



Technology Focus: Wireless Communications

Deployable Wireless Camera Penetrators

Disposable, wireless camera darts can be used in zero G, or for surface surveys.

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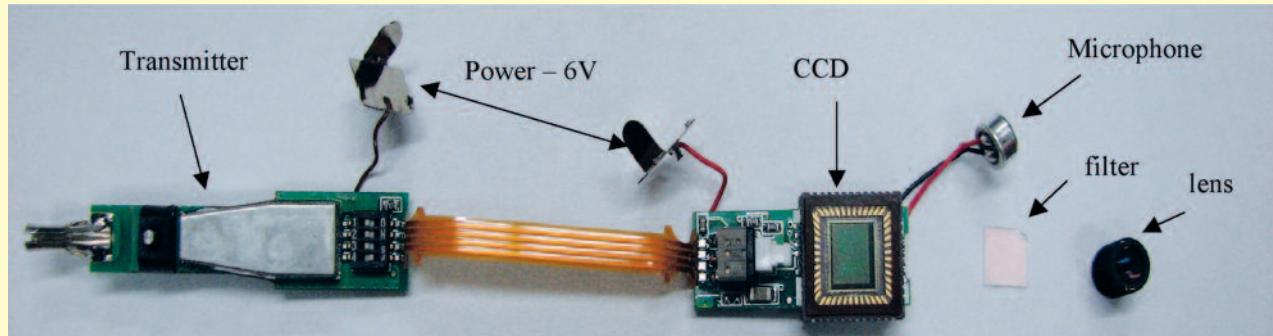


Figure 1. Components of a "Spy Pen" Camera incorporated into the dart camera weigh less than 8 grams. The unit produces VGA color images and sound at 30 frames per second and transmits up to 100 m.



Figure 2. CAD Models of the penetrator prototype.

A lightweight, low-power camera dart has been designed and tested for context imaging of sampling sites and ground surveys from an aerobot or an orbiting spacecraft in a microgravity environment. The camera penetrators also can be used to image any line-of-sight surface, such as cliff walls, that is difficult to access.

Tethered cameras to inspect the surfaces of planetary bodies use both power and signal transmission lines to operate. A tether adds the possibility of inadvertently anchoring the aerobot, and requires some form of station-keeping capability of the aerobot if extended examination time is required. The new camera penetrators are deployed without a tether, weigh less than 30 grams, and are disposable. They are designed to drop from any altitude with the boost in transmitting power currently demonstrated at approximately 100-m line-of-sight. The penetrators also can be deployed to monitor lander or rover operations from a distance, and can be used for surface surveys or for context information gathering from a touch-and-go sampling site.

Thanks to wireless operation, the complexity of the sampling or survey mechanisms may be reduced. The penetrators may be battery powered for short-duration missions, or have solar panels for longer or intermittent duration missions. The imaging device is embedded in the penetrator, which is dropped or

projected at the surface of a study site at 90° to the surface. Mirrors can be used in the design to image the ground or the horizon. Some of the camera features were tested using commercial "nanny" or "spy" camera components with the charge-coupled device (CCD) looking at a direction parallel to the ground.

Figure 1 shows components of one camera that weighs less than 8 g and occupies a volume of 11 cm³. This camera could transmit a standard television signal, including sound, up to 100 m.

Figure 2 shows the CAD models of a version of the penetrator. A low-volume array of such penetrator cameras could be deployed from an aerobot or a spacecraft onto a comet or asteroid. A system of 20 of these penetrators could be designed and built in a 1- to 2-kg mass envelope.

Possible future modifications of the camera penetrators, such as the addition of a chemical spray device, would allow the study of simple chemical reactions of reagents sprayed at the landing site and looking at the color changes. Zoom lenses also could be added for future use.

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