Responsible Space

TEAM 21 – TEAM "WORKS IN THEORY"

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The Space Debris Problem

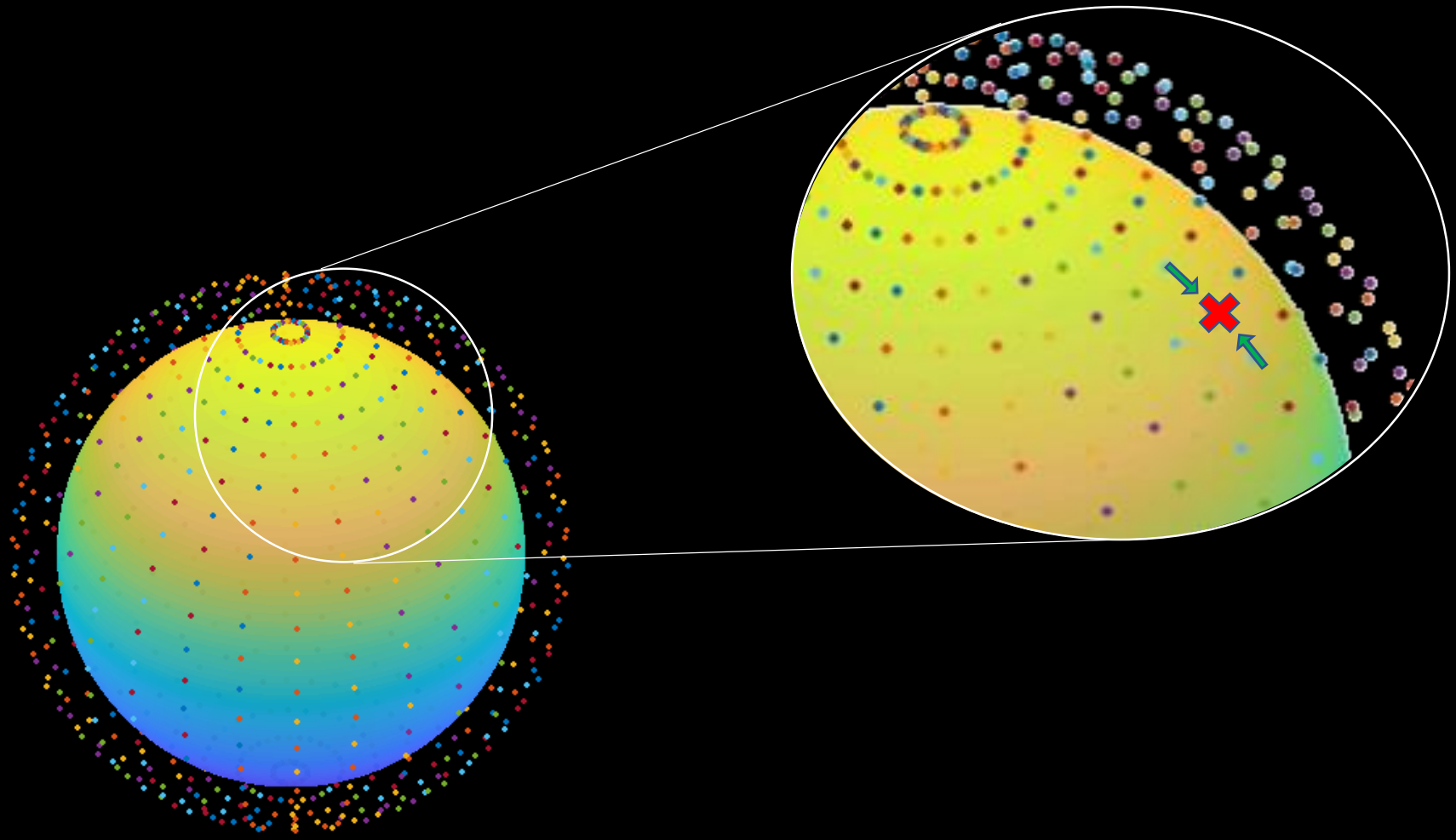
- 8000 satellites launched in the entire human history
- 5000 of them still in space
- 1950 of them still working
- Sustainability of a 600 satellites constellation?
- Long-term consequences

