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Chapter 6

Project Farside*

S. Fred Singer†

Project Farside, sponsored by the U.S. Air Force Office of Scientific Research (AFOSR) during the period 1955 to 1958, was designed to furnish a low-cost method for penetrating the Earth's magnetosphere and even reaching beyond the Moon. It was based on a four-stage solid-propellant balloon-launched rocket vehicle, using available rocket motors. The initial phase was to have reached an altitude of 4,000 miles (6,400 km), or one Earth radius. Under contract to the AFOSR office in Pasadena, I carried out the basic design in 1955, and an instrument package containing a single Geiger counter was built at the University of Maryland. My proposal was to measure the increase with altitude of the primary cosmic radiation and to look for the existence of particles trapped in the Earth's magnetic field, i.e., radiation belts. Aeronutronics Corporation, later a division of Ford Motor Company, carried out the engineering and construction, and they supervised the launch activities. These were speeded up greatly after the launch of Sputnik-1 in 1957, and they took place in great secrecy in late 1957 from the island of Eniwetok. Unfortunately, most of the launch attempts failed, according to what few reports became available. The two successful launches did not carry the Geiger counter instrument, and no scientific results were transmitted to the University of Maryland.

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As a consultant to the Office of Naval Research in 1953-1954, I had become interested in achieving high altitudes with small rockets. The big problem seemed to be the energy loss (or velocity loss) due to friction of the lower atmosphere. A straightforward way to overcome this is to lift the rocket to high altitudes by means of a balloon. This was accomplished by J. A. Van Allen, following the suggestion by Lieutenant Lee of the U.S. Navy. Another approach is to fire the rocket from a high-altitude airplane. I achieved this in a project which we named "Rockair," in which an A/C rocket of 2.75 inch diameter, at a cost of about two hundred dollars, was fired from a Navy fighter plane. These tests were carried out at Patuxent Air Force Base around 1955, and they were successful. They gave us the means of getting meteorological data at low cost up to altitudes of something like 50 to 60 kilometers.

Another approach to overcome atmospheric resistance is to use a slow-burning rocket, which achieves most of its propulsion at higher altitudes where the air density is less. This was done by Atlantic Research Corporation in its Arcas rocket, which is widely used for meteorological purposes.

I followed yet another approach, using a Loki rocket as a first stage. I put the instrumentation into a second stage which had no propulsion but was simply a thin pencil of one inch diameter. I also designed this pencil, containing subminiature instrumentation, to be stable without fins, thereby further decreasing air resistance. This was done by putting the mass far forward in the nose of the pencil, using a tungsten tip. These flights were successful, and we christened the project Oriole rocket, after the Maryland state bird.

I also tried a third approach, namely, a two-stage rocket, which we called the Terrapin, after the University of Maryland mascot. In firings from Wallops Island and offshore we achieved altitudes on the order of eighty kilometers.

By 1955, I was therefore involved in a number of ways of achieving high altitudes with small and cheap rockets. It then occurred to me to combine these several principles in order to achieve extremely high altitudes, up to about one Earth radius or four thousand miles. I named it HARVIE, which stands for "high altitude research vehicle," and I persuaded the AFOSR to take me on as a consultant to develop this project.

I do not remember now how I got in touch with AFOSR. It might have been through Colonel William O. Davis, whom I knew in Washington. But I do remember meeting the director of the Pasadena Office of AFOSR, Dr. Morton Alperin, in Paris in the summer of 1955. We were both on our way to a Congress of the International Astronautical Federation in Copenhagen. I think it was somewhere in those few days that I persuaded him that such a project was feasible and could be done at extremely low cost.

I outlined to him a four-stage rocket vehicle, which would first be carried to a 100,000 foot altitude by means of a large plastic balloon. The first stage would consist of four Recruit rockets, the second stage of one Recruit rocket, the third stage of four Loki rockets, and the fourth stage would be a single Loki. I had verified that this combination of staging was optimal in giving the highest velocity, and therefore the highest eventual peak altitude, for a certain vehicle weight. The payload, of course, could only be a few pounds.

