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# BIRD'S EYE VIEW

Unsurprisingly, the best place to watch an earthquake from is up in the air. And a balloon may be the best platform of all. The annual meeting of the Global Disaster Information Network in Italy last week saw the introduction of a new type of balloon-based satellite that could provide communications and remote sensing data for disasters in remote areas of the world with no technological infrastructure.

The new monitoring systems are the brainchild of America's Global Aerospace Corporation (GAC). Known as "Stratospheric Satellites", the platforms consist of NASA-developed "super-pressure balloons" that fly at 110,000 feet, combined with steering systems and a solar array used for power. They can carry payloads up to 2000 kg, roughly the size and weight of a small truck. This package could consist of just about anything, but in a disaster scenario, packages of sensor and camera arrays would be most likely.

According to Dr. Alexey Pankine, Project Scientist at GAC, "The super-pressure balloon component of the Stratospheric Satellite was flown successfully in a short NASA test flight on June 6, 2000." Since then, super-pressure balloons have been



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developed for larger and longer flights -- advanced designs are projected to have a flight life of 3-10 years. Global Aerospace developed a trajectory control and solar array system for the super-pressure balloon, allowing it to be steered and loitered over disaster areas and powered over the course of its lengthy mission.

Balloons have been flying for decades in Earth's stratosphere, which has an atmosphere as thin as that on the surface of Mars. Conventional stratospheric balloons (like those used to monitor weather) have lifetimes limited to a few days because of the daily heating and cooling of the envelope. Helium super-pressure balloons, currently under development for NASA's Ultra Long Duration Balloon (ULDB), will fly more than 100 days and perhaps as long as a year. Smaller super-pressure balloons carrying payloads of only a few kilograms have already flown for as long as a year. These designs will pave the way for the multi-year versions GAC predicts.

At a current cost of $1.75M per unit for development, and a projected life-cycle cost of $500,000 or less per unit in production, Stratospheric Satellites are a low-cost and low maintenance alternative to remote communications platforms provided by aircraft and orbital satellites. Because Stratospheric Satellites fly so much closer to the ground than space-based platforms, they provide surface images with 20 times higher resolution and radar scanning with 160,000 times the signal strength.

In addition to monitoring global disasters, Global Aerospace is considering other uses for the new technology. According to Kerry Nock, President of GAC, "Because they are relatively inexpensive, can be steered, are independently powered, and can carry a large payload, they will probably be the most cost effective way of bridging the last mile in telecommunications coverage." A constellation of 400 Stratospheric Satellites covering most of the populated areas in the northern hemisphere is projected to cost less than $100 million – less than the cost of a single space-based satellite including its launch. Operations costs are expected to be less than $10 million per year.


Far from Earthly deployment, balloons are also being considered as a vital link in exploration of Mars. Balloons could fly one hundred times closer to the surface of Mars than orbiters and can travel a thousand times further than rovers in a comparable period, thus providing views of much broader areas of the surface.

A Mars balloon would be deployed soon after the transporting spacecraft enters the Mars atmosphere and would be rapidly inflated from a helium tank as the payload descends beneath a parachute. After inflation, the parachute and tanks would detach and the balloon and its science payload would then fly at a nearly constant altitude for both day and night. The balloon's internal pressure would be higher during the day than at night, although the balloon volume would remain the same. Strong, lightweight, leak-proof material is under development to permit large payloads to be flown on Mars by such a balloon and tests of balloon deployment in the Earth's atmosphere are underway. Payloads would include imaging, magnetometers, spectroscopy and any technique that can benefit from surface proximity.

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