ROCKET WITH ECHO—The 28-inch canister on top of the Delta launch vehicle (above), built by Douglas Aircraft Co., Inc., Santa Monica, Calif., contains the folded 100-foot deflated Echo sphere. When ejected, the two hemispheres of the canister (right) will separate, allowing the plastic sphere to inflate and go into orbit about 1,000 miles above the earth. The canister weighs about 24 pounds. The sphere, made by the G. T. Schjeldahl Co., Northfield, Minn., for the National Aeronautics and Space Administration, weighs 166 pounds.

ROCKETS AND MISSILES

Echo Found Practical

12 to 24 Echo-type satellites would provide a nearly continuous communications network. Due to electronic advances, equipment is able to bounce signals off the satellite.

DEFENSE-ORIENTED scientists say the Echo satellite scheduled to be launched this year may be the most practical satellite the National Aeronautics and Space Administration has yet put up. The reason:

Echo is a major step toward a nearly invulnerable communications system for the military.

The system is badly needed. Transoceanic cables are crowded and can be sabotaged easily. Shortwave radio is also crowded and is dependent on favorable, but uncontrollable, atmospheric conditions.

But 12 to 24 Echo-type satellites uniformly spaced around the earth would provide a nearly continuous, world-wide network for bouncing messages from continent to continent.

An attempt to place an Echo satellite into orbit failed last May but a second attempt is planned in the next few months.

The man credited as father of the system is Dr. John R. Pierce, director of research in communications principles at the Bell Telephone Laboratories. He proposed the system in a 1955 paper.

"At that time I made calculations concerning the use of passive reflecting satellites that could be used to reflect microwaves," he said recently. There were no artificial satellites then.

Bell scientists are working closely with NASA on the Echo project. They say that when they attempt to bounce radio signals from coast to coast, the satellite's aluminized shell will reflect 98% of the waves up to frequencies of 20,000 megacycles.

The scientists are particularly interested in how space conditions will affect the satellite. The 100-foot Mylar plastic sphere will probably collapse when it moves into the earth's shadow. The sun's heat, which will have caused powders to turn into gas and swell the balloon, will then be gone.

Scientists also will be waiting to see if the satellite re-expands when it returns into the sunlight. They will be interested in leaks of gas that might be caused by punctures of the balloon by micrometeors.

And what of the plastic, a common one used in grocery packaging? Will heat, ultraviolet light and radiation make it deteriorate rapidly and lose its flexibility?

The purpose of the Echo experiment is to find out and thus to put the United States another step closer to a revolutionary new system of military communications.

Echo Could Be Jammed

Echo is almost as simple as a toy balloon, but the ground equipment needed to bounce waves off the satellite is extremely complicated. It is made possible due to spectacular electronic advances made since 1955.

Most important for Echo was the development of the maser, a new form of microwave amplifier. It amplifies radio signals with only about a hundredth of the unwanted noise of earlier amplifiers.

Thus radio signals sent to Echo need only about a hundredth of the power they would have needed five years ago.

Dr. Pierce told the House Committee on Science and Astronautics that Echo-type satellites may be troubled by unauthorized persons beaming radio signals at them.

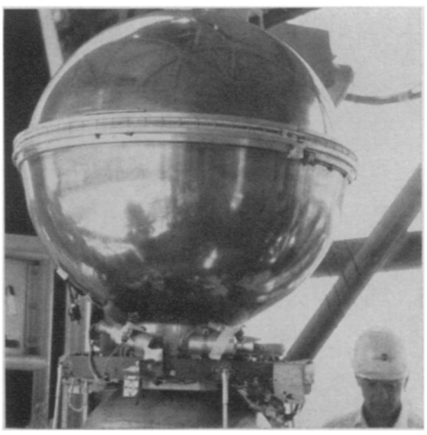
"Satellites are completely in the public domain in a way that nothing ever before has been.

"They are up in the sky where everyone can see them and unfortunately anyone who wishes to could shoot radio signals at them."

Dr. Pierce said that if many persons have access to a satellite, they may accidentally jam one another.

"There is also the possibility, of course, that somebody would deliberately jam the satellites," Dr. Pierce said.

Science News Letter, June 18, 1960



ROCKETS AND MISSILES

Rocket-Borne Radiosonde To Send Weather Data

See Front Cover

A ROCKET-BORNE radiosonde, developed by the U. S. Army Signal Research and Development Lab, Ft. Monmouth, N. J., is loaded into the nose cone of a 77-pound Arcas rocket as seen on the cover of this week's SCIENCE NEWS LETTER.

The rocket will travel 40 miles up in the atmosphere where the radiosonde will separate from it and parachute slowly to earth, transmitting weather information.

Science News Letter, June 18, 1960