Ball Aerospace designed the Combined Release and Radiation Effects Satellite (CRRES) to study the electrical, magnetic, and particle environment of space near Earth, and to improve the performance of future satellites.

Ball Aerospace created the satellite for NASA’s Marshall Space Flight Center and the Department of Defense (DOD) to help scientists determine how long various electronic parts could withstand the cosmic bombardment encountered in orbit.

CRRES was specifically designed to withstand brutal conditions caused by intense solar activity; by flying in the harshest of orbits, it provided vital data, which helps prolong the lifetimes of current and future satellites.

CRRES carried 24 canisters containing barium, lithium, strontium, and calcium - all chemicals that are not harmful to the Earth or its atmosphere - and for each experiment it ejected one or two canisters. The released chemical vapors were then ionized by the sun’s ultraviolet light. This created luminous bright red and blue clouds that stretched along the Earth’s magnetic field lines, briefly “painting” these invisible structures as wide as 125 miles.

By observing the motion of the released clouds, scientists were able to measure electric fields in outer space to understand how the Earth extracts energy from the solar wind. These observations, coupled with particle measurements, led scientists to discover a third radiation belt between the inner and the outer Van Allen Radiation Belts in the magnetosphere.

CRRES was launched in 1990 from Cape Canaveral aboard the first commercial launch of an Atlas I expendable launch vehicle. It carried 50 instruments to complete 14 experiments.