

Methods of propulsion

for spacecraft and launch vehicles

Chemical

Fuel and oxidiser mixed,
exhaust fumes push rocket
upwards

+ lots of fuel choices - LH2,
CH4, RP1

+ throttle can be controlled

- more complicated

- suffers from slosh and liquid
oscillation

Liquid

- uses fossil fuels

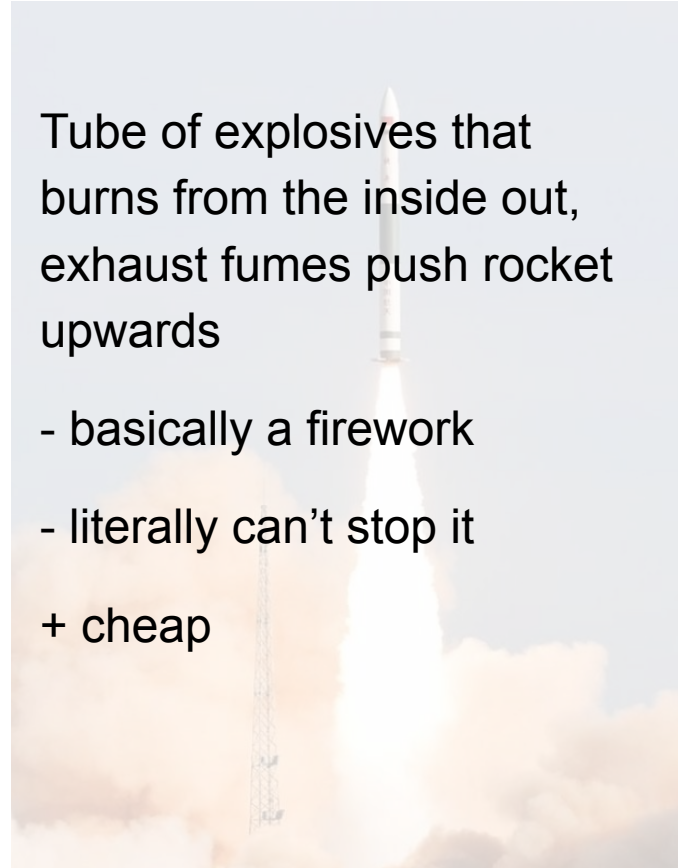
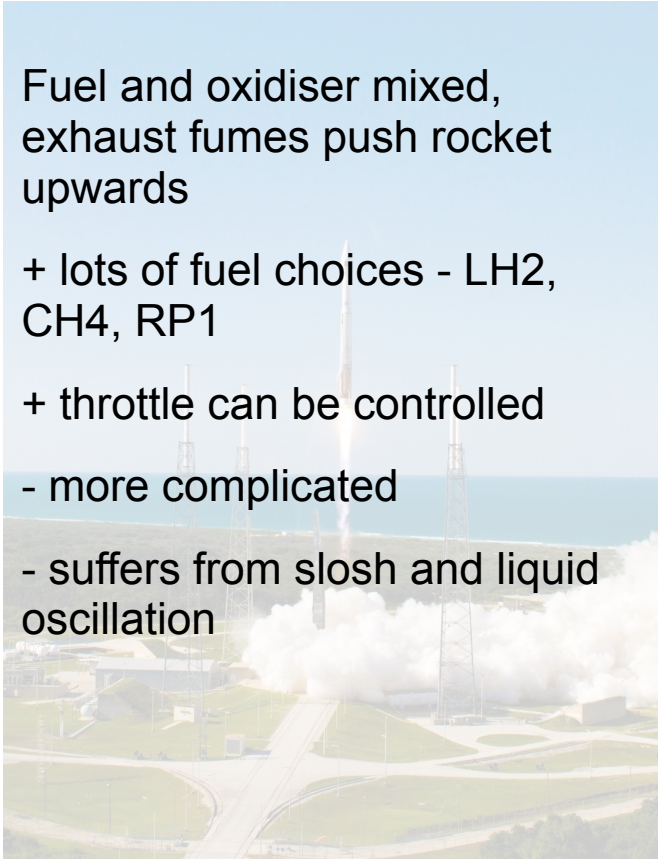
Solid

Tube of explosives that
burns from the inside out,
exhaust fumes push rocket
upwards

