

September 1997

The National Space Society: A Position Statement

The Cassini Mission To Saturn

Prepared by the National Space Society Policy Committee

The National Space Society believes the plutonium-fueled radioisotope thermoelectric generators (RTGs) on Cassini represent a minuscule risk taken for great gain in scientific knowledge. Scientific analysis of the risk of radiation release shows that the risk of release is very small and the consequences of a release, even if it happens, are very minor. To not fly the mission after the substantial investment, and considering the great scientific importance of the mission, is irresponsible.

The RTG containers are designed and tested to survive launch accidents without releasing radiation. While much has been made of the risk associated with the Earth swingby of Cassini, the risk is vanishingly small compared to the risk of Earth impact of a near-Earth asteroid. There are hundreds of near-Earth asteroids big enough to create devastation upon Earth impact, flying around the inner solar system. There will only be one Cassini and it is guided so as to not hit Earth.

Discussion

The principal risk involves possible failure in the launch vehicle. The RTGs are designed and tested to survive such an accident intact. Most launch failures would deposit the RTGs in the ocean, where they would sink harmlessly to the bottom. This has happened once before. In the event of a pad explosion, the RTGs would be recovered intact. There is a slight risk of the craft being stuck in Earth orbit, if the Centaur stage runs properly for orbit insertion but fails to restart. In this case, Cassini would reenter Earth's atmosphere after a few weeks or months. The RTG fuel canisters are designed and tested to survive reentry intact. If they impact on land they can be recovered, if at sea they will sink. In either case the plutonium is not released.

Most of the fuss has been made over the planned use of an Earth swingby trajectory to gravity assist the Cassini on its way to Jupiter, where it will receive another gravity assist to Saturn. The RTGs are not designed to survive reentry at the speed that would be obtained from an inadvertent collision with Earth instead of the planned swingby. The effects of such a reentry and dispersal of the plutonium have been analyzed and represent a very small risk. Please point your browser to to access the "Plutonium Primer" by Cassini scientist Jeff Cuzzi for a common-sense analysis.

It is also important to realize that the risk of Cassini's hitting Earth is exceedingly small. Interplanetary navigation is not difficult. Interplanetary navigation through the series of planetary swingbys required for Cassini is very safe. For example, if the first swingby is to be Venus, followed by Earth, Venus is targeted so that in the worst-case Venutian swingby Cassini would subsequently miss Earth entirely. In fact, even in the case of nominal Venutian swingby, Cassini is targeted such that it would miss Earth without subsequent adjustments in its trajectory. A series of small thrust maneuvers nudge the trajectory, gradually reducing the preprogrammed discrepancy until the craft is on target for an Earth swingby. But the worst-case Venutian swingby always misses Earth. Remember we know where the spacecraft is,

literally within inches, by precision radar tracking.

Another thing to remember is that planets are actually hard to hit. There are hundreds of natural objects (small asteroids) flying around the inner solar system, any one of which would cause major devastation if it did hit Earth. They are unguided, and *we do not know where most of them are*.

Fortunately, such hits are rare. Cassini is guided in such a way as to miss Earth, and to leave the inner solar system permanently. People worried about Cassini could more productively worry about the asteroid danger. It's far, far worse, and little is being done about it.