An Innovative Method for Protecting Optical and Sensory Devices on NASA's Curiosity Martian Rover and Other Terrestrial Rovers by Using Electrostatic Properties

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On Mars, research rovers traversing the surface are frequented by harsh Martian dust storms which are harmful because dust clogs or coats their optics, sensors, and solar panels, reducing their efficiency. Terrestrial dust has been described as one of the most intricate technological problems limiting the lifetime of many missions." (Centro de Astrobiologie, Spain). The NASA rover Spirit was lost due to dust coating its solar panels, and it, along with its twin Opportunity, has had strained power supplies throughout its lifetime. The current solution to this problem is rudimentary at best, and involves simply angling the rover away from or into the wind to try to avoid the dust. Although the threat is extreme, widespread efforts to overcome the problem have not been seen due to the recent timeframe in which it has arisen and become noticeable. Thus, the aim of this project was to seek and develop an innovative solution. This project consisted of five main components: (1) Ideas/methods to remove dust were investigated, and (2) a novel idea involving electrostatic fields was prototyped. (3) Trials and tests were conducted on this apparatus and data was collected. (4) Upon reviewing the correlations as well as the relevant mathematical equations, optimization of the prototype was performed. (5) Finally, this optimization process was repeated as improved stages of the invention were prototyped. The findings were encouraging. Later stages of the contraption proved not only to be more effective, but also more versatile and robust in their applications as well. This technique can be utilized not only on rovers on terrestrial objects, but also to control dust on Earth in high-tech manufacturing and mining environments, as well as other unmanned vehicles such as drones.

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