- basically a firework

- literally can't stop it

+ cheap



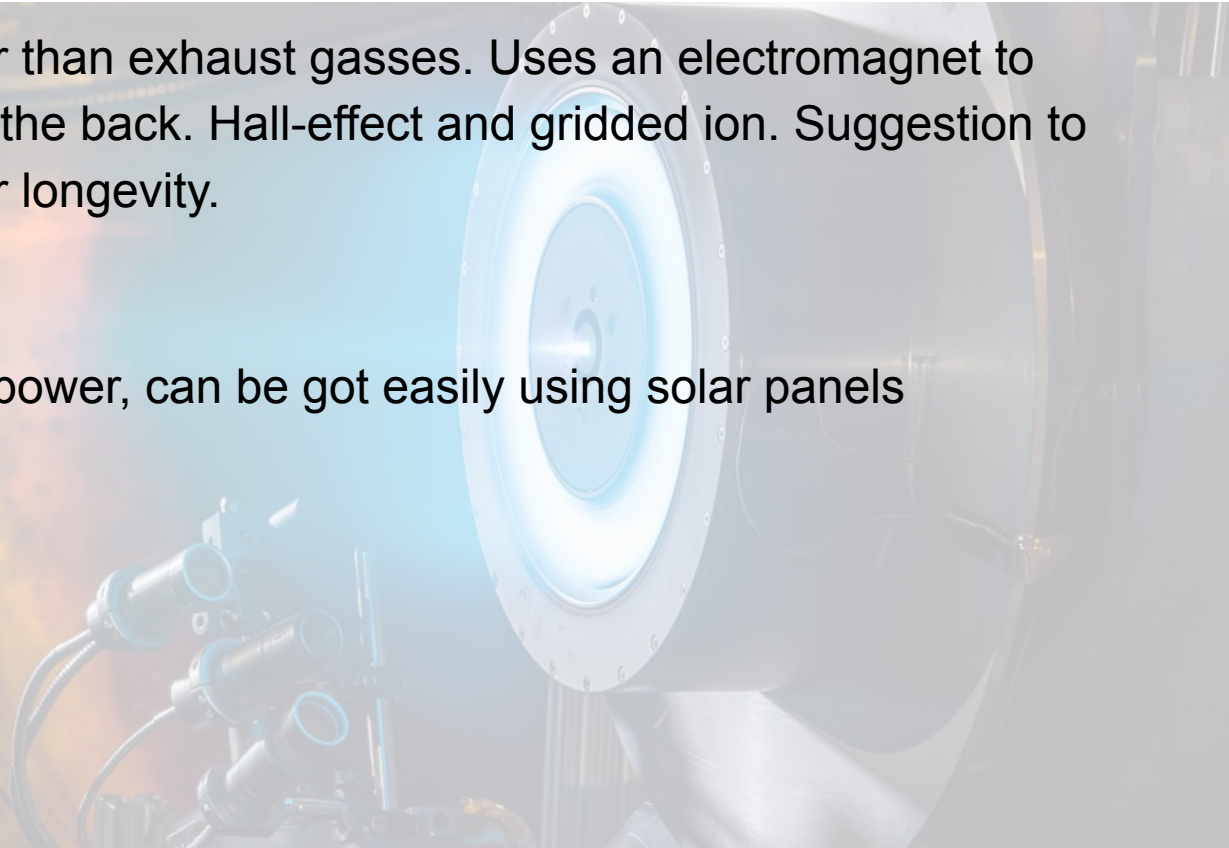
Ion engines

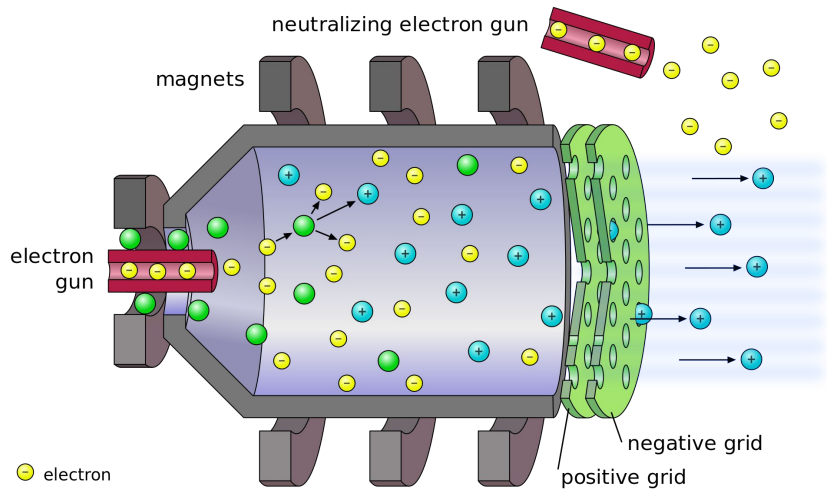
Uses accelerated ions rather than exhaust gasses. Uses an electromagnet to accelerate charged ions out the back. Hall-effect and gridded ion. Suggestion to use diamond on the walls for longevity.

+ very efficient

+ uses electricity to provide power, can be got easily using solar panels

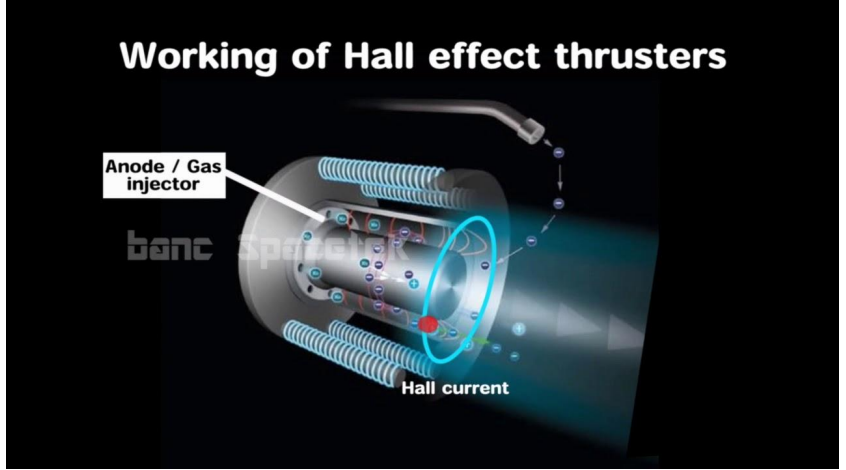
- not very powerful





- electron
- neutral propellant atom
- ⊕ positive ion

gridded ion



Nuclear reactor

Can be used to power ion engine and possibly make them powerful enough for general use