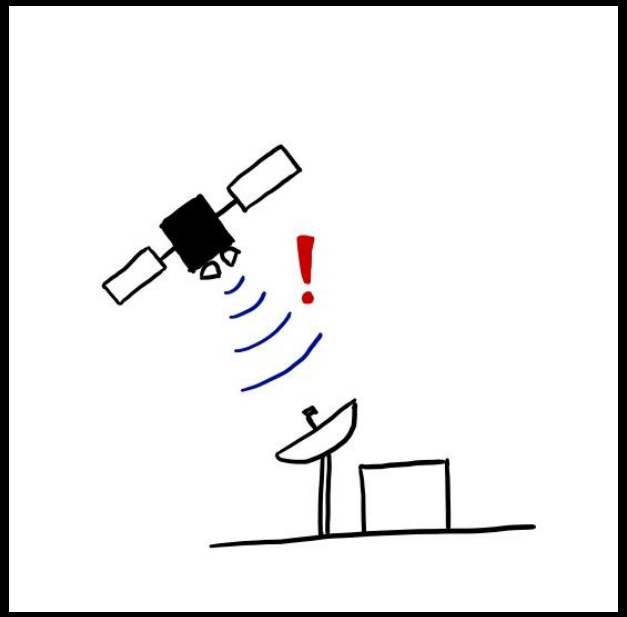
Deorbiting

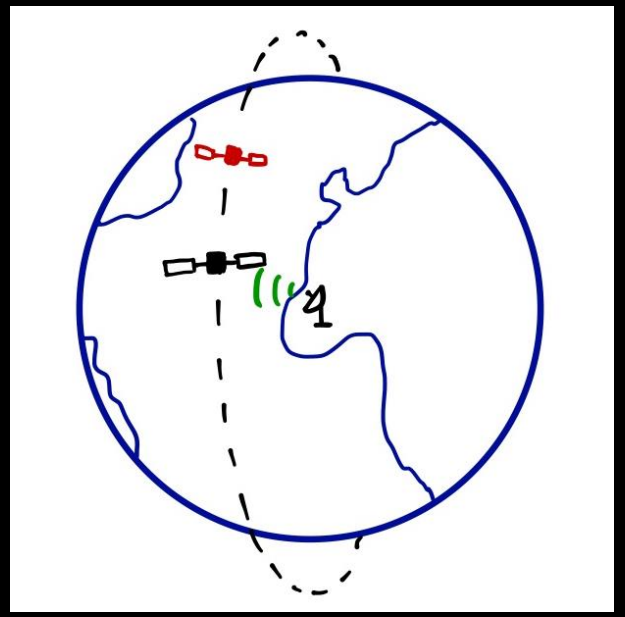
- Currently, satellites take years to deorbit before burning up in the atmosphere.
- This increases costs and risk of collisions with other satellites
- We aim to accelerate this process with our design

