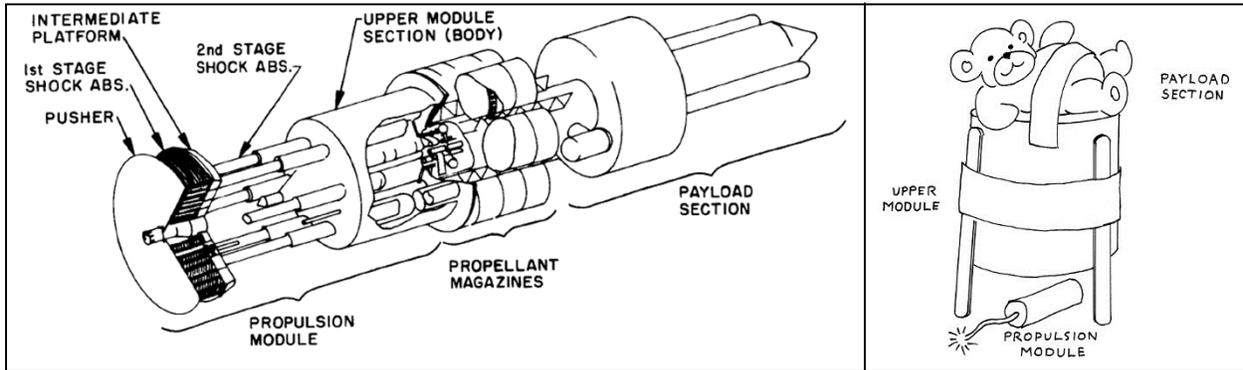


Spaceship Orion

Looking back toward the future

Sometimes there are perfectly good ideas that just don't make any sense—at least in a particular time and place. The United States' secret Orion spaceship program is one example. Let's look back at the early days of space exploration. In October 1957, the Soviet Union launched Sputnik, the first artificial earth satellite. It was twice the size of a basketball and weighed 185 pounds. Shortly afterward, the U.S. launched its first satellite. The next day, nuclear physicist, Ted Taylor, called theoretical physicist, Freeman Dyson, and suggested they design a vehicle that would blast into space on top of nuclear bombs, carrying humans throughout the solar system. Dreamers perhaps, but they almost did it.

Looking Back to the Future



What's the difference between an Orion spaceship and a tin can and firecracker? Not much, really.

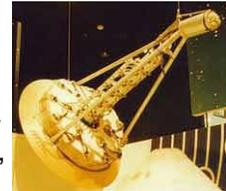
Set off a firecracker under a tin can and the can blasts upward maybe eight or ten feet and falls to the ground. Blow up an atom bomb under the Orion craft and it blasts upward as well. Both devices are powered by explosive propulsion. Orion doesn't fall back to Earth because it uses a series of timed explosions to keep it going. That is why Orion is said to use a nuclear pulse engine.

As illustrated above, the crew would live in the Payload Section at the top. This was as far as possible from the back of the spaceship.

A large, thick, metal pusher plate was attached to giant shock absorbers in the back. Small atomic bombs would be shot through a hole in the pusher plate and then explode. The pusher plate and shock absorbers would take the brunt of the blast and protect the passengers. Unlike today's rocket ships, weight was not an issue for the designers. Nuclear explosions are so much more powerful than liquid or solid fuel rockets, the Orion team joked that

they planned to take along an old fashioned heavy metal barber's chair.

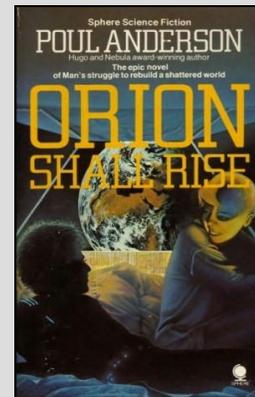
The concept of a pulse engine was tested with standard explosives. The "Hot Rod" to the right proved the concept. It is now at the National Aeronautics and Space Museum in Washington D.C.



The Orion Spaceship in Fiction

The Orion spaceship didn't make it into space, but it did find a place in our imagination. Several novels, including *Footfall*, *King David's Spaceship*, *Ilium*, *Anathem*, and *Orion Shall Rise*, feature spaceships using an Orion drive.

The 1998 film, *Deep Impact*, features a spaceship with an Orion drive. An early version of *2001: A Space Odyssey* include Orion type ships. And an episode of *Star Trek* included a 10,000 year old "Orion class" spaceship.



