

## Cassini: Well Worth the Small Risk

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The spectacular advances in planetary science of the Cassini-Huygens mission to Saturn were outlined and illustrated in a recent talk at Sonoma State University by Cassini deputy project scientist Linda Spilker. As we were admiring the breathtaking new high-resolution images of Saturn's rings and satellites, we recalled the controversy surrounding Cassini's launch in October 1997 and its Earth flyby in August 1999.

We realized how challenging it is to assess accurately the benefits and perils of many significant scientific ventures. Wild exaggerations of risk can be hard to dispel when the technical issues involved are poorly understood by the public.

In 1996 State University of New York journalism professor Karl Grossman called for cancellation of the Cassini mission because of what he claimed was a serious danger from the space probe's radioactive power source. Cassini contains 72 pounds of plutonium in three radioisotope thermoelectric generators (RTGs).

In numerous articles and his book *The Wrong Stuff*, Grossman argued that an accident during Cassini's launch or an inadvertent reentry to the Earth's atmosphere during its "gravity assist" flyby could result in disintegration of the RTGs and a catastrophic release of plutonium into the atmosphere, threatening thousands if not millions of human lives.

Few reputable scientists supported Grossman's analysis. RTGs had been used safely before, most notably on the Voyager 1 and 2 missions to the outer planets, launched in 1977, and the Galileo mission to Jupiter, launched in 1989. The late astronomer Carl Sagan, a strong opponent of nuclear weapons, endorsed the Cassini mission and urged the peace movement to focus on more urgent tasks.

Cassini's RTGs, scientists pointed out, are not nuclear reactors. The natural decay of the RTGs' plutonium generates heat that is converted into electricity. No chain reaction takes place, and there is no possibility of a nuclear explosion. Further, the plutonium is packaged in small encased pellets and surrounded by a graphite shell. Disintegration of the plutonium is highly unlikely in the event of an accident. In fact, in the two instances when NASA-designed RTGs accidentally reentered the Earth's atmosphere, no radiation was released, and the RTGs remained intact.

Despite the minimal risk involved, Grossman's argument was taken up by some activists from the peace, environmental, and anti-nuclear movements. In *Censored 1997*, Project Censored designated Grossman's articles as its No. 1 under-reported story of 1996, writing that NASA could expose "billions" of people to radiation. The height of rhetorical excess was reached by peace activist and physician Helen Caldicott, who wrote in opposition to Cassini in *The Nation*, "Plutonium is so toxic that one pound distributed around the Earth in particles small enough to be inhaled could induce lung cancer in every person on the planet." The likelihood of this hypothetical scenario is infinitesimal.

But was there a feasible alternative power source for Cassini? Grossman maintained that European scientists were close to producing more efficient solar cells that would soon provide a safe power source for missions to the outer planets. Eight years later, no such solar cells are available for extensive use beyond the orbit of Mars. For Cassini, Spilker said, "solar panels the size of tennis courts" would have been required. Cassini would have to be RTG-powered, or postponed indefinitely.

Cassini is proving its scientific value. Beyond the awe-inspiring images, we have received new information about the composition and geometry of Saturn's rings, helping refine ideas about the formation of planets in our solar system. And in December, if all goes well, the Huygens probe will deploy from Cassini, and in January will descend into the atmosphere of Saturn's moon Titan, giving us a first glimpse of a world that may resemble Earth at the dawn of life.

Many current controversial scientific innovations – from biotechnology to new designs for nuclear power plants – will require careful assessment of possible risks and benefits. We must approach these case by case, not with some reflexive anti-technology reaction. In the case of Cassini, the rich scientific results have proven well worth the minimal risk.

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