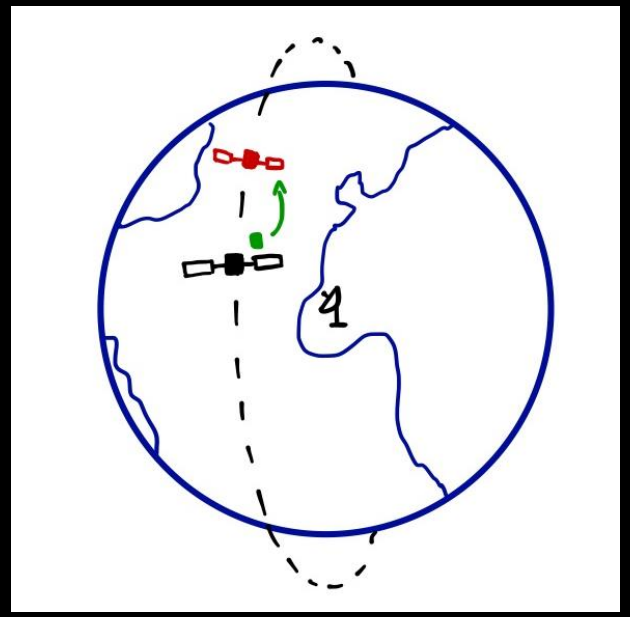
Design

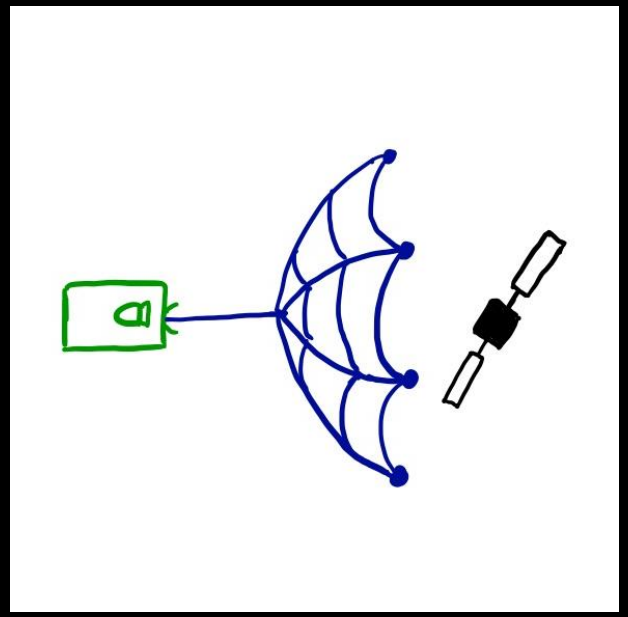
- Need a design that does not require any input from the target satellite
- Able to use the existing constellation of satellites to achieve this.
- Minimise space debris in the process.



