CASSINI SPACE MISSION.

OGE ONUOHA
ALY SOUMARE
What is Cassini?

- Spacecraft, named after the Italian astronomer who discovered the largest gap in Saturn's rings.
- After fifteen years of detailed planning, the $3.4 billion Cassini mission to Saturn was one of the most complex, expensive and ambitious ventures in the history of space exploration.
- On October 15, 1997, NASA launched the Cassini space mission, which stands over two stories tall and weighs more than six tons, from Cape Canaveral, FL to Saturn.
- Traveling at approximately 43,000 miles per hour and powered by 72 pounds plutonium 238.
Cassini will first circle around Venus twice and then return to make a flyby of Earth, and then circle Jupiter. If the flyby is successful, it would allow the spacecraft to use the gravitational fields of the Earth and Venus to gain sufficient speed to make its way to Saturn.
Scheduled to arrive in orbit around Saturn in 2004 and will spend four years orbiting and scrutinizing the planet, feeding back data until at least 2008.
The principal objectives.

- Determine the three-dimensional structure and dynamical behavior of the rings;
- Determine the composition of the satellite surfaces and the geological history of each object;
- Measure the three-dimensional structure and dynamical behavior of the magnetosphere;
- Study the dynamical behavior of Saturn's atmosphere at cloud level;
- Study the time variability of Titan's clouds and hazes.
The Question.

- Was it ethical to launch Cassini spacecraft with the knowledge of the dangers and risks involved?

It is ethical.  
ALY SOUMARE

It is unethical. 
OGE ONUOHA
Cassini is not Safe.

- Contained 72 pounds of highly radioactive and carcinogenic plutonium 238. Largest amount of plutonium NASA ever launched in space.

- There was not one, but two crucial phases,
  - The early launch phase: was launched atop a Titan IV rocket which have nearly 10% failure rate
  - Fly-by phase: worldwide plutonium contamination due to the speed of about 43,000 miles per hour.

- A slight malfunction, miscalculation, or a random collision with any of billions of pieces of space debris could have resulted in the probe, and its deadly plutonium, reentering earth's atmosphere and thereby incinerating its deadly cargo.

- 1 in 476 chance of such a mishap later in the launch.
NSPE Code states:

- Engineers should be required to hold paramount human health in the performance of their engineering work.

- More than one hundred years of human experience with radioactivity has proved that radioactivity causes different cancer.
  - Plutonium is no different.
  - Pu-238, is especially dangerous because of it's rapid rate of radioactive decay.
Plutonium Dioxide in the environment WILL cause:

- Death
- Illness
- Genetic mutation for centuries to all life forms.

The science about Saturn which Cassini seeks to solve is not worth the cancers Cassini can cause.
IEEE Code of Ethics

- Canon 1: ...to accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to **disclose promptly** factors that might endanger the public or the environment.

- Canon 8: Engineers shall **consider environmental impact** in the performance of their professional duties.
Cassini was not only a threat to human being but also to the environment.

Cassini's Earth flyby poses the added risk of worldwide plutonium contamination in case of failure or guidance error.

Therefore posed a problem of air pollution.
Hold that when pollutants pose a clear and present threat to human health, they must be reduced below any reasonable threshold of harm.

In this scenario, contamination would not be limited to just the Florida Space Coast alone.

Nowhere on Earth would be safe from a plutonium cargo that makes an accidental reentry of the atmosphere.

Therefore, it is not reduced below any reasonable threshold of harm.
Golden Rule.

- Treat others as you would like them to treat you.

- Florida Residents would lose their lives and everything they own if there happened to be an accident during the launch.

- Is this what anyone would want for themselves?
Acceptable Risk.

- An Acceptable Risk is one in which risk is freely assumed by free and informed consent, or properly compensated, and which is justly distributed.
Summary of risk odds

- There is 1 in 1,400 chance of an accident early in the launch that would cause a plutonium release.

- A less then 1 in 1 million chance of the Cassini re-entering the atmosphere and releasing plutonium during its Earth fly-by.

Source: WWW.CNN.COM/CASSINI
Cassini is safe

NASA said:

- Cassini is not a reactor.
- Plutonium used is not fissionable.
- Plutonium used is not weapons-grade material.
- Cassini is reliable, no moving part.
Supporting Facts.

- 26 nuclear-powered space missions.
- 23 hits and three failures.
- In two out of the three failures the plutonium were retrieved intact, reinforced and flown.
- In the third flop, the plutonium remained intact and well insulated in the south pacific.
Informed Consent

To give free and informed consent to the risks imposed by technology, three things are necessary.

- First, a person must not be coerced.
- Second, a person must have relevant information.
- Third, a person must be rational and competent enough to evaluate the information.
A six-years government’s safety analysis of cassini’s mission. In which every fact has been substantiated by experts conclude that cassini’s mission is safe.

The information was available to the public.

The elected officials approved Cassini’s mission.

Public is moral agent.
Cassini’s Earthly Benefits

- **International Co-operation.**
  - 16 European countries and 33 US states participated to the project.
  - The Cassini program is an opportunity for space-faring nations to share in both the investment and scientific information.

- **Technology Utilization.**
  - Generated technological advances which are applicable to other unrelated fields.
Technology developed and qualified for the Cassini project could be adopted by new space science programs to develop a new class of low-cost, high-efficiency spacecrafts

- Contributions to education
  Help to make the math, and Engineering more attractive subjects to teachers and students
- Provide insights on the profound issues ranging from the origin of the planets to the beginning of life on earth
Utilitarianism

- Utilitarianism holds that the answer to any moral question is to be found by determining the course of action that maximizes well-being.
- The Cassini’s mission gives more benefits to the most people.
- The risk of deaths, injuries, or other harms associated with Cassini’s mission is negligible.
Conclusion.

- No compromise was reached in this debate.
Questions!!!!