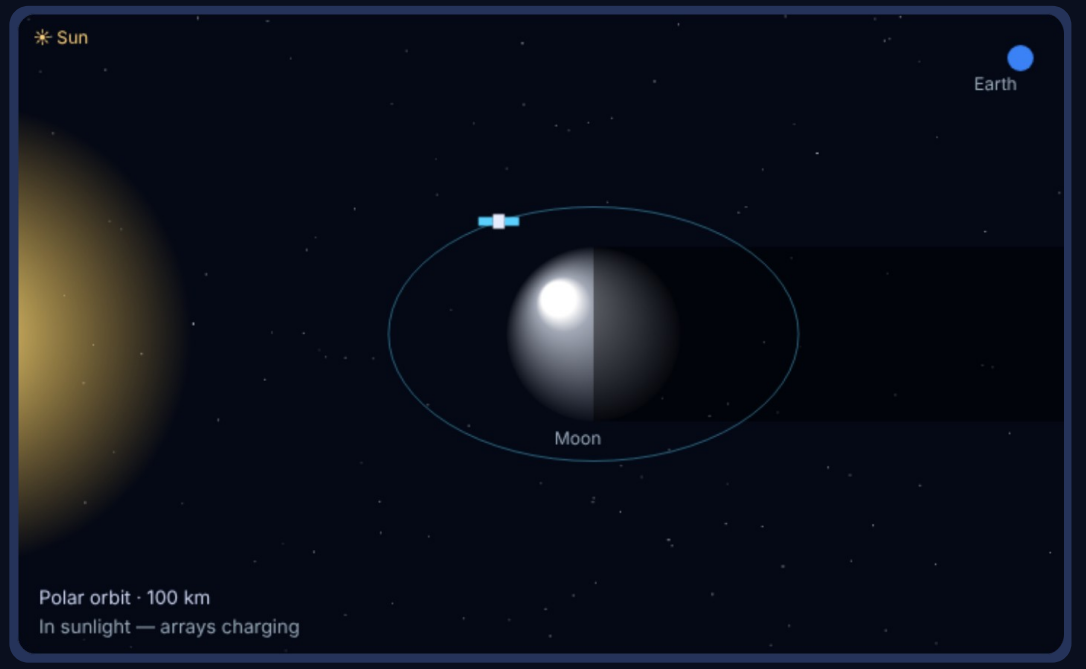
NASA SPACE APPS CHALLENGE 2026 · SPACE MISSION DESIGN GAME

Mission Architect

Every choice has a cost. Design, fly and debrief a complete space mission — and learn why it succeeds or fails.



Team Counterbirne

Play in your browser — no install, no login
marlonwollny-dotcom.github.io/NasaSpaceAppsChallange_Counterbirne

Mission trade-offs stay abstract

A real mission is a web of coupled decisions: change one subsystem and everything else moves.

Students rarely get to design a mission from concept to operations. Most learning tools cover one subsystem at a time — so the system-level trade-offs that decide success or failure stay invisible.



...and the budget is fixed.

One complete mission, question to downlink

1

Choose a mission

Earth fires, lunar ice or Mars climate — each asks a real science question

2

Design

Orbit, launcher, instruments, power, propulsion, antenna, computer

3

Go / No-Go

Readiness review explains blockers; every crew role votes

4

Fly

Launch, cruise, orbit insertion and daily operations with anomalies

5

Debrief

Score, cause-and-effect explanation, compare designs and re-fly

3 missions

Earth orbit, Moon, Mars

1–4 players

hot-seat crew with roles

0 installs

one HTML file, any browser

~15 minutes

per mission, re-fly anytime

Design: every choice moves the system



Live mission dashboard

Budget, launch mass, power, eclipse energy, Δv, data flow and a science forecast update with every click.