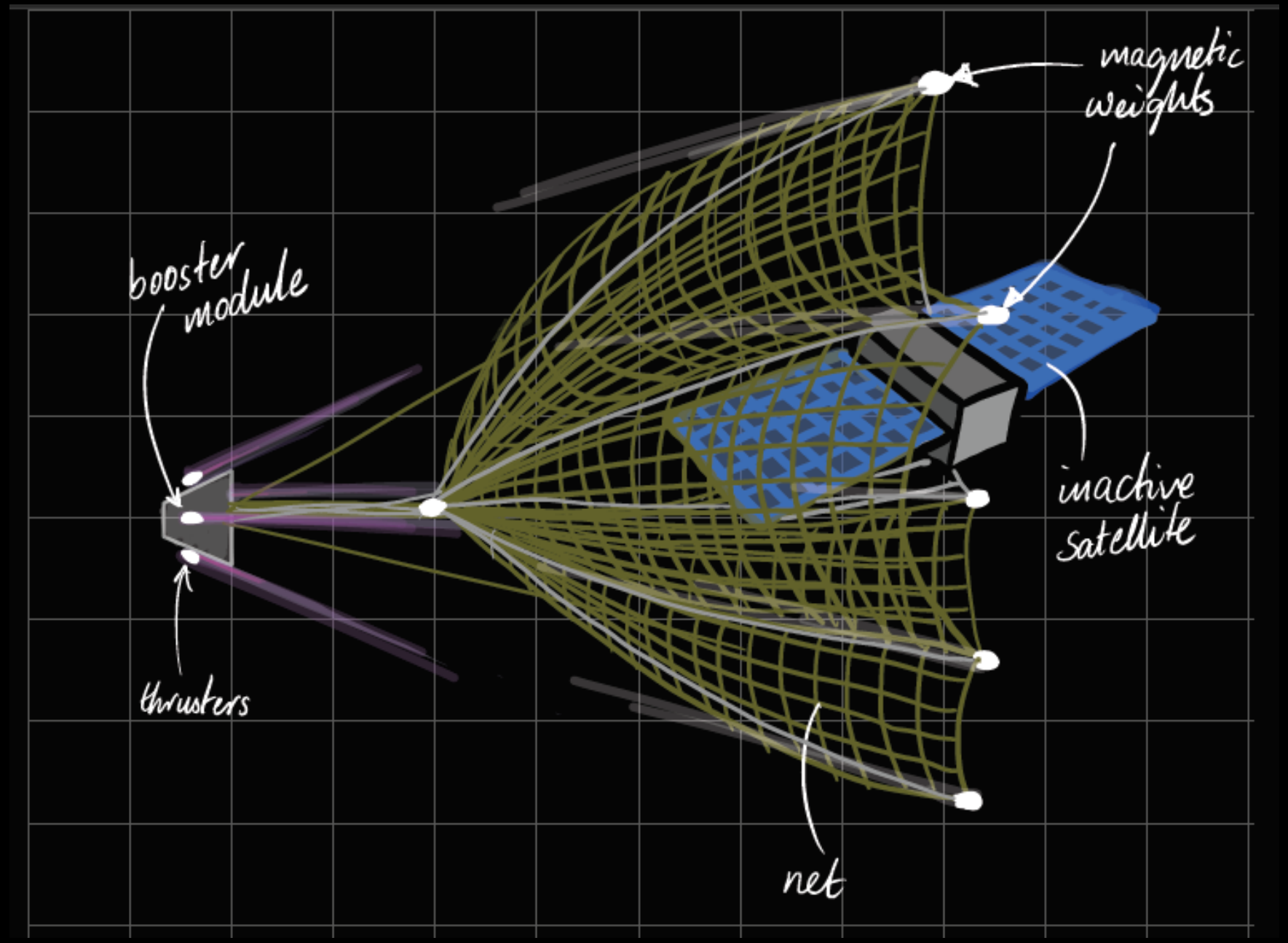




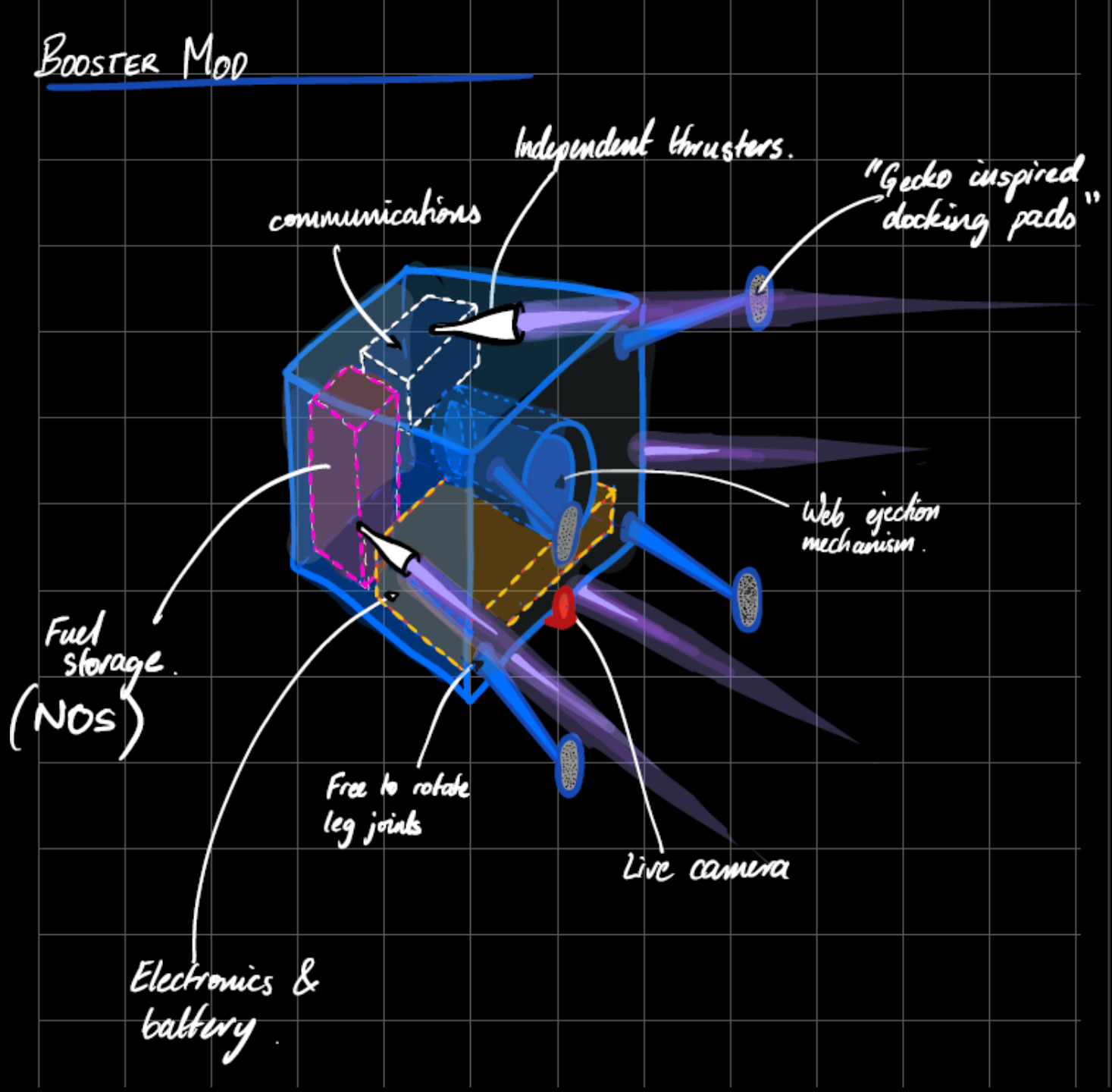




Our Design

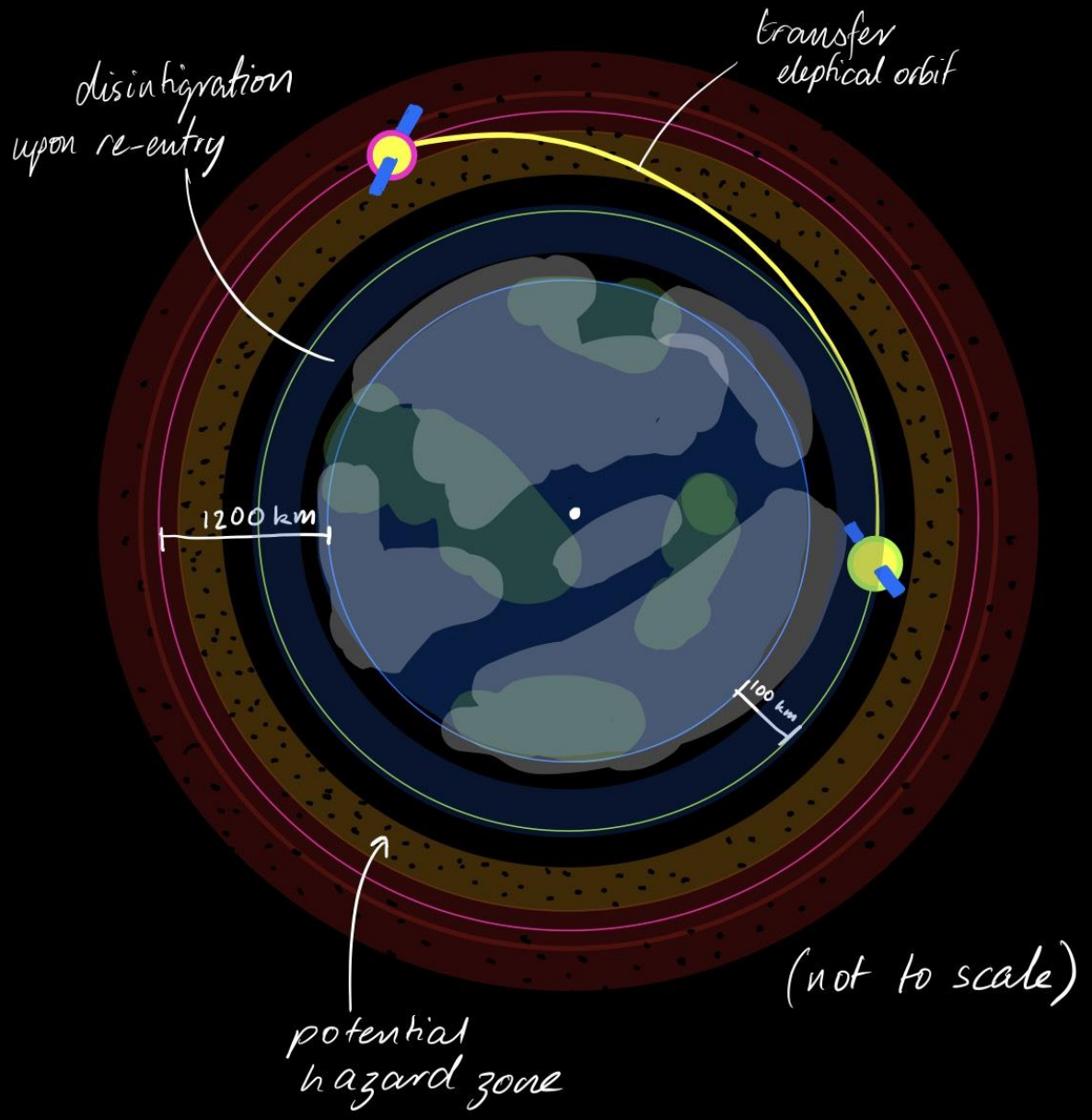

magnetic weights
booster module
inactive satellite
thrusters
net

Our Design


Booster Mod
Independent thrusters.
communications
"Gecko inspired docking pads"
Web ejection mechanism.
Fuel storage. (NOS)
Free to rotate leg joints
Live camera
Electronics & battery.