Neutron thrusters

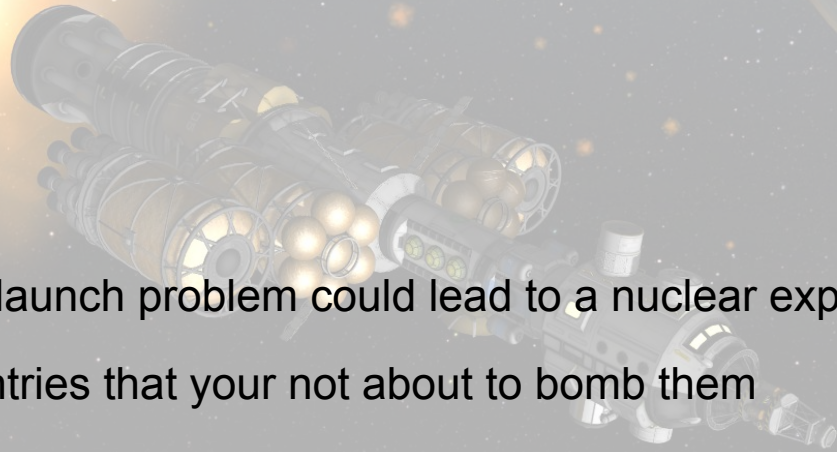
Nuclear pulse

Blowing up nuclear bombs behind your vehicle

Allows you to go fast, quickly

probably a really bad idea

- radiation
- hard to control
- really expensive
- have to get it into space - a launch problem could lead to a nuclear explosion
- hard to persuade other countries that your not about to bomb them
- explicitly banned by the Outer Space Treaty



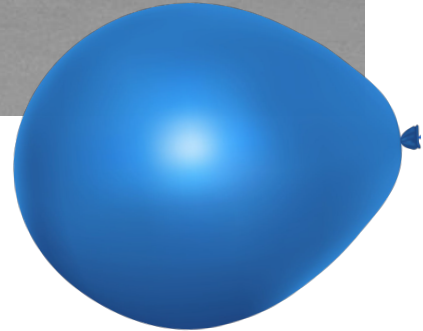
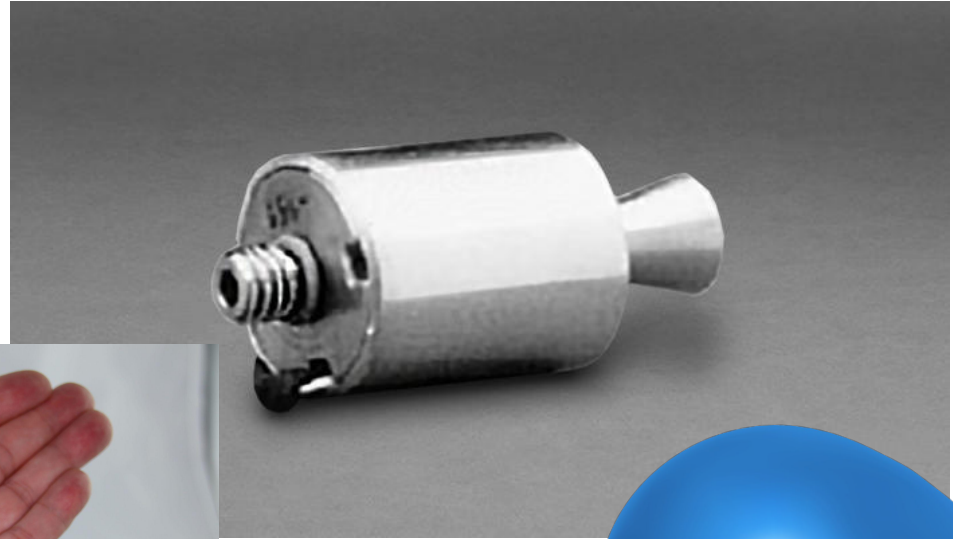
Cold gas

Like a balloon

- very, very small amount of thrust

+ very, very small amount of thrust

used for small maneuvers



Solar sails

Uses the force of light hitting a reflective sail

- really small thrust
- only works when in sunlight
- + doesn't need any fuel



Solar sails but with lasers

Uses the force of light hitting a reflective sail

- a little bit bigger thrust

+ doesn't need any fuel



unrelated - aurora



Pictures from Kathryn
because they are better than