

# SCORE

Project SCORE, the first major project accomplished at RCA Astro, was undoubtedly one of the most important milestones in the US space program, as it signaled a major change in government priorities and erased, at least for a while, the separation between the Defense Department's intercontinental ballistic missile program and the development of space for civilian purposes.

In 1957 our civilian space program was foundering. Attempts to orbit a basketball size satellite, Vanguard I, in support of the United Nations' first International Geophysical Year, ended with two successive failures with the rocket lifting a few feet, falling over and breaking on the way down, with the satellite landing on the beach at Cape Canaveral. This ignominious scene was reported by newsreels to the amusement of audiences around the world.

Suddenly and unexpectedly, on October 4, 1957, the Russians startled the world by launching the first artificial satellite, Sputnik. The effect on US morale was devastating. After years of being told by our government that Russian technology was no match for Yankee know-how, the Russians had won the space race! To drive the point harder, Sputnik was equipped with a radio transmitter operating in a frequency band readily picked up by radio amateurs around the world. The repeating BEEP BEEP from Sputnik proclaimed Russian technical superiority around the world. I personally remember being in New York for the annual Audio Engineering Society convention when someone placed a receiver, oscilloscope and speaker in one of the display windows of the New Yorker Hotel. People on the street would stop and listen to the repeating BEEPs and watch the signal on the oscilloscope in real time as the satellite passed over several times a day.

Pundits, in television and radio interviews tried to downplay the importance of the Russian accomplishment by pointing out that "after all, Sputnik only weighed 84 kilograms (184 pounds) so it did not pose a threat to our national security because it was too small to carry an atomic bomb. It was also claimed that Sputnik was much less sophisticated than Vanguard (which incidentally only weighed 1.4 kg - 3 pounds).

Then, only 30 days after Sputnik, the Russians gave us the "2 punch", right on the chin. On November 3<sup>rd</sup> they launched Sputnik 2. This time, not only it was a considerably heavier spacecraft, weighing 508 kg (1121 pounds), but it carried a live dog, Laika, as the payload. This accomplishment really captured the imagination of people around the world. These were things which up to that time were only the purview of science fiction and fantasy stories. The heavier mass made it clear to the general public that the Russians were indeed capable of launching an atomic weapon at the US if they so desired, in spite of our government's assurance to the contrary. The result was a curious combination of public fear and rage.

The public placed the blame squarely on the shoulders of the government bureaucracy and politicians. The government blamed the decay of the educational system. It was clear that the public was enraged at the failure of our leaders and that something had to be done.

Enter the military. Up to that moment, government policy was to keep the civilian space program strictly isolated from the military intercontinental missile program. Clearly the situation had changed overnight and something had to be done to regain the initiative and reassure the public. ARPA, the Army Research Projects Agency, came up with the idea of placing a voice communications payload in orbit using an Atlas ICBM. In order to save time, no “satellite” would be built, but instead the payload would be bolted inside the nosecone of the missile. The Army’s Signal Research and Development Laboratory in Fort Monmouth, New Jersey was given the job and the Laboratory selected the nearby RCA Astro plant to actually carry it out.

The communications subsystem, designed by RCA, consisted of two identical redundant payloads (to protect against a failure during launch), each consisting of a receive antenna, receiver, control system, tape recorder, transmitter and transmit antenna. The control system permitted actuating all the functions remotely by means of simple control tones. The payload was powered by silver-zinc batteries which would be capable of operating the payload intermittently for the 21 day planned mission life and thus avoid the complexity of solar cells and rechargeable batteries. The tape recorder had a 4 minute capacity and a real-time mode of operation was provided which bypassed the tape recorder. Any of the four ground stations in the southern US could command the satellite into a playback mode to transmit the stored message or into a record mode to receive and store a new message.

The entire communications subsystem was developed in six months by modifying commercial equipment and launched on December 18, 1958. The primary objective of the project was to demonstrate that an Atlas missile could be put into orbit. The secondary objective was to demonstrate a communications repeater, perceived as “more sophisticated” than the simple one-way transmissions of Sputnik. For obvious reasons the project was named “SCORE”. The program was an unqualified success and about 8 hours of actual operation were accumulated before the batteries failed on December 30 1958.

To maximize the public impact of this project, and by implication the US space program, it was decided to use this payload to record and later broadcast a Christmas message from President Eisenhower that could be easily received by ham radio. This was successfully done (after a few initial problems as we will see), as well as single-channel and frequency multiplexed six-channel Teletype messages.

A little known anecdote is the following. The plans for the Presidential broadcast had been extensively publicized and the reputation of everyone involved, as well as the US Space Program was riding on its success. As in any pioneering project such as this, people were understandably nervous. Someone (maybe an RCA engineer) decided it would be a good idea to hedge their bets by pre-recording the Eisenhower message on the on-board tape recorder before the launch. That would eliminate any potential difficulties in transmitting the message from the earth stations. Only one problem... everyone forgot about doing it until the payload was on the rocket and ready for launch! It would, of course, be easy enough to transmit the message to the rocket on the pad and record it before liftoff. The only problem was that, because of all the publicity, some radio amateur or member of the press would be sure to detect the transmission and let the cat out of the bag. The solution was a typical pragmatic engineering solution – wait till the wee hours of the morning and hope that everyone would be sleeping, getting ready to watch the launch the next day. This was done with no-one the wiser.

The next day, the Atlas was successfully launched. At the proper time, one of the ground stations commanded the transmitter on and the tape recorder into playback and out came, not Eisenhower's message, but some strange Slavic sounding language! Suspicion immediately fell on the Russians – maybe they had replaced Eisenhower's message with one of their own! After some time, it was decided to transmit Eisenhower's message from the ground, store it on the on-board tape recorder and play it back as originally advertised. To everyone's immense relief, it worked flawlessly!

An investigation followed into the original mishap. It was quickly realized that the strange language was Hebrew, not Russian, and that the original recorded message originated at an Israeli radio station. It appears that the identification tones of the radio station were identical to the command tones to place the on-board tape recorder in record mode, so the radio station transmission accidentally placed the tape recorder on record mode. This obliterated the previously recorded Eisenhower message and substituted for it whatever program was being broadcast.