I proposed that I design a payload based on my experience with cosmic ray detectors, consisting of a thin-walled Geiger counter, counting circuits, and telemetry—really quite a simple instrumentation. Nevertheless, as I pointed out to Mort Alperin, the scientific payoff could be very great. Not only could we observe the primary cosmic radiation at much higher altitudes than had ever been done before (the previous maximum was about 100 kilometers and we proposed to go over 6,000 kilometers), but also I had hypothesized the existence of trapped particles, which would be energetic enough to penetrate into the Geiger counter. I had visualized these particles as trapped in the Earth's magnetic field, although not quite in the form in which they were later discovered in Explorer I. I remember publishing the details of the vehicle design and of the scientific objective in the magazine *Missiles and Rockets* sometime around 1956. Specifically, the idea of looking for geomagnetic trapped particles was laid out in this article.

Mort Alperin was very much taken by my idea, since at that time the Air Force was frozen out of satellites and other exciting space work. The Navy had gotten the go-ahead to design the Vanguard satellite based on the Navy Viking rocket. Incidentally, the Army was also frozen out. Wernher von Braun, whom I visited at Huntsville in 1956, was chafing at the bit. He had the Jupiter rocket, which he thought would be quite adequate to put a small satellite into orbit. In fact, at a later date it did, of course, launch Explorer I.

During the following two years, I made many trips to Pasadena to visit the AFOSR. I completed the detailed design study for the propulsion system. The contract was eventually given to Ford-Aeronutronics. I was given a small contract to build the payload and delivered the appropriate number of units to them sometime in early 1957.

In the meantime, there was a lot of infighting between the Air Force and other government organizations. The commanding general of AFOSR seemed to believe that the vehicle would eventually reach the Moon and look at the other side of the Moon. He therefore decided to name the project Farside.

I remember that we were somewhat appalled by this idea, because we wanted to keep it rather quiet and avoid attracting too much attention. I had hoped, of course, that if the flight was successful, and the scientific results inter-

esting, then we would release the information in the proper way. This, however, was not to be the case. By mid-1957, the project had gotten bogged down. The vehicles had been built, but the actual authorization to do the launch was delayed for reasons which I do not know.

In October 1957, Sputnik was launched, and this suddenly changed everything. All of a sudden, the Air Force was very intent on launching Farside in order to score some kind of a spectacular counter-success. Unfortunately, they pushed too hard. The story, as I got it from Colonel Gene Lavier, was as follows.