You must be a nut to design a rocket fueled by atom bombs. Right?

Well, not really. They had a bold idea—to some, a crazy idea—but the men who pushed it and worked on it were far from crazy. In all, there were around fifty men who worked on the project, which lasted from 1958 to 1965. Many of these scientists and engineers were the best in their field.

A child of missionaries, **Ted Taylor** was born and raised in Mexico. He grew up to be a physicist who specialized in atomic weapons and nuclear reactors.



Ted Taylor with Orion model

He designed both the largest and smallest atom bombs of his era. He helped design the “safe” TRIGA nuclear reactor that is in use around the world for medical purposes.

Taylor’s knowledge of atomic weapons led him to lead the Orion spaceship project. After-

wards, he became a world leader in the movement to destroy all nuclear weapons.

Born in England, **Freeman Dyson** migrated to the U.S. and followed Albert Einstein as a professor of physics at the Institute for Advanced Study. He took a leave of absence from the Institute to help design Orion.

Dyson is recognized both for his contributions to physics and his publications on science and disarmament, including: *Weapons and Hope*, and *Disturbing the Universe*.

Taylor, Dyson and many on the Orion team imagined themselves riding into space aboard the craft they were designing. Their slogan was: “Mars by 1965. Saturn by 1970.”

The project was cancelled in 1965, however, after the United States and the Soviet Union signed a treaty banning nuclear explosions in space. The U.S. landed on the moon in 1969 and cancelled the project in 1972.

Orion Shall Rise?

Could an old idea from the 1960s make sense in the 21st century? Maybe. In 1994 a comet hit the planet Jupiter. There were multiple explosions. The largest explosion left a spot on the planet that was twice the size of Earth. A similar impact on Earth would destroy the planet.

Shortly after observing these impacts, government scientists interviewed old members of the Orion team to learn more about the long terminated project.

Comets and asteroids pose a real threat to the Earth. Small hits and near misses are common. In 2004, a 30 meter asteroid flew past the Earth at 1/10th of the distance to the Moon.

The U.S. National Aeronautics and Space Administration (NASA) states that it expects an asteroid larger than 50 meters to reach the Earth around every hundred years. Every few hundred thousand years, an asteroid larger than one kilometer tends to hit the Earth doing great damage to all life. One such asteroid wiped out the dinosaurs. If one of these Earth changing objects is spotted, an Orion class spaceship may be called on to save the Earth in reality, not just in fiction.



Spaceship Orion | Key Terms

disarmament	To give up or reduce armed forces or specific weapons. “The United Nations called for nuclear disarmament.”
nuclear pulse engine	A way to power spaceships by using a series of closely timed nuclear explosions that hit a pusher plate and propel the ship into space.
physicist	A scientist who studies physics. A nuclear physicist studies atomic and sub-atomic materials.
Sputnik 1	The first man-made Earth satellite fired into space by the Soviet Union in 1957.
TRIGA reactor	A class of small nuclear reactor that is said to be very safe. Several of the Orion team worked on this project.

Discussion Points

1. A number of the scientists and engineers who worked on the Orion spaceship wanted to fly it into space. In addition to designing and helping build the craft, they wanted to be space explorers. If you had the opportunity to go to Mars riding on the explosions of atom bombs, would you like to go?
2. There is an interesting connection between the Orion project and the TV series, Star Trek. Don Prickett was an Air Force liaison with the Orion project. He had flown in World War II with Gene Roddenberry, the creator of Star Trek. Prickett introduced Roddenberry to the Orion team. Later Roddenberry brought out his new science fiction series. Some say that Spock was modeled on the physicist Freeman Dyson. What do you think?
3. Like the Orion team, the crew of the Starship Enterprise wanted “to boldly go where no man has gone before.” Do you think our world would be any different today if they had been able to meet their objective of “Mars by 1965. Saturn by 1970.”?



Credits

Page 1: Artists conception of Orion Spacecraft created by U.S. National Aeronautics and Space Administration (NASA)

Page 2: Orion diagram and photo of “Hot Rod” from NASA

Page 2: Illustration of tin can rocket by James Powrie

Page 3: Photo of Ted Taylor with Orion Model courtesy of Charles Powrie

Page 3: Photo of asteroid—Earth collision from NASA