

It's the bomb

Nuclear power could help propel spaceships on distant flights into the atmosphere

By Robert S. Boyd
KRT CAMPUS

WASHINGTON — To boost future space-ships to distant moons and planets, the Bush administration is turning to nuclear power, long a no-no for a nation nervous about anything to do with radioactivity.

Despite activists' fears of a nuclear accident, NASA has used small atomic generators to power scientific instruments and communications systems on at least 25 space missions over the last 30 years. Unlike batteries, which run down, or solar panels, which don't work well far from the sun, nuclear generators give steady, reliable, almost unlimited power.

Each of the Mars rovers, Spirit and Opportunity, has eight penny-sized pellets of radioactive plutonium aboard to keep its electronic instruments warm during the freezing Martian night. The huge Cassini spaceship, which will reach Saturn in June after a seven-year voyage, carries 72 pounds of plutonium to produce electrical energy.

To the dismay of some opponents of nuclear projects in space or on the ground, NASA has begun work on a far more controversial project.

For the first time, it intends to use a powerful nuclear-propulsion system to send a large scientific spaceship, traveling as fast as 50,000 mph, on a tour of the ice-covered moons of Jupiter, where scientists think they might find evidence of life.

NASA's science chief, Ed Weiler, calls the ship "Battlestar Galactica," after the science-fiction TV show.

The proposed spaceship will depend on nuclear fission — splitting uranium atoms — to propel it to the neighborhood of Jupiter, starting sometime after 2011.

When the atoms are split, they will generate heat that can be converted to electricity. The electricity, in turn, would accelerate electrically charged hydrogen atoms and speed them out the rear of the spaceship, thrusting it forward.

The multibillion-dollar mission is known as JIMO, short for Jupiter Icy Moons Orbiter.

It's the first phase of a larger NASA program called Prometheus, which is designed to develop nuclear propulsion for a series of space missions, including the human expedition to Mars that President Bush proposed in January.

NASA wants to spend \$2 billion developing Prometheus over the next five years. JIMO's trip to Mars would cost billions more. "Our nuclear budget is going up radically," Weiler said.

JIMO will be "difficult both technically and politically," Prometheus director Alan Newhouse acknowledged. Before the space reactor can get off the ground, members of Congress will have turned over several times and one or two new presidents will have been in the White House. Support for putting a nuclear power plant in space may not last that long.

"It depends on who wins the next several presidential elections," said John Pike, an expert on space policy and director of GlobalSecurity, a nonprofit organization in Washington. "Another administration might not want it."

Prometheus officials say a nuclear fission system would give a spaceship up to 100 times more thrust than a non-nuclear system of similar weight. JIMO could make the trip to Jupiter in one-third to half the time of today's vessels, which are launched by chemical rockets fueled by hydrogen and oxygen. Using current technology, the trip takes about 38 months.

Furthermore, the current generation of spaceships, once they've dropped off their booster rockets, depend on batteries or solar power, which have limited capabilities.

"Solar does not provide enough power at the outer planets, which are too far from the sun," Newhouse said. "Chemical (power) limits maneuverability and destination. We launch and we coast. We can't change targets. We can't operate many instruments. We can't transmit a great deal of information."

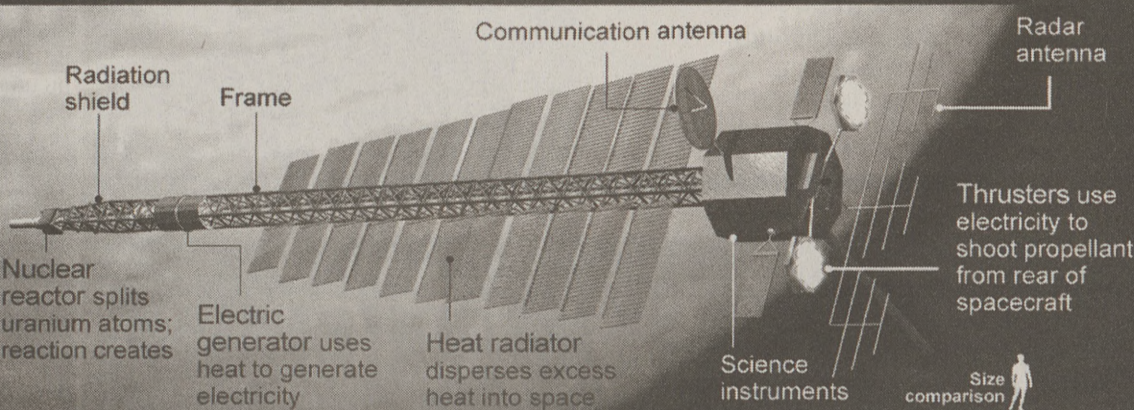
With nuclear propulsion, he said, "we have power all the way. We can go into orbit, slow down, stay there, go back, change targets. We have almost unlimited power for instruments. We can send back much more data. We have more launch opportunities. We don't have to wait for the planets to line up."

The pro-nuclear enthusiasm of the Bush administration rankles activists, who oppose putting atomic devices in space.

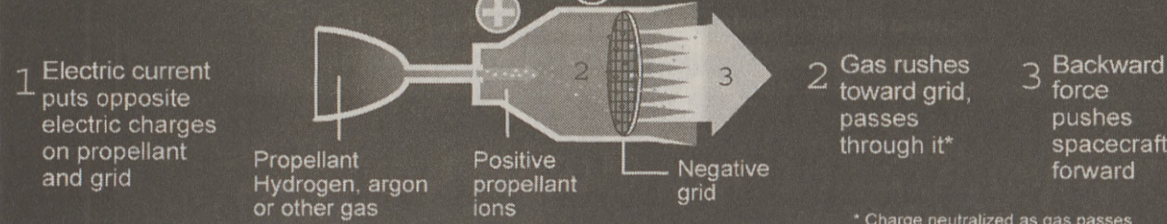
Bruce Gagnon, the coordinator of the Global

Nuclear power for long flight to Jupiter

The Jupiter Icy Moons Orbiter, a crewless space probe planned for some time after 2011, will have a nuclear engine, which is more powerful than non-nuclear engines but raises safety concerns.



How the thrusters work



* Charge neutralized as gas passes
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Network against Weapons and Nuclear Power in Brunswick, Maine, is concerned about the environmental consequences of an accident.

"We're told, 'Don't worry; everything is going to be safe,'" he said. "But space technology fails on occasion. We've seen enough examples, like the Russian 1996 Mars mission that fell back to Earth and spread a half-pound of plutonium around. Imagine if Columbia (the space shuttle that exploded last year) had a nuclear reactor on it."

NASA officials contend that JIMO will be safe. They point out that the spaceship will be launched on a conventional chemical rocket. The nuclear reactor won't be turned on until it's well out in space, beyond where it could fall back to Earth.

Even if a spaceship carrying uranium or plutonium blew up on the ground — or tumbled to Earth like Columbia — officials say there's little

risk of harm to people.

Unlike plutonium-239, the stuff of nuclear bombs, plutonium-238, the material used in on-board power generators, is "quite harmless," said John Hancher, a geochemist at George Washington University, in Washington. "It's used in pacemakers and navigation beacons. Its particles are stopped by the skin, clothing, even a piece of paper."

Fissionable uranium-235, which would be used for propulsion, is more toxic. But NASA says a space reactor isn't like an atom bomb — it can't explode. The worst effect of an accident on or near Earth would be scattered radioactive dust, which would be harmful only if breathed in.

"We will need presidential approval to launch nuclear material," Newhouse pointed out. "We have to think of safety up front."

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