Future Developments

- New propulsion methods
- Reusable
- Recovery of deorbited units
- Operation automation



https://www.qinetiq.com/what-we-do/space/electric-propulsion
http://www.russianspaceweb.com/vega_lv.html

Central Body

μ [km^3/s^{-2}]: Earth | 398 600.

Radius [km]: 6378

Min Flyby Radius [km]: 6478

Orbits

r_i [km]: Custom | 7578

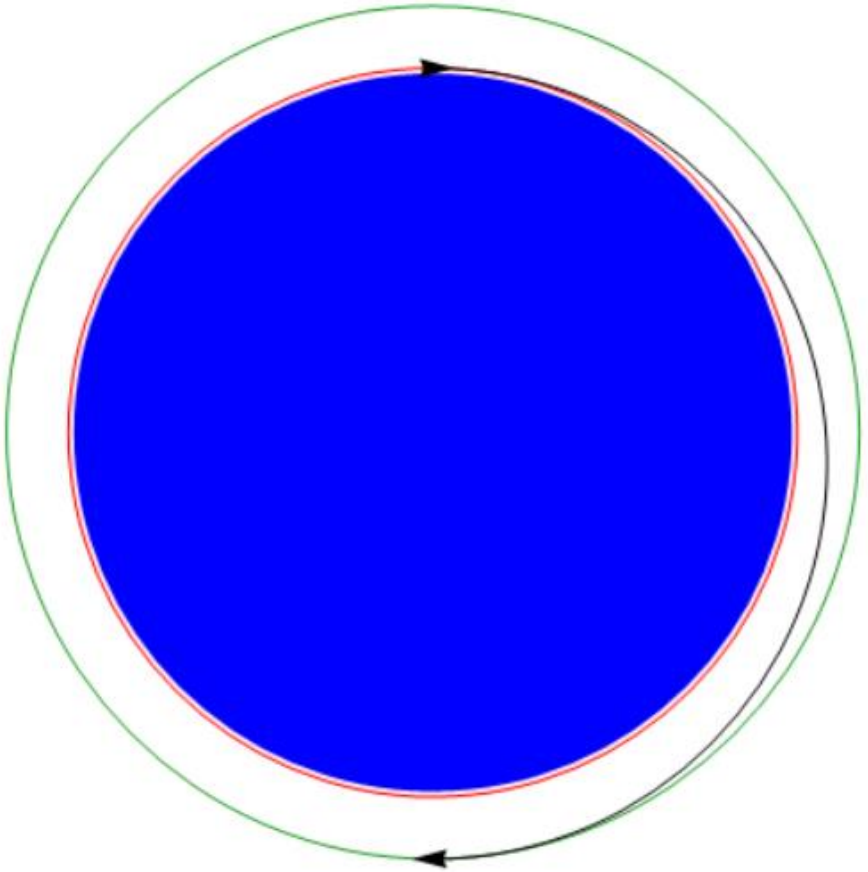
r_f [km]: Custom | 6478

Other Settings

Length: m km AU ly

Time: s min h day year

Sun to Scale: ☐



Example orbit: Custom to Custom

Warning: Orbiter crossing the Earth's atmosphere.

Initial orbit

r_1 [m] =	7.578×10^6
h_1 [m] =	1.2×10^6
v_{c1} [m/s] =	7252.56
T_1 [s] =	6565.12

Final orbit

r_2 [m] =	6.478×10^6
h_2 [m] =	100 000.
v_{c2} [m/s] =	7844.2
T_2 [s] =	5188.87

Transfer orbit

a [m] =	7.028×10^6
ecc =	0.0782584
Δv_1 [m/s] =	-289.568
Δv_2 [m/s] =	-301.156
Δv_{Total} [m/s] =	590.724
$t_{transfer}$ = T/2 [s] =	2931.76

Print data (m-kg-s)