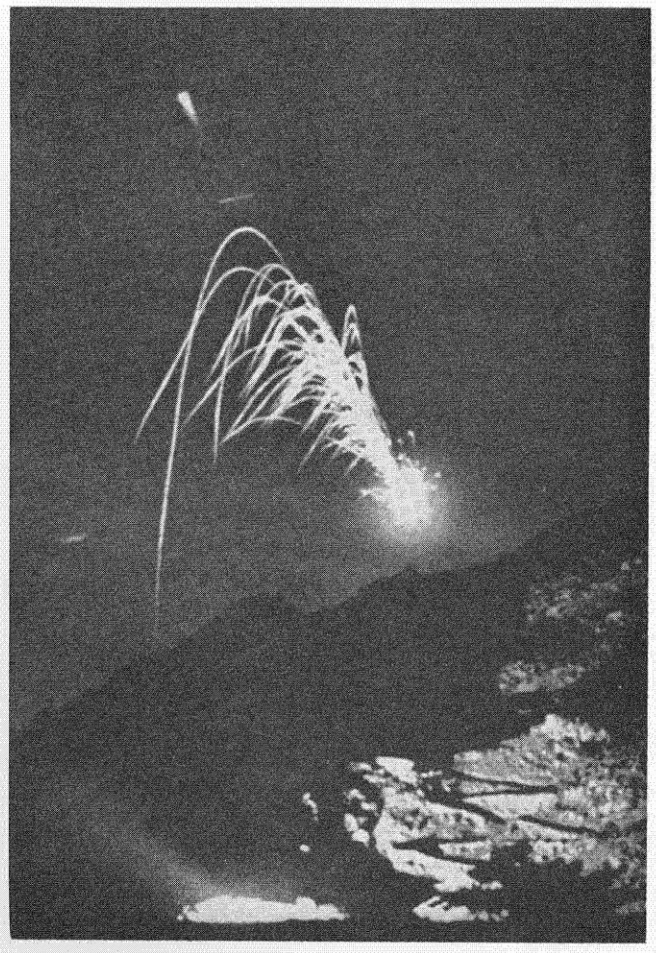
THE ANNIVERSARY OF A HISTORIC FAILURE

by Albert G. Wilson



A test of artificial meteors—December 16, 1946.

The pages of *Engineering and Science* magazine provide a historical record of many of the achievements and successes of Caltech researchers—alumni and staff. The dead ends and failures rarely appear in print. Fortunately for publication costs, few people want their failures recorded. However, now and then certain types of failures become historic and deserve a place in the record.

The 17th of December this year marks the 20th anniversary of such a historic failure—the first attempt to launch particles into space with escape velocity. A team of Caltech men headed by Fritz Zwicky, professor of astronomy, in cooperation with Army Ordnance, the Johns Hopkins Applied Physics Laboratory, the Harvard College Observatory, and the New Mexico School of Mines, put together a project in White Sands, New Mexico, combining the hardware components available in 1946 in a way which, theoretically, would launch a few pellets in orbit about the earth or throw them off into interplanetary space. Two marginal devices and one valid motivation made the attempt worthwhile. The devices were the V-2 rocket and the Monroe rifle grenade or "shaped charge." The motivation was to generate a shower of artificial meteors in order to calibrate the luminous efficiency of natural meteors.

The possibility of throwing something up that would not come down again fired the imagination. Although there had been 16 postwar V-2 rocket firings, this was to be first night firing of a V-2 in the United States. In those days the launching of a V-2, with or without an instrument on board, was as much news as the launching of a Gemini today. Dr. Zwicky, who designed the experiment, placed the event in historical context: "We first throw a little something into the skies, then a little more, then a shipload of instruments—then ourselves."

A V-2 rocket was equipped with six 150-gram penolite shaped charges with 30-gram steel inserts. These were set to fire at times after launching that would eject the slugs of molten steel at heights of approximately 50, 65, and 75 kilometers. At these heights the ejection velocities of from 10 to 15 km/sec would place the slugs either in orbit or on

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escape trajectory. The ultimate fate of a slug would depend on its mass and velocity. Most would be meteors, but some might not be consumed.

To determine the destinies of the meteors, a battery of K4 aerial cameras equipped with rotating shutters was scattered over the White Sands Proving Range. One of these was equipped with a transparent objective grating to obtain spectra of the V-2 exhaust jet and the luminous artificial meteors launched. The sites were selected to acquire optimal triangulation data. In addition the Caltech eight-inch Schmidt camera was removed from its usual house at Palomar and set up a few miles south of the launch site to photograph the flight of the V-2 rocket and of the particles ejected from the shaped charges. Astronomers at nearby observatories with wide angle telescopes also focused in on the firing.

As this 17th postwar V-2 left the pad at $22^h\ 12^m\ 49^s$ mountain standard time, expectations were high. There was a feeling that history was being made. There was also the anxiety that has become as much part of every launching as the countdown. (The 16th rocket, fired a few days earlier, had tilted on lift-off and travelled 131 miles horizontally.) Lifting slowly, No. 17 filled the whole range with sound and, falling upward, held true to its course—5° tilt north. The shutters clicked and telescopes tracked—then burnout. But the rocket could still be followed by the red glow from its exhaust vanes. The time came and passed for the three pairs of charge detonations. Nothing was seen. The rocket mounted to a new record of 114 miles, then returned to earth.

Films were hastily developed in hope of seeing on the emulsion what could not be seen in the sky. But there were no trails. Tests of the charges made on previous evenings had been in every way successful. Had the charges fired, but been undetected? Subsequent investigations have not solved the mystery of just what did happen.

Just as man's first attempts at flight in the atmosphere failed, the first attempt to reach space with a chance of succeeding also failed. It is significant, however, that whereas the span between the first attempts to fly and the first successful flight is measured in centuries, the span between the first attempt to achieve orbital velocity and the successful orbiting of Sputnik was only one decade. Those who participated directly and indirectly in this experiment, though failing to launch the space age on the night of December 17, 1946, have to their credit an important contribution leading to later triumphs. Zwicky's idea was ultimately vindicated, when success crowned the *second* experimental firing of shaped charges from a rocket on October 16, 1957—twelve days after Sputnik.