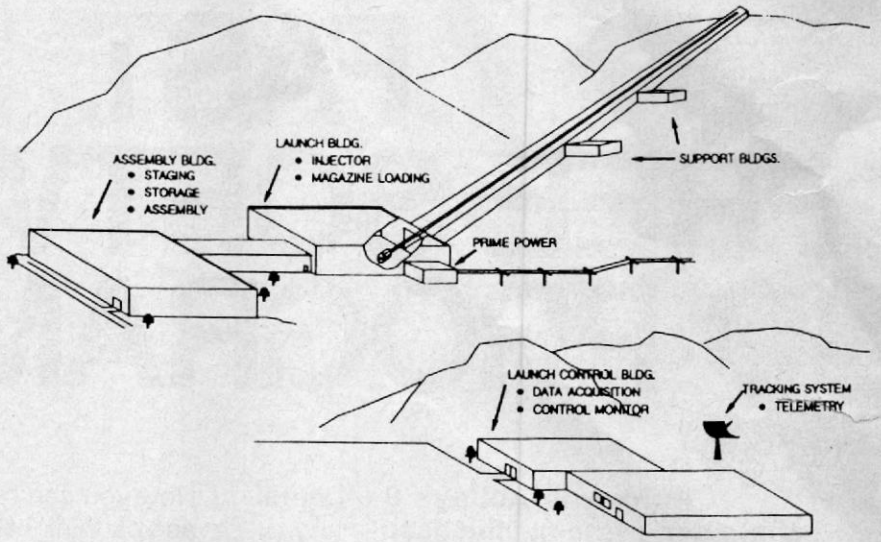
WHAT'S NEWS

New earth-to-orbit launcher will use electromagnetism

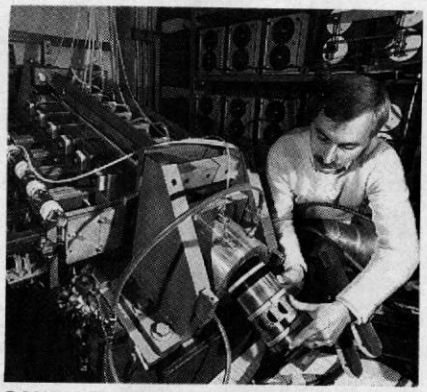
A new technology that might be used to launch small satellites from earth to orbit, currently being developed by Sandia National Laboratories (Albuquerque, NM), uses electromagnetic induction and involves no sliding electrical contact between the projectile and the barrel. Providing an alternative method to rockets for the launching of satellites up to 1,000 pounds, it could have potential military and commercial applications.

In the new launcher, the projectile passes through a series of cylindrical coils that form a contactless barrel. Just before firing, a pneumatic device sets the projectile spinning, for aerodynamic stability. The firing is under electronic control: One after another, coils are energized by a heavy capacitor discharge, accelerating the armature forward down the length of the flyway. Between each coil, a high-speed optical-fiber sensor measures the precise position and velocity of the projectile and instructs the computer to fire the next coil at the right instant to provide maximum effect. The launch mass for a full-scale earth-to-orbit projectile would include an iron or other magnetizable armature, a removable aeroshell, small rocket motor, and the payload. An existing mockup resembles a small rocket or a very large artillery shell, with the tapered aeroshell streamlined to reduce atmospheric friction.

A sophisticated code called "WARP 10" has been used to support the experiments. The code has successfully predicted the results of all of the experiments made so far. Its predictions for scaled-up versions of the electromagnetic launch system are making scientists extremely optimistic that the larger systems will also be successful.



A FUTURE FULL-SCALE EARTH-TO-ORBIT electromagnetic launch system might look like this. The flyway, consisting of hundreds of stages, is built up the side of a hill to present a 30-degree launch angle.



SANDIA EXPERIMENTER Ronald Kaye inserts a projectile into the breech of a six-stage electromagnetic launcher, which is being developed as a possible alternative to rockets for frequent launches of small payloads.

The electromagnetic launcher would provide enough velocity—about 4.5 kilometers per second at the end of the flyway—to send the main part above the earth's atmosphere (the armature would drop away shortly after launch). Once the projectile was above the atmosphere, the aeroshell would drop away and the rocket motor would step up the velocity about another 4.5 km/sec, to achieve orbit velocity. The combination of electromagnetic and rocket techniques reduces costs and risks for the electromagnetic launch.

Still in the exploratory development phase, the work has achieved a record velocity for contactless electromagnetic launchers of 1 kilometer per second with a 160-gram projectile. Experiments are now underway with a larger, six-stage launcher that fires a 4-kilogram (10-pound) projectile that is 5½ inches in diameter. Subsequent development stages will focus first on still larger launchers. After that, the concept would be scaled up further by adding more stages to the launcher, increasing the length of the flyway along which the launch mass is accelerated. For earth-to-orbit launch, the flyway would consist of multiple stages, each powered by its own capacitor bank, and elevated at a 30-degree angle. The technology seems especially promising for the economical launching of large numbers of relatively small objects into earth orbit. **R-E**