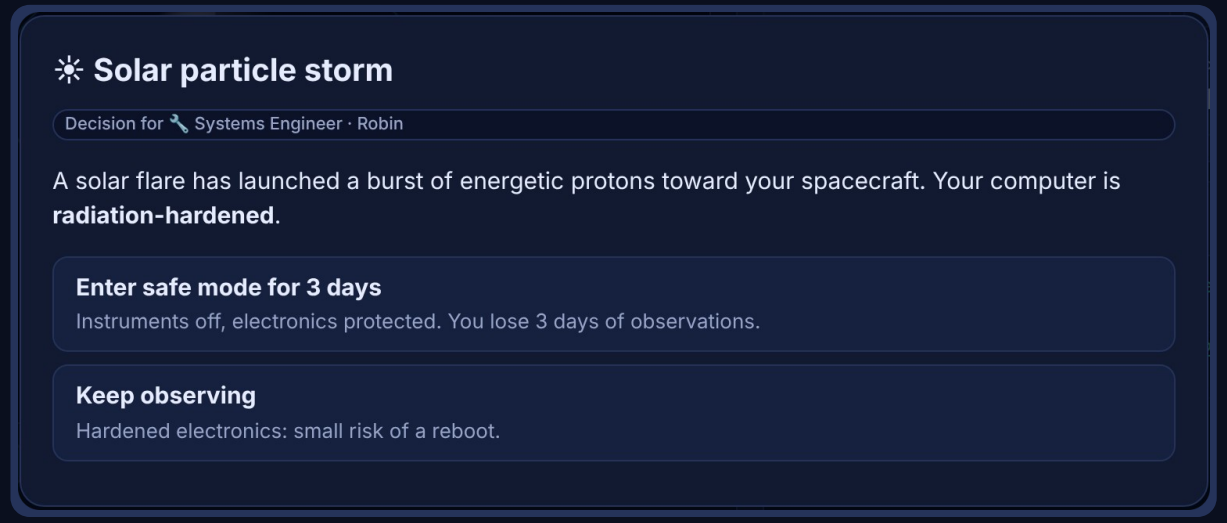
Real physics underneath

Rocket equation, Kepler orbits, eclipse length, link budget and battery depth of discharge.

Readiness review

Blockers and warnings say what is wrong and how to fix it — before launch, not after.

Fly: anomalies, decisions, conflicting goals



Solar storms · reaction-wheel failures · debris alerts · lunar eclipses · dust storms · solar conjunction · budget cuts

The responsible role decides. The design decides how much each anomaly hurts: a spare wheel or a hardened computer turns a crisis into a footnote.

Mission Lead

Finish ≥10% under budget

Payload Scientist

Return ≥120% of the science target

Systems Engineer

Keep power and mass margins

Comms & Data Lead

Get every bit home to Earth

Go / No-Go poll Launch needs a unanimous GO — the roles must negotiate a design where everyone wins.

Debrief: learn why, improve, re-fly



"Data bottleneck: you generated 18,250 Gbit but only 3,350 Gbit reached Earth. Downlink grows with antenna diameter² × power ÷ distance² — a bigger dish would have returned more science."

Cause and effect

Every result is explained in plain language, with the physics behind it.

Five scores

Performance, science value, resource efficiency, decision quality and teamwork.

Fair comparison

Re-fly under identical conditions and compare designs side by side.

Real physics, honestly labelled

Real data

Radii, gravitational parameters, solar irradiance and distances of Earth, Moon and Mars from the NASA Planetary Fact Sheets.

Real physics

Kepler's third law, Tsiolkovsky rocket equation, eclipse geometry, link budget, battery depth of discharge.

Game model

Component masses, costs and science values are simplified — and labelled as such in the in-game "Data & sources" panel.

Next steps More destinations (Europa, asteroids), a classroom mode with shared leaderboards, and more languages.

Play now marlonwollny-dotcom.github.io/NasaSpaceAppsChallange_Counterbirne

Source code github.com/marlonwollny-dotcom/NasaSpaceAppsChallange_Counterbirne

AI disclosure: the game's code was developed with the help of an AI assistant (Claude, Anthropic) and reviewed and tested by our team. No AI-generated images, audio or video; no NASA logos or insignia. Independent project, not endorsed by NASA.