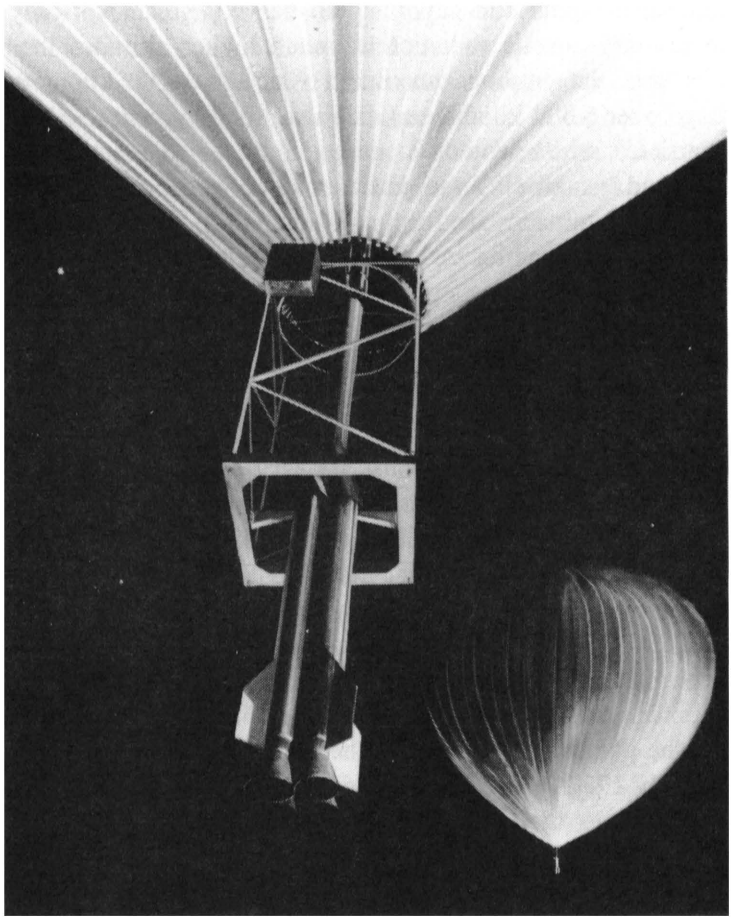

Figure 1 Artist's rendering of Farside rocket suspended beneath its balloon (Photo: SI 76-1706, courtesy of General Mills, Mechanical Division).

About six balloons and rocket vehicles were taken to Eniwetok in the Pacific. The launchings were pushed ahead because of public relations. However, the meteorology was not right. A couple of the balloons froze up and did not reach altitude. Some of the vehicles were successful, so I was told, but I never saw any telemetered results from my experiment. To this day I have no idea whether my Geiger counters reported the trapped radiation which was later discovered by the Explorer I satellite and by Sputnik III.

The Air Force works in mysterious ways, and I have never quite penetrated the curtain of secrecy which now surrounds this project. I am happy to say, however, that the complete Farside vehicle is on display at the Smithsonian National Air and Space Museum, together with a little note that Fred Singer of the University of Maryland prepared the instrumentation.

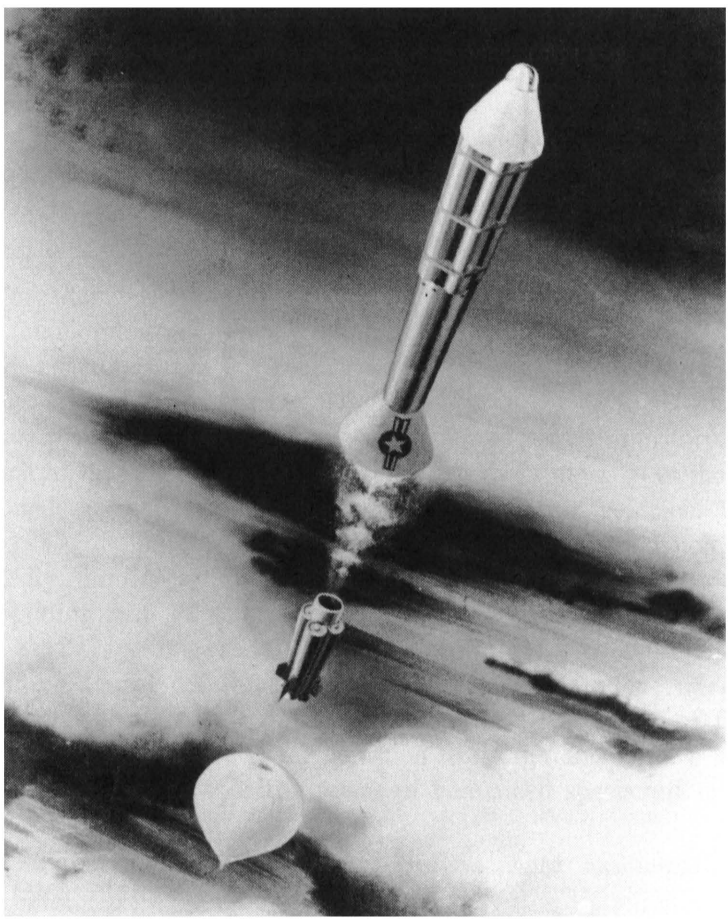

Figure 2 Farside launch (Photo: SI 76-1705).