

Design, build and launch a real space mission, step by step, the way NASA does.

TEAM CAPELLA STARS · RECIFE, BRAZIL · CHALLENGE: SPACE MISSION DESIGN GAME

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NASA Space Apps Challenge 2026

01 · THE PROBLEM

COSMOS ODYSSEY

Students rarely live a whole space mission

So the engineering behind every mission stays abstract.

01

Trade-offs stay on paper

Mass, fuel, energy and cost are numbers in a textbook. Nobody feels the price of one more instrument.

02

One topic at a time

Existing tools teach orbits, spacecraft or launch separately, never how one decision changes the others.

03

Failure without a reason

A wrong answer says "wrong". It never shows the chain of causes that would end a real mission.

Who feels it: students who love space but never see a mission end to end, and teachers who want to bring real NASA engineering into class.

02 · OUR SOLUTION

Cosmos Odyssey: play the whole mission

A browser game where you plan, build, launch and bring a spacecraft home with limited resources.

One early choice, like too little fuel or a weak heat shield, decides whether the mission comes home or fails. And the game shows you why.



- ✓ Follows the real NASA project life cycle, from concept study to return.
- ✓ Every part has a pro and a con: there is no perfect spacecraft.
- ✓ Runs in any browser: no login, no install, no data collected.

7
NASA project phases, played in order

16
random crew tasks, each with a science card

3
mission types: bring samples, study on site, mine resources

3
real NASA launch sites to choose from

03 · HOW IT WORKS

COSMOS ODYSSEY

7 NASA phases, one mission

The game follows the NASA project life cycle. Each phase is a screen you play, not a page you read.

FORMULATION · decide what to build

1 — PRE-PHASE A — Concept study

Compare real mission alternatives, their cost and what can go wrong.

2 — PHASE A — Concept

Choose the goal and one of 3 real NASA launch sites on the globe.

3 — PHASE B — Preliminary design

Spend science points on 5 parts and write the requirements.

IMPLEMENTATION · build it, fly it, bring it home

4 — PHASE C — Fabrication

Assemble the rocket like a puzzle and tune its parameters.

5 — PHASE D — Tests

Every requirement is verified. A failed test sends you back to fix it.

6 — PHASE E — Operations

Launch, cruise and random crew tasks until you reach the target.

7 — PHASE F — Return

Reentry, parachutes and landing, with the crew and the cargo.

Fail too many tasks and the mission is lost. The game shows which choice caused it, and you start again, like a real program.

Every choice has a cost

No perfect spacecraft: only trade-offs, like a real engineering team.

Science points are the budget

Solar panel or nuclear generator? Chemical or ion engine? Each part buys one strength and pays with another.

Resources react live

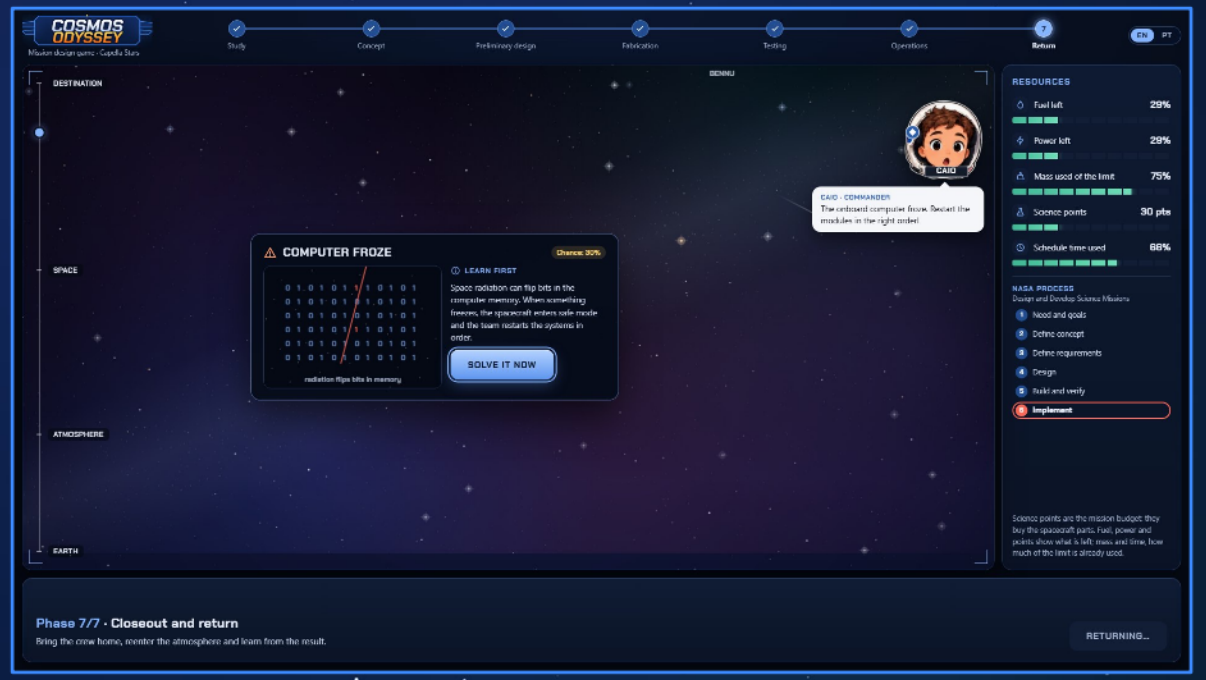
Fuel, energy, mass, budget and schedule update on every decision, during the whole flight.

Random crew tasks

Mini-games in the Among Us style: wires, oxygen leaks, meteor showers. Each one opens with a short science card.

Mistakes have weight

3 errors fail a task. 3 failed tasks abort the mission, and the game explains which choice caused it.







COSMOS ODYSSEY

Built on how NASA really works

Simplified for beginners, never invented: every phase points to a real NASA source or mission.

STRUCTURE

NASA project life cycle

Pre-Phase A to Phase F, as described in the NASA Systems Engineering Handbook and the NASA Program and Project Management Handbook.

PROCESS

Design and Develop Science Missions

The NASA resource of this challenge. Its 6 steps (needs, concept, requirements, design, build and verify, implement) run live in the game's side panel.

MISSIONS

Real missions as examples

OSIRIS-REx brought 121.6 g of asteroid Bennu to Earth in 2023. Perseverance studies Jezero crater on Mars. Voyager shows why nuclear power works far from the Sun.

LAUNCH SITES

Real NASA launch sites

Kennedy (28.6° N): Earth's spin helps the climb. Vandenberg (34.8° N): polar orbits. Wallops (37.9° N): smaller and cheaper rockets.

Requirements follow the NASA rule: each one already says how it will be verified (weighing, thermal vacuum, reentry heat test, quality inspection).

Learn how NASA missions work, by playing one

Why it matters

- ✓ Learning by doing: students feel the trade-offs instead of memorizing them.
- ✓ Ready for class: each phase is one short screen, and every task opens with a science card.
- ✓ Safe and open: runs in the browser, with no login and no personal data.

Next steps

- ◆ Each new mission goes a little farther, and what you bring back upgrades the spacecraft.
- ◆ Group mode for up to 4 players, each with a role (planned).
- ◆ Full English and Portuguese versions.
- ◆ Playtests with students to measure what they learn.

