We will use Paramecium caudatum because:

* It is easy to culture and produces large populations.
* It is hardier compared to other Paramecium species.
* It is well-researched, allowing easy comparison to existing studies.
* Its large size and clear body make it ideal for observing structural damage under a microscope.

Other species, like:

* Paramecium bursaria (which hosts symbiotic algae) would complicate the experiment because it introduces a second organism (the algae), making it harder to isolate the effects of freezing and radiation on just the Paramecium itself.
* Paramecium aurelia is smaller and less robust, making it harder to observe and culture for these kinds of extreme experiments.

Thus, Paramecium caudatum is the best and simplest model organism for this project.

Experimental Design:

The Paramecia will be placed in sealed sample containers and launched without active heating, allowing them to freeze naturally during ascent.

Key Environmental Challenges:

* Temperature: As low as -60°C. Paramecia will freeze, causing potential ice crystal damage to cells.
* Pressure: Very low pressure (~1% of Earth's surface pressure) may cause stress and dehydration effects.
* Radiation: UV and cosmic rays will be much stronger, possibly damaging DNA.

Since Paramecia lack natural cryoprotectants, most will likely die from ice damage. However, this provides an excellent opportunity to study:

* Cell survival after freezing without cryoprotection.
* Structural damage under a microscope.
* Potential resilience of single-celled organisms to near-space conditions.

Control groups will be kept at ground level to account for changes caused only by temperature and pressure (and not flight-specific factors like vibrations or radiation).

Why Freezing Without Protection is Valuable:

* Realistic Space Model: Simulates what might happen to life on icy planets (Europa, Mars).
* Simple and Natural: No need for complicated heating systems.
* Clear Results: Easy to observe cell membrane rupture and survival rates post-thawing.
* Potential Discoveries: Might observe rare survival events or adaptation-